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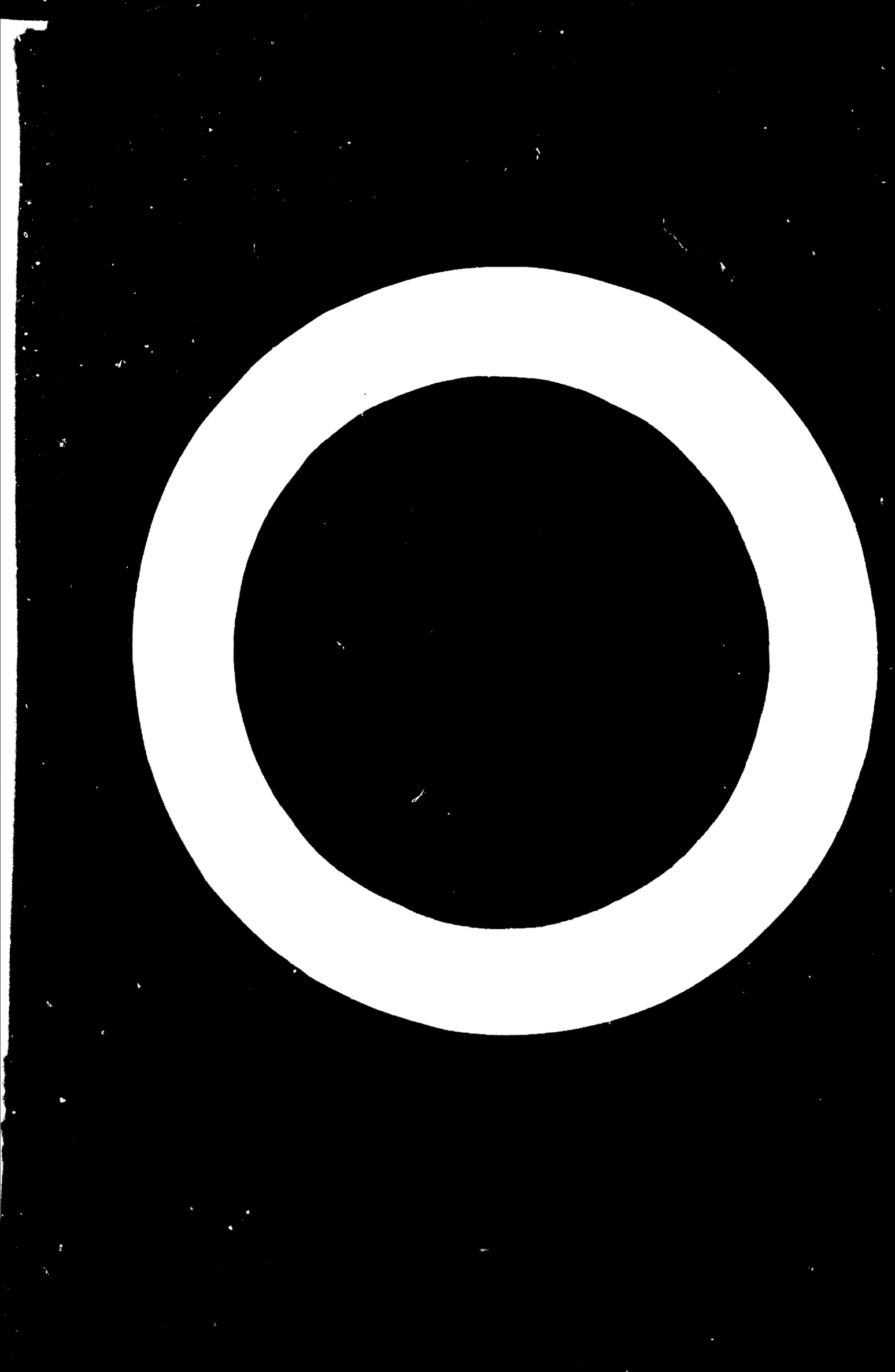
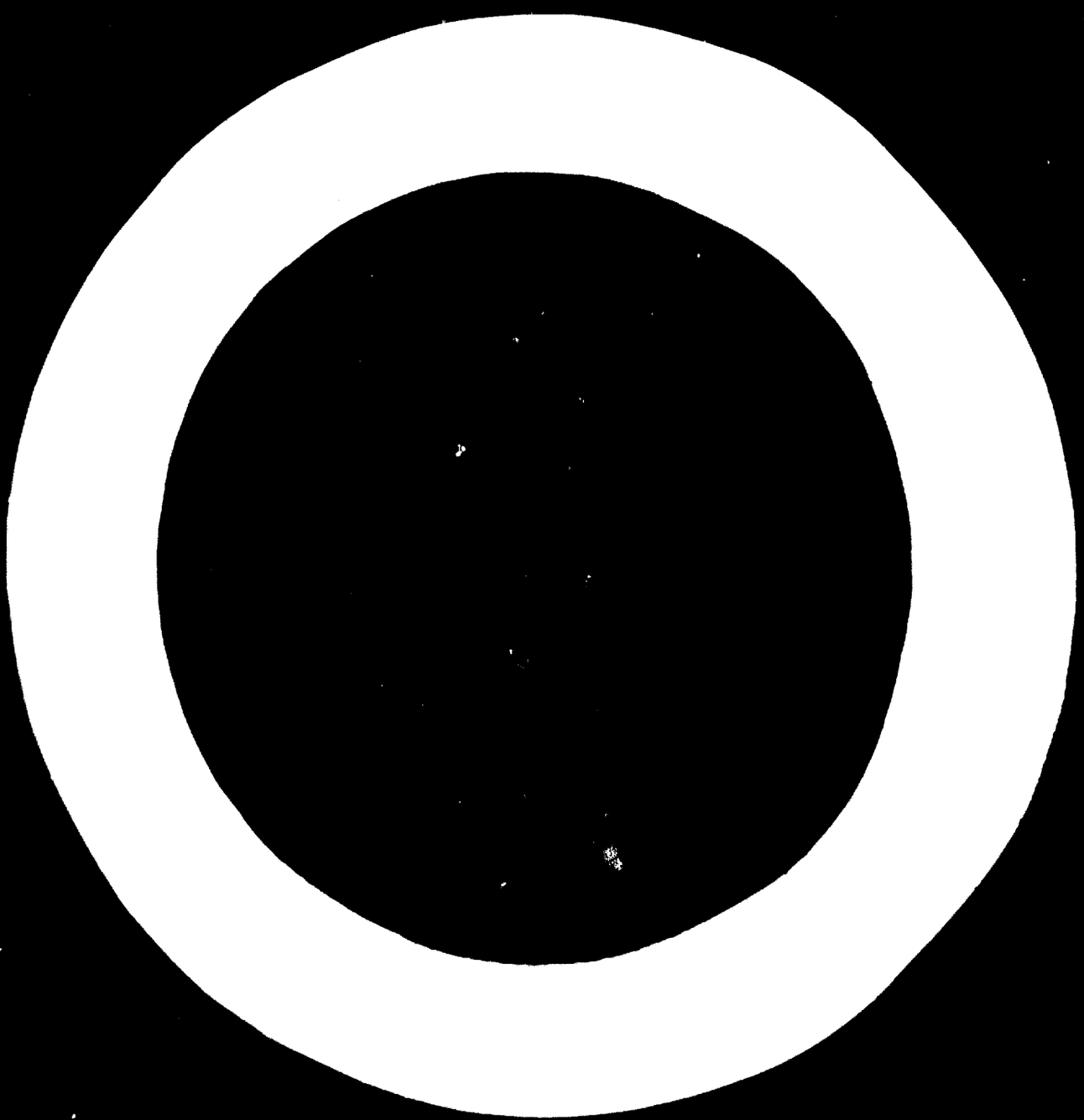
INDUSTRIAL LOCATION AND REGIONAL DEVELOPMENT

Proceedings of Interregional Seminar
Minsk, 14-26 August 1968

UNITED NATIONS





UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION, VIENNA

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Preface

Industrial location and regional development are an integral part of problems connected with industrial programming. Profitability of industrial investment vary considerably - from both the commercial and national points of view - according to the geographic allocation of the investment. Incorrect spatial distribution of industrial activity may, under any economic system, seriously retard the economic development of a country. At the same time the region very often becomes the principal area in which the social and environmental problems of the society can be confronted and solved.

The problem of planning industrial location at the regional level is particularly relevant in developing countries. Most of them are not yet settled, and have not experienced major mislocations of industries up to now, so that they have the possibility of avoiding the serious negative consequences of such mislocations.

On the whole, economists and planners have, in recent years, paid too little attention to the role of industry location in the development of the industrial sector of the national economy. The factor of location and space has now, however, become crucial as a requisite for successful plant operation. In the near future, no developing or developed country can afford to disregard this problem.

The importance of the regional aspects of planning, both in developing countries and within their regions and subregions, was stressed in the recommendations of the International Symposium on Industrial Development (Athens, November-December 1967). Following this recommendation, the United Nations Industrial Development Organisation (UNIDO) organized the Interregional Seminar on Industrial Location and Regional Development, held in Minsk (Byelorussian SSR) from 14 to 26 August 1968.[1/] It was the first international gathering devoted exclusively to the consideration of issues and problems in industrial location.

1/ See Report of the Interregional Seminar on Industrial Location and Regional Development (United Nations publication, Sales No.: 69.II.B.22).

The agenda of the seminar consisted of four main items:

(a) The general problems of industrial location and regional development;

(b) Factors in the location of industry;

(c) Methods of industrial location planning;

(d) Instruments of industrial location policy.

The seminar examined all relevant aspects of the problem. The hope was expressed by the participants that the seminar and the comprehensive documentation submitted to it would lay the foundation for an organized body of knowledge that will apply to the needs of the developing countries.

Most of the papers presented at the seminar are brought together in the present publication, grouped according to the main items of the seminar agenda. The views and opinions in signed papers and in papers communicated by Governments are those of the authors and do not necessarily reflect the views of the secretariat of UNIDO.

On recommendation of the Minsk seminar, UNIDO has published a bibliography on industrial location and regional development, intended for the use of planners and policy makers in developing countries.[2/] Since the field is broad, and the amount of published material is somewhat limited, the bibliography and the present study include a number of references that are incomplete and some references to unpublished manuscripts.

2/ See Industrial Location and Regional Development - An Annotated Bibliography (United Nations publication, Sales No.: 70.II.B.15).

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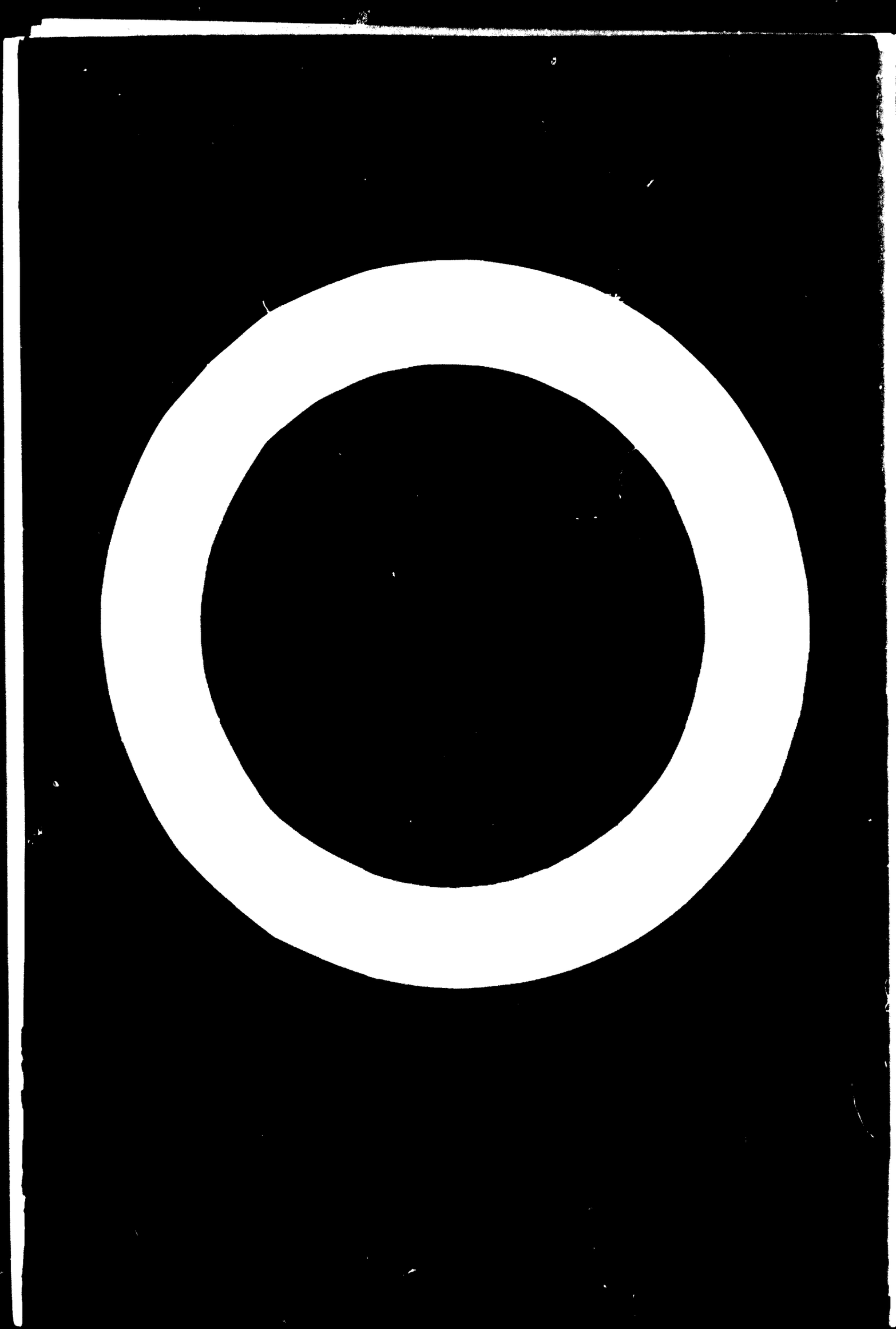

1. THE LOCATION OF INDUSTRY IN DEVELOPING COUNTRIES

by W. Alonso[1]

The developing countries present such a variety of living conditions and levels of development that it is impossible to offer a universal formula for the location of industry applicable to all. Some of the proposals in this paper may be self-evident for countries already on the road to development, but may have a practical application for countries in the initial stages of industrial progress.

The analysis that follows is based on a highly simplified alternative for the choice of location: the large city or the hinterland. From the point of view of the businessman or the project analyst in a developing country, the choice often lies between only two or three locations, one or two of which will be strongly indicated because of the existence of raw materials, source of power, specialized market, or other factors; the other location will invariably be one of the large cities - in many cases the only large city. The paramount issue of territorial planning in many countries is the possible overdevelopment of major cities to the detriment of the rest of the country.

In many cases, the major cities bear to the hinterland the same relation as developed countries bear to the developing ones. Though the literature on obstacles to development usually presents these problems at the national level, they also exist almost unchanged at the regional level. Countries endeavouring to develop their backward areas within the framework of national economic development are faced with overcoming identical obstacles at the national and regional levels.

In the earliest stages of development, regional planning often fails to take into account the realities of the problems of location and of the true dimensions of policy issues. There are a number of otherwise excellent studies of developing economies that treat the question of location superficially. In the same study contradictory statements can be found, namely, that continued

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1/ Department of City and Regional Planning, University of California, Berkeley, California.

concentration in the cities increases national polarization and income disparities but that this same concentration is uneconomic and leads to a slowing down of national growth. It is unlikely that both of these can be simultaneously true. Sometimes it is asserted that cities of 5,000, 25,000 or 250,000 inhabitants are large enough to make external economies possible. Considerable stress will be laid on such economies in the course of this study, but actually there is no reliable yardstick of relevant urban size. Perhaps the most common error is the assertion that industry is or should be located at places where transport costs are reduced to a minimum. This is true only in exceptional circumstances.

This paper presents a brief, non-technical review of the theory of industrial location, a consideration of factors of location usually neglected in the theory, and an examination of the question from the point of view of the businessmen or the project director. Problems concerning the evaluation of locations from the national standpoint are discussed as well as those involving regional planning as a factor in location. On the other hand, a number of important issues are not explicitly treated. Among these are the relative priorities of agricultural and industrial development and the links between the two, the question of infrastructure and directly productive investment, and industrial estates or growth centres.

Brief review of the classical location theory

The formal theory of the location of industry originated in Germany in the nineteenth century and remains to this day a classical one in that it presupposes economic rationality, completeness of information and a static situation, and ignores the complexities of conditions in developing countries. Most contemporary studies on industry in developing countries make only passing references to particular aspects of location within the discussion of economic development in general. Thus, many studies touch upon the over-all geographic structure of a country upon urban and regional policies (for instance, industrial parks, poles of growth, urban decentralization), or upon transportation planning.

This paper attempts to amalgamate many of these scattered ideas concerning the forces that determine the choice of an industrial location in developing countries. Although the classical location theory is ill-suited to developing economies a brief non-technical review of it will be useful if only because its deceptive straightforwardness has moulded the thinking of many practitioners

and experts in the field of development, who have been misled by the half-truth that the rational location for an industry is that which minimizes transportation costs.

The classical problem dealt with in the literature on the subject is that of choosing a location for setting up a factory. It is assumed that the sources of materials, the location and size of markets, the necessary quantities of input materials per unit of product and the transportation rates are known. When the problem is stated in these terms, everything but transportation costs is held to be constant, and the best location is naturally that which minimizes transportation costs. Later it will be shown how other factors do not remain constant and that this objective is subject to strong qualifications; for the moment, however, the classical formulation will be accepted.

To assess transportation costs, it is necessary to consider the costs of assembling materials and distributing the product to each possible location. These costs will vary from one site to another, and, if graphed together, they would describe over the national territory a fairly smooth surface of transportation costs, shaped like a bowl. The lowest point of that surface must fall within the polygon formed by drawing lines joining the locations of markets and materials, or at one of the vertices of the polygon. The point of least transportation costs may be the lowest point on that surface; however, the surface is likely to have pits at each material or market location. This is because locating a factory at such points will avoid terminal costs such as loading or unloading, insurance or shipment. These pits may be lower than the bottom of the bowl, and may thus represent locations of lower transportation costs.

Another type of location where savings of this type are possible is at ports and other points where there is trans-shipment or break-of-bulk. It is often advantageous to process materials when, for example, they are to be transferred from trucks to ships; this is one of the principal reasons for the development of port locations as industrial centres. In the terms used above, port locations often represent deep pits on the surface of transportation costs.

The classical theory recognizes that transportation costs are not the only factors to be considered. Certain locations may have lower wage rates, preferential tax treatment, or some other advantage that lowers the costs of manufacturing. The savings per unit of product may be subtracted from the

height of the transport surface at that point, and create another pit which must be compared with the others.

In short, the theory amounts to no more than a systematic consideration of all possible locations, calculating transportation and production costs at each location, and choosing the lowest. This is an engineering rather than a true economic model, at least in this simplified form. It does not take into account economic considerations such as factor substitution, the elasticity of demand, economies of scale, or the consequences of alternative pricing policies. Full consideration of all these would lead to a complex mathematical analysis.2/

Since diversity of location results in differences in the delivered prices of materials, many manufacturing processes adjust their factor proportions. For instance, a steel-making plant at a location distant from a source of coal will find coal relatively more expensive because of its additional transportation costs and will probably choose a production process that uses relatively less coal and more of some other product. Thus, the classical theory studies only substitutions as between transportation inputs, whereas in reality there often exist possibilities of substitution between transportation and other inputs. The objective of minimizing transportation costs must be broadened so as to include the minimizing of total costs, and this only if total revenues are considered as fixed.

Total revenues, however, are not fixed if the quantity to be sold varies with the price. If the product is sold at different prices in various markets because of differences in delivery costs or for other reasons, the profitability of the enterprise will in general be greater if it is located near markets sensitive to price variations. A large market that has an unvarying rate of sales will exert a lesser force of attraction than a smaller one, in which slight reductions in delivered price result in large variations in the quantity sold. The quantity sold at each market may thus vary from location to location, and also with the pricing policy adopted. This point is important, for the true objective of most economic activity is to increase profits, not to reduce costs to a minimum. The reduction of transportation costs is only a limited objective in the over-all pattern,

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2/ The interested reader is referred to W. Alonso (1967) "A Reformulation of Classical Location Theory and its Relation to Rent Theory", Papers of the Regional Science Association, Vol.XIX.

and a firm will normally be willing to spend more in order to make more. Otherwise, to take an extreme instance, transportation costs would be minimized by not producing at all.

It must be recognized, however, that the classical problem of adapting production to a pre-determined quantity and price may be well-suited to conditions of scarcity, imperfect articulation of the pricing system, and socialized production such as are commonly found in developing countries. It may be argued that, in those cases, the problem is to engineer production rather than to identify demand, in contrast to the free-market situation of affluent economies. But such an argument, and the objections to it, lead to difficult and as yet poorly defined areas of economies. A simpler and more forceful argument for a location that minimizes transportation costs is that it makes the analysis simpler, requires less technical manpower, and is likely to be less time-consuming; thus the project may get underway more quickly at a location which is satisfactory, even if it is not the best in terms of profitability, contribution to the national product, or some other fundamental objective. It may be noted that different objectives will sometimes result in the choice of different locations.

According to the classical theory the choice of location is governed by the pulls from markets or material sources. In the simplest case, where all quantities are fixed and only transportation costs vary, the pull of a source of material is equal to the weight of that material per unit of product multiplied by its transportation rate. The pull of a market is equal to the fraction of total production sold there, multiplied by the weight of the product, multiplied by the transportation rate. If we allow substitution among production factors, the pull of a material is weighted by the sum of cross-elasticities between this factor and the others. In certain methods of pricing, the pull of a market is weighted by the price elasticity of the demand at that market. But, setting such complexities aside, we may imagine these various pulls operating on the location: the optimal location will be at the point where these forces balance each other and an equilibrium is achieved.

This simple physical analogue of the forces of location is quite instructive. The force that pulls towards a location is called the ideal weight.[3/]

3/ Actually, the ideal weight is the name of the magnitude of the force, (excluding direction) in the simple case. No general name exists for the more complex directed force.

Where one ideal weight is large in relation to the others, it pulls the location of the plant towards it, and the industry is said to be oriented towards it. Thus, processes that lose weight, such as the reduction of ores, result in a material-orientation. On the other hand, processes that increase in ideal weight tend to be market-oriented. The increase in ideal weight may, as in the case of beer and ink, be due to the addition of a universally available ingredient (water), or, as in the case of boxes and automobiles, to the increase in bulk which increases the freight per mile, or again, as in the case of newspapers and baked goods, to the perishability of the product which requires rapid and expensive transportation.

Even these rudimentary considerations begin to shed light on the question whether industry will be attracted to resources. Thus, iron ore has a low ideal weight in relation to coal and to the other factors that go into iron and steel, and the higher the grade of the ore, the less likely it is to attract industry since it is easier to move it. Oil has an ideal weight nearly equal to that of its first stage products, and therefore the petrochemical industry may be located either at the source, or at the market, or at some intermediate location which is convenient because of transportation, availability of funds, political safety, or any other reason. Generally speaking, it may be said that most physical resources attract little industry. Their first processing does not add much to their value and is seldom labour-intensive, and later transformations are likely to be oriented to other locational pulls. On the other hand, coal is weight-losing in most of its uses, and electricity is expensive to move over long distances. Hence their ideal weights are high, and they may attract industry.

In comparison with the industries of developed countries, most industries in developing countries are simple, in that they require relatively few raw materials. Thus, the steel industry will confine itself to the manufacture of the basic types rather than more specialized alloys. The markets will be concentrated in a few locations, in particular large cities or, in the case of foreign markets, the ports. A complex process that uses materials obtained from many primary sources and secondary producers, and which produces a wide line of goods which sell in a large number of markets is subject to many locational pulls, and may often be located almost anywhere, since an increase in distance to one market or material source is likely to be compensated by a smaller distance to another. In other words, the bowl of the transportation surface for such processes is likely to be rather flat. In contrast,

if the locations of markets and materials are few, the transportation surface is likely to have a very distinct low point, and therefore, definite optimal location. In developing countries this tendency is strengthened by the fact that the ratio of the value of materials to the value of the final product is far higher than in developed countries. Since the value added in the production process is lower, the location of the plant is more likely to be determined by transportation costs. It will be seen, however, that a host of other factors in developing countries actually reverse this tendency by favouring the location of industry in the capital cities.

Location from the point of view of the industrial enterprise or project

Though this section deals primarily with the industrial enterprise, almost all of the criteria apply also to governmental industrial projects if viewed as projects rather than as part of a general policy of national spatial development. The criteria are particularly applicable to enterprises owned and operated by an individual or a family, as is often the case in developing countries. Some of the factors discussed, such as the personal space preferences of managers and technicians, play a less important part when the enterprise functions through an operator other than the owners, such as the state, a large corporation or a group of shareholders. Consideration is also given to firms that are said to be "located", that is, firms whose location has been deliberately chosen.

Little mention is made of "spontaneous" industry, that is, industry located where it is because the residence of the founder happens to be there, or because the founder was able to create or take advantage of an opportunity. In many countries, both developed and developing, there are entire regions or cities in which new industries spring up from such sources. Little is known about the phenomenon of this abundant growth; much of the fundamental work on location of industry belongs to an earlier generation of economists. Among present day students interested in this phenomenon, Everett Hagen holds an important place.[4/] In general, the causes for such a ferment appear to arise from tension or restlessness, a dissatisfaction with existing conditions or the fear of some imminent change, which provokes a desire to seek fresh opportunities and new ways of approach. Racial or religious minorities, uprooted

4/ Planning Economic Development, R. D. Irwin, Inc., Homewood, Illinois, 1963.

sections of the farm population and members of a threatened landed aristocracy have all, on occasion, played an entrepreneurial role, but it is difficult to generalize about the spatial incidence of such spontaneous industrialization. However, if spontaneous industrialization is successful, it is likely to lead to professional management and to the separation of management from ownership. As the scale of operations increases, decisions regarding location are taken more deliberately, especially as regards branch plants, and what began as a "spontaneous" industry becomes a located one.

In general, the principal differences in the problem of location between developed and developing countries are due to the amount of available information, which involves an element of uncertainty; the knowledge of opportunities, of technical and managerial capacity, of supply and other factors. In a broader sense, the problem can also involve the movement of goods and of ideas. The classical location theory, by assuming complete information and predictability, and unlimited managerial and technical manpower, ignores the strongest factors influencing location in developing countries. Moreover, the theory is for the most part static and assumes that events happen in an instant, whereas actually time plays a crucial role in location in developing countries. An examination of the effects of the spatial structure of developing countries on transportation costs follows, and some vital but neglected factors are considered.

Transportation network and the concentration of markets

The transportation networks of developing countries reflect their economic history. The traditional role of these countries as exporters of primary products resulted in the creation of transportation networks that resemble drainage systems converging towards the coastline. Ports became the major cities and served as trans-shipment points for the exports and as distribution points for finished products coming from abroad. It is thus that the transportation networks of developing countries are typically shaped like a fan or the branches of a tree.[5/] In developed countries, by contrast, networks form a lattice which offers nodes or points of confluence and permits a more even distribution of locations. World maps of population concentration show a striking pattern of coastal cities ringing the developing continents while

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5/ See P. Haggett (1966) Locational Analysis in Human Geography, St. Martin's Press, New York and his discussion of the works of Taaffe and Kansky. The most detailed and thorough documentation is in B. J. L. Berry (1966) Essays on Commodity Flows and the Spatial Structure of the Indian Economy, Research Paper No.111, Dept. of Geography, University of Chicago, Illinois.

the hearts of the continents are virtually empty. Sometimes a navigable river permits the development of an inland city, but this is due to some circumstance that links the interior to the sea. If, instead of concentration of population, the concentrations of industry, income, education, or other forms of economic development are examined, the existence of a coastal ring can be seen even more clearly.

The consequence of such coastal concentrations and fan-shaped transport systems is that the point most accessible to the country as a whole is not its geographic centre, but some point on the edge, which is its functional centre in terms of economic distances. The physical eccentricity of these functional centres results in longer average distances between points than in countries of equal size with a lattice network transportation system. On the other hand, the extreme concentrations of economic activity reduces the distances that are effectively traversed.

One of the consequences of this strong directional veining of the national territory is that, in the preliminary analysis of location, distances must be considered in terms of specific routes, while in developed countries they may be taken in a more abstract way. In a developed country, situated in Europe or North America, for instance, it is more or less certain that the effective distance between any two points on the map will not exceed by more than 20 per cent the distance by air. In a developing country, however, one location may be unconnected to a relatively neighbouring location by road, and accessible only by a detour through some distant major city. Thus, the problem of location will involve either more difficult geometric transformations of physical space into economic space than is the case in developed countries, or a more specific and detailed (and therefore more demanding) analysis in the preliminary stages of planning.

The large coastal cities are the central locations for the distribution of goods to the population at large, a factor of primary importance for industries producing consumer goods with a country-wide market. However, consumer industries that can operate effectively on a small scale can and should be distributed more widely over the nation. The large coastal cities or principal nodes are the most central points for industries that depend on material obtained from dispersed sources. The cities serve as ports for the import of materials, components, or equipment, and for the export of manufactured goods. The concentration of demand at these points is often preponderant, both because

income is always geographically more concentrated than population and because manufactured products are essentially income-elastic, so that demand is more concentrated than income. Similarly, industrial demand for producer goods is essentially concentrated at these points.

It follows that transportation-oriented industries will often find that coastal nodes are the most advantageous from the point of view of location. It is the author's view, however, that transport inputs play a less important role in the location of industry in developing countries than in the developed ones. External causes often serve as more powerful magnets than transportation factors in attracting industry to large cities. This does not mean, of course, that there are not many industries whose location is determined by the classical location factors associated with transportation costs. Of these factors, one of the most typical is processing of materials which, being weight-reducing, is often located at the source of the material. Among such processes are the early processes of metal refining, cotton ginning, bacon curing, seed crushing, sugar refining, sawmilling, rice milling, cement and brick making.[6/]

Distance as time

Often time rather than cost is the primary factor in the consideration of distance. This is self-evident for industries that deal with perishable commodities. There are, however, other factors in developing countries that make time more important for industry than in developed countries.

The time consumed in simple shipments can be surprisingly long. Often weeks are spent in moving commodities or materials over relatively short distances. Sometimes days are wasted because of delays due to confusion, breakdowns, layovers, unavailability of carriers, labyrinthine paper work and authorizations, washed-out roads or tracks and many other contingencies that defy the imagination. For example, sometimes after waiting weeks for the arrival of an order, it is discovered that the request was misplaced and the shipment has not even left; or that the shipment has been sent to the wrong destination. The probability of these occurrences varies from country to country, but it may be said in general that shipments take longer to arrive in developing countries and there is greater uncertainty as to the time of arrival.

6/ P. S. Florence (1964) Economics and Sociology of Industry, C. A. Watts and Co., London, p.151.

Because of these conditions, the time consumed in transportation is an important consideration for many industries. At distant locations substantially larger inventories of materials must be maintained in order to ensure continuity of production, and large inventories of the product must be kept at the markets to ensure prompt deliveries. Even the inventory of spare parts for production machinery must be greater than usual. This important item has been estimated at about 20 per cent of the total machinery and equipment investment in developing countries.7/

Considerably larger investments of capital are necessary to maintain inventories at distant locations to cover the long lead times involved in normal trips and to cover the possibilities of unforeseen delays. The additional capital costs, in view of the high interest rates that prevail in these countries, can easily exceed savings in transportation costs as such. The first type of cost, involving lead times, is unavoidable, especially in the absence of complex and sophisticated inventory techniques. The second type, due to uncertainty, is avoidable only at the probable cost of idle production lines or unfilled orders.

Location preferences of managers and technicians

The location preferences of managers and technicians can be in some ways the most powerful factor influencing the choice of an industry location. Managers and technicians belong to established social classes, such as the aristocracy or an emerging upper-middle class, and are usually well educated. They expect the kind of living conditions associated with life in large cities such as good restaurants, cinemas, clubs, fashionable shops, bookstores, television, and a sense of being at a place where things are happening. The majority of managers and technicians and the overwhelming majority of their wives consider such living conditions as an absolute necessity. To be away from the life of a big city is often regarded as equivalent to exile. Family links, which are of great importance in many developing societies, also tie men to a specific location.8/

Frequently when families are relocated problems of personal adjustment arise at the new location. These may be due to ethnic or religious differences,

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7/ M. Bryce (1960) Industrial Development, McGraw-Hill, New York, p.125.

8/ This phenomenon is not limited to developing countries. A recent survey by the Wall Street Journal (23 Feb. 1966) found that this issue was of great importance in American industry, and determined location to a considerable extent.

a difference in dialect, a resistive local aristocracy, or differences in customs and food. Often a family's adjustment will be difficult because of its feeling of superiority towards its new environment which it may regard as provincial and old-fashioned. To persuade managers and technicians to leave the large cities, very often substantial inducements are offered such as high salaries, company-provided houses and automobiles, long vacations and paid trips. But even with such inducements men of high qualifications often will not relocate.

In developing countries where the novelty of situations and the lack of an institutional matrix call for the highest degree of resourcefulness, energy, and inventiveness, a second-rate man can be far more costly in terms of lost efficiency and missed opportunities than any differential in transportation costs. Personal preferences play a more important role in the location of enterprises owned and managed by an individual or a family than of government projects or those of a publicly-held private corporation in which management is a professional career. Under these conditions decisions regarding the location of plants are usually taken by people who will not have to live at the plant locations.[9/]

Spatial distribution of information and the cost of time in decisions relating to location

It is often difficult or nearly impossible to obtain reliable information about hinterland locations in developing countries. Information on transportation facilities, schedules, and supporting services and facilities; the availability of water; the varieties of local woods, clays or other materials and their properties are all difficult to obtain. Local variations of any important factor may require the redesign of equipment and processes involving lengthy scientific investigations which may not even be successful. Often some item that has been taken for granted as available is not, and the firm is put to considerable expense and waste of time in order to find a supply. For example, an enterprise may be forced to become its own trucking and shipping

9/ See A. Lauterbach (1962) "Managerial Attitudes and Economic Development", Kyklos, Vol.XV, No.2. While making similar although non-locational observations, Lauterbach observes that industrial enterprises of powerful families in Latin America are often associated with their agricultural background and holdings. Thus, they tend to develop canneries, sugar refineries, coffee roasting and meat freezing plants and wool and cotton mills. Both the economics of location and the space preferences of these families frequently favour hinterland locations.

firm, a warehouse of office supplies or a repairshop of office equipment; a real estate manager or a general storehouse for employees; or even its own jobber for materials and components. These are, of course, the opposite of external economies, and may be termed diseconomies due to forced internalization. Several countries that have attempted to adopt industrial decentralization policies have discovered that large firms can adapt themselves more successfully than small firms to the conditions prevailing in the hinterland. The size of the firm permits economies of scale for internalizing these externalities.

Besides factors such as lower transport costs or localized advantages, a principal reason in favour of locating industry in the hinterland is simply equity, which aims at minimizing differences in income and employment between regions. In both developed and developing countries much of the labour needed for a new enterprise must frequently be brought into a developing region because the local population lacks the necessary skills. In such cases, except at the most superficial statistical level, the goal of interregional equity is not reached, since the newly employed are not, except post facto, residents of the region. The local population may receive little benefit from the new enterprise except for multiplier effects, which will be small in areas of sparse intra-regional sectoral linkages, and which may in fact reduce local welfare by causing sharp sectoral imbalances in a region with low productive adaptability. In other words, the increased demand for food, building materials and the like may raise the price of these items for the local population.

The most common advantages associated with new enterprises in distant locations are low transport costs, low rents, a labour force that works for lower than usual wages and is less set in its ways. In contrast to these will be disadvantages such as the risk of costs due to uncertainty of local conditions, and the costs of internalizing functions that would normally be external. These costs may be largely unknown at the time of choosing the location, and in any rational decision they must be evaluated according to probabilities. Since, in the last analysis, profits represent the difference between costs and revenues, uncertainty as to the upper limit of costs necessitates establishing a greater margin for safety, especially since revenue is also difficult to predict unless there is a competitive product for price comparison. The known advantages of a distant location must be very large to offset the probable, but unknown, disadvantages.

The very high output-capital ratio and rates of interest in developing countries constitute another force that attracts industry to the known environment of the large city. Even if it were possible to obtain all the necessary information about a distant site it would probably take many months or even years to do so, and such a delay would be costly in terms of lost production. Thus, a choice will often be made in favour of the opportunities known to exist in a developed locality even though it is recognized that another locality might be better if there were time to look into it. Vigorous action and quick decision can be preferable to careful consideration if the latter is likely to cause delay.

It should be noted that low-cost but less skilled labour is usually an advantage only in the relatively long run. In the beginning years of an enterprise, when the labour force is being trained, inefficiency can be expected not only because of the lack of specific skills, but also from the lack of industrialized attitudes, which, although subtle, may manifest themselves in such expensive forms as high rates of absenteeism, tardiness, a large turnover, high spoilage rates and poor maintenance of equipment.[10/] In view of the short-range financial planning which is characteristic of developing countries, a delay of a few years in reaping the benefits of low wages can rob a location of all investment interest. On the other hand, when public policy is involved, usually based on long-range planning and taking into account factors other than the balance sheet, the creation of modern attitudes among the population is as important as the production of goods.

External economies

External economies, which are among the most important determinants of location in developing countries, are the most difficult to assess. They have not been classified systematically, nor are there any sharp tools for their analysis or for the measurement of their effects. Descriptive literature on external economies has been written essentially for the developed countries but certain aspects are of particular importance for developing countries. There is considerable evidence that, in many cases, external economies can

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10/ Although these phenomena are commonplace and familiar in developing countries, it is interesting that some of the most precise documentation refers to a developed country. See W. F. Luttrell (1962) Factory Location and Industrial Movement, National Institute of Economic and Social Research, London.

more than compensate for higher costs of transport, labour, or other factors of production. In the formulation of national regional development policy, an understanding of external economies can probably answer the crucial questions: Are the principal cities too large? How big must secondary centres be to enjoy self-sustaining growth? What types of industries lend themselves to decentralization and at what stage of their evolution?

A classic definition[11/] includes three elements in external economies - multiples, massing of reserves and bulk transactions. These are concepts usually applied to the problem of determining the efficient size of enterprises. In the case of an enterprise, the concept of multiples implies that, since machinery is designed to operate at certain capacities, the minimum efficient size is that which ensures that no piece of equipment is under-utilized. By way of illustration, imagine a three-step process. If the machine of step B accomodates the output of three machines of step A, and the machine of step C accomodates the output of two machines of step B, the minimum efficient size of a plant would consist of six machines of step A, two machines of step B, and one machine of step C.

The same logic applies to a city. A certain minimum size is required of various forms at infrastructure, such as an airport or a transport system, for them to be of efficient use. Smaller sizes mean overcapacity and therefore greater unit cost. Perhaps even more important is that only a certain size enterprise can justify the setting up of its own specialized supporting services, such as shippers and jobbers, financial agencies, trade publications, repair services, printing, consulting services, equipment leasing, advanced education facilities, and laboratories. It should be noted that the principle of multiples may result in higher productivity not only by preventing idle capacity, but also by permitting firms to become highly specialized and thus increase productivity. A firm could have its catalogues printed at a shop already experienced in that type of work, for example; it could seek advice from a lawyer who is particularly qualified to handle the issues at hand; or it could get its machines repaired by experienced men who have the proper tools.

The principal of the massing of reserves is an actuarial principle. Imagine, for instance, five firms, each of which plans to use ten units of a

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11/ E. M. Hoover (1948) The Location of Economic Activity, McGraw-Hill, New York, pp.120-121. Hoover refers this to P. S. Florence (1933) The Logic of Industrial Organization, Kegan, Paul, Trench, Trubner and Co., London.

material, but each of which, because of the possibility of spoilage or unexpected orders, may need two additional units. If these firms are far apart, each must have twelve units of material for this level of risk; hence, the five will need a total of sixty units. This constitutes a reserve of ten units or 20 per cent. On the other hand, if all five are close together and use a common supplier or have an understanding to assist each other, only four and one half units or 9 per cent of the material will be needed as a reserve for the same level of risk.[12/] The same advantages result from larger pools of skilled labour, larger markets for the product, and larger or more numerous suppliers of the factors of production, repair and other services.

While the principle of multiples refers to the definite advantages of particular combinations, the principle of the massing of reserves deals with the probabilistic advantages of sheet size. It is based on the fact that uncertainty, when spread over large numbers, is more predictable and therefore involves less risk. Looked at another way, large numbers permit greater flexibility and adaptability to changing and often unforeseeable circumstances, because more opportunities are open. For instance, if a firm changes its production process and thereby finds itself with a new waste product, a firm in a large and varied aggregate will be more likely to make use of it than one in a smaller city; the waste product can become a by-product. Conversely, if the new process calls for some new input, it is more likely to be available within a large city.

The third element in external economies is the principle of bulk transactions. In the case of a firm, this principle is based on the fact that buying or shipping in large quantities usually results in lower unit prices. In the parallel case of the city, the size of operations may result in lower rates and more frequent and convenient transfer and terminal facilities. The same may apply to other public and commercial services; fixed costs may decline per unit as more efficient processes can be used with an increased scale of operations. It is frequently suggested, however, that many functions in large cities operate under diminishing returns, principally because of congestion, either within the function or externally. This point has not been settled by empirical research, and constitutes the principal bone of

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[12/] This is based on the assumption that the probabilities of needing extra material are independent as between one firm and another.

contention between those who argue for and those who argue against big cities as industrial location sites.

The principle of bulk transactions has a less equivocal aspect when applied to cities than the principle of multiples. The number of events and transactions occurring in a city make it possible to handle a wide variety of needs in a standardized and therefore more efficient and less costly manner. For example, specialized shippers, repairmen, professionals, and subcontractors are available. In fact, the large city is particularly hospitable to the unstandardized producer who has greater need for supporting services and associated activities.

The subtle but enormous importance of face to face relations is not sufficiently recognized in the classic definition of external economies. In developing countries personal contacts are of crucial importance; telephones are scarce and not dependable, mail is slow and unreliable, and air connexions are inadequate. Consequently, distances are a formidable barrier. This leads to a spatial concentration of those who must do business together.

Social forces exert an even stronger force towards spatial concentration. In developed countries, for instance, much information is transmitted by trade journals, catalogues and government publications. Contracts, terms of financing and details of payment and delivery, specification of the product are settled through impersonal communication media. In developing countries communication is by word of mouth. Procedures are not standardized, making it necessary for people to get together. The rituals of social contact in such a two-way communication are often elaborate. In many countries, considerable time must be devoted to expressions of mutual respect, and no hurry must be shown to get to the substance of a meeting. Even the substance must be treated in a subtle and indirect manner, which often baffles those used to procedures in developed countries. There are ways of saying yes which mean no, price and time estimates which mean something else, gentle probings and subtle hints. An order blank, a long-distance telephone call, a cable or a business letter are instruments too blunt and insensitive.

The social and institutional matrix of communication and information as well as customary modes of contact attract firms to the city. Personal relations play a more frequent and more persuasive role in human contacts of all types, including business contacts. In developed countries, contacts are

segmented into well defined roles, which are limited to the issues at hand.[13] In developing countries, it is more often important to cultivate sources and to establish a community of attitudes or class positions. Information on new developments becomes available at irregular intervals, so channels must be kept open constantly. Since the information is unpredictable, and often takes the form of rumours or confidential reports, it is important to be in contact with many people, and to see them even when no particular business is at hand. Conditions in developing countries change frequently and unpredictably; regulations are modified, ministries are reorganized, and the relative costs and availability of production factors and financing change suddenly. To be in the centre of influence, decision, and information is therefore often of vital importance. Because of the heavy bureaucratic maze of government permits and licences, papers must be carried personally from one official's desk to another. This is not only because rules and procedures are often confused or even contradictory, or because favourable interpretations, favours, and often corruption are needed to grease many an overbureaucratized machine, but also because the low standards of professional competence of many government officials below the top levels make it likely that papers will get lost on some desk or dusty file in the depths of some ministry.

The fluidity of the situation, the lack of standardization of procedures, and the personalization of contacts strongly attract businessmen and enterprises to the cities. This attraction is magnified by the scarcity of entrepreneurs and managers. In most firms one or a few individuals exercise all responsibilities of general management, marketing, finance, purchasing, production, and long and short-range planning. For these reasons management is attracted to the cities and draws production with it. The advantages of flexibility, adaptability, and the conservation and efficient use of management in the cities are more profitable than any advantages of cheaper transportation, cost of labour, or other cost factor at some hinterland location.

There are similarities between the situation in developing countries and that of new industries in developed countries[14] which are attracted to

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13/ This, of course, is a matter of degree. For instance, even in developed countries, salesmanship is often pursued by warming the personal aspects of relations in the sharing of meals or leisure.

14/ See R. Vernon (1963) Metropolis 1985, Doubleday Anchor, New York, and R. M. Lichtenberg (1960) One Tenth of a Nation, Harvard University Press, Cambridge, Massachusetts.

large cities for much the same reasons. Sometimes neither production nor demand are standardized and situations can change rapidly. Ownership, management, and technical functions may be exercised by one or a few individuals. The instability of demand and frequent changes in technology or the cost or availability of production factors put a premium on contacts and adaptability. Investment per worker is low, since larger commitments can only be judiciously undertaken when the situation and the processes are stable and predictable enough to justify with safety extended runs of identical items. In the early stages of the industry, it is vital to have access to common services and inventories outside the firm, to sources of finance, and to complementary producers; in short, new industries in cities are oriented to external economies. With time, demand becomes more predictable, production processes and product lines become stabilized, the various functions of management become professionalized, specialized, and distinct, and greater stability makes it possible for the firm to internalize some of the services and steps of production that were previously done outside. In short, the firm becomes a self-contained system. At this stage the industry often moves out of the large city to a locality that offers advantages in the cost of transportation, labour or some other factor. Even the work of innovation often becomes institutionalized in research sections staffed by professionals who work systematically towards established objectives. This activity may be free of locational constraints if not from locational preferences. Very often, too, since the professionalization (depersonalization) of roles and the routinization of communications permit control of production, deliveries and other elements by set standards, branch plants are established which operate apart from the head office.

In a newly industrializing country, most industries will be in the position of "new industries". Even well established and standardized industries in developed countries pass through an extended period of adaptation as management, technicians, and skilled workers learn the business, as production methods are adapted to local conditions, and as demand becomes specific. The most commonly noted of these adaptations in developing countries arises from the differences in relative costs of factor prices. In particular, labour is cheaper but capital is more expensive, and technology may have to make the difficult adaptation to a labour-intensive process. During this period of adaptation the city is naturally the most hospitable place for the development of a new industry. As the industry matures, it will show a tendency to seek other locations, although it may be detained by such factors as poor communications and traditions of direct personal contact.

An industrializing country naturally has a large proportion of new industries which contribute to the appearance of over-urbanization or excessive concentration. As the country develops and industry is established on a larger basis, new industries seeking the external facilities of the city will become fewer and industry as a whole will become more decentralized. As the economy advances, changes may be expected that will facilitate such relative decentralization. Thus, the quality of the infrastructure and of the information about local conditions will become more stabilized across the whole territory, and the population will adapt to modern conditions of production as a result of increasing literacy and the acquisition of new habits. A sectoral shift may be expected in the structure of the national economy, with a typical relative shift from the predominance of raw materials for export and of easily produced comsumption goods to the processing of materials within the country, and ultimately to greater production of intermediate and capital goods. To the extent that the productive structure diminishes imports of intermediate and consumer goods and decreases exports of raw materials, the great cities will lose some of their attractive power as ports. On the other hand, nationally produced intermediate goods are likely to find both their materials and their markets within the large existing concentrations, and therefore to be very much oriented towards the existing centres of production. Furthermore, the national market for these products will probably be relatively small, so that production runs will be short and tailored to the particular order. Such a dependence on close contacts and on external conditions will lead to the concentration of these industries in the existing centres.[15/]

The location of industry from the point of view of public policy

Most of the considerations outlined in the preceding pages apply with equal force to projects in which the decision regarding location rests with the government as well as with private enterprises. It has been suggested that managers tend to overestimate the profitability of the centre as compared with the hinterland because they lack objective knowledge about conditions in the periphery, because of the relative ease with which new investment can be

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15/ A dissenting view on this point appears in P. Hauser, Ed. (1961) Urbanization in Latin America, UNESCO, Belgium. It is argued there that producer goods and capital goods tend to choose production sites close to the necessary raw materials; this view seems to disregard not only the great pull of the market, but also the fact that most of the inputs into these activities are themselves manufactures rather than "raw materials".

made at the centre, because of a strong preference for the metropolitan environment, and because of lack of interest in the periphery per se.[16] This paper argues that such behaviour by entrepreneurs is realistic in discounting the unproven advantages of the hinterland in proportion to their uncertainty and the delays in their realization. Economic models that assume the possibility of obtaining full information are unsuited to the conditions prevailing in developing countries; lack of information should not be treated as an accidental factor. In fact, lack of information is one of the structural aspects of underdevelopment. The compiling of the necessary data requires the existence of records, a paper culture, a sophisticated and technically competent bureaucracy, and sufficient demand for information from government and private decision makers and technical staff to justify the heavy investments necessary to gather and store the required information. These conditions are not met in developing countries.

In developing countries with a small and precarious economic base the appropriate strategy is one of production rather than innovation.[17] One of the profound disadvantages of underdevelopment is that, since resources are few, enterprises with a high probability of failure must be avoided when safe though less profitable alternatives are open. The larger developed countries can sometimes assume the risk of innovation, since enough experiments are undertaken to guarantee that the failures will be compensated by the successes. In this sense, the choice of a hinterland location in a developing country may be in itself regarded as an innovation. Only a country whose economy has become sufficiently large and secure can afford the risk of failure. Similarly, large firms consisting of several plants are those most able to accept such a risk.

The same logic applies to location decisions by a governmental agency entrusted with one or a few projects. Rational programming by the individual agency will lead to decisions which are virtually indistinguishable from those of private enterprises. It is only when agency programming is influenced by considerations of national policy that these decisions may vary.

In many countries, the government is engaged in a large number of enterprises and, by comparison with the individual agency, may possess the

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16/ A. Hirschman (1958) The Strategy of Economic Development, Yale University Press, New Haven, Connecticut, p.185.

17/ M. Bryce, op. cit.

advantages of size and thus be able to afford a more adventurous policy involving a few failures in return for greater over-all benefits. The problem is how to transmit this over-all strategy to the programming agency. One possibility is to require that agencies examine alternative locations before arriving at a decision. Such a policy is not without costs, in spite of its deceptive modesty. It may stretch very thin the technical resources of the operating agency; it may delay the initiation of projects; it may invite irrational decisions by stirring a hornets' nest of political pressures, and it may cost a surprising amount of money. Yet it may be indicated if there is reasonable expectation that enough advantages which would otherwise be neglected will be discovered to offset these costs.

The principal reason for this possible divergence between national policy and private or agency decisions is that the national government is, or should be, concerned with national profitability rather than with project profitability. The costs of examining alternative locations may be excessive from the point of view of any one project, but a good investment if a large number of projects are considered. The national government, as the representative of the nation, should take into account external effects, while the individual public project keeps its books in a manner similar to that of a private enterprise. The next few pages will indicate some of the principal ways in which a consideration of economic cost (as distinct from money costs) may be introduced into location decisions taken by individual agencies.

The most general factor by which such decisions are influenced is the possible difference in the interest rate applied to capital costs and the discount rate applied to future profits. The appropriate rate which should be taken to calculate interest costs on public investment has been the subject of considerable discussion. The arguments are complex, and there is no unanimity on the proper rate to be adopted, but a large number of economists are of the opinion that the rate should be substantially below the prevailing free-market rate. Such a lower rate would favour alternatives which need more capital. If an agency in charge of projects bases its calculations on cheap capital, it might opt for distant locations, even though such locations might require larger investments in infrastructure. Similarly, a policy which made capital relatively cheaper would favour investment in plant and machinery which are more typical of standard-product industries with long production runs.

It has also been argued that the rate of discount to be applied to the future stream of income should be lower for public projects than that applied

(often only implicitly) by private entrepreneurs. Among the arguments in favour of this proposition is that of the permanence of institutions and the society they represent, as compared with the shorter and more uncertain lives of individuals and private concerns. If public agencies are directed to apply a low rate of discount to future earnings, they will be less influenced by the delays involved in reaping the benefits of distant locations. These delays may be due to the length of time necessary to develop the labour force, or to a lengthy period of adaptation of production processes to local conditions, or again to the time it takes to establish efficient regular procedures of communication with suppliers and customers.

These three simple directives from a central planning agency to operating agencies might alter the decisions in regard to location for some projects, and it may be conjectured that they would favour hinterland locations. On the other hand, it must be recognized that many developing countries are politically unstable, and that a particular government, or certain officials in a government, may want to obtain even quicker results than private entrepreneurs. In such cases, they will adopt a high discount rate, and favour projects with quick returns. They will shun distant locations because the exploration of alternatives would delay the project and because projects built near the centres of population enjoy greater publicity. Whether or not such considerations are valid, they are present in many cases, and no technical means exists to evaluate the relative importance of political stability.

The decisions to explore alternatives, to adopt a low rate of interest and to employ a low rate of discount are only the first steps in the assessment of economic costs and benefits which reflect the national interest, as opposed to the assessment of money costs and benefits which characterizes private and most public project accounting. Other steps can also be taken, some of which are relatively simple. For instance, if one of the inputs is subject to a government tax, its economic cost would be obtained by deducting the tax from the purchase price;[18/] conversely, if one of the inputs is subsidized, the cost of the subsidy should be added to the price. The general principle is that taxes and subsidies are transfer payments and should be eliminated from the money costs to arrive at the economic costs. The cost of land (exclusive of improvements) presents a particularly difficult theoretical

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18/ In some cases the tax may in fact be a charge for services or facilities. In such cases, the tax should not be deducted.

and practical problem in this respect. The purchase or leasing of land for a project is a money cost, and because the transfer of money only transfers the asset (land) from one holder to another, it should not be counted among the economic costs. It may also be argued, however, that the price of land represents the costs of opportunities lost by excluding some alternative use for the land; if that view is taken, land costs should be taken into account. Third, it may be argued that the price of land, particularly if it has been unoccupied or little used, is a measure of its productivity in the use for which it is intended (say, as a location differential rent), and should therefore be counted as a benefit rather than as a cost. The matter is far from clear, and the writer would be inclined to disregard idle land either as a cost or as a benefit from the public point of view. Land which is in use should be treated as a cost to the extent of its advantage over an alternative location and the costs of transferring it.

The techniques of cost-benefit calculation are only now being evolved in the developed countries, and their adaptation to the developing countries is beset with difficulties. There are practical reasons for this, such as the scarcity of technical personnel who know how to employ these techniques, but there are also fundamental theoretical reasons. Two of these will be mentioned here.

The first is that the economic cost of an input is the marginal cost of producing and delivering it. For reasons of economic theory and of procedure, if not of empirical observation, it is commonly assumed in the developed countries that the price of an input is the marginal cost of production. This assumption, however, is far less sound when applied to a developing economy, where the pricing mechanisms are more capricious, the economy less integrated, and money a more uncertain medium (in part because of inflation). Thus, the assumption that price equals marginal cost is less tenable.

The second reason is based on the small size of underdeveloped economies. The calculations of cost-benefit analysis may be regarded as the partial differentials of a general equation for national income in which the net benefit is the algebraic sum of the effects on the various sectors of the economy of a given change (the given project). In a developed economy with a large national income, any one project will be small in its effects, and these marginal effects may be normally taken to be constant. But in a developing country with a small economic base, a project is likely to be comparatively large and to have profound structural effects, affecting, for

instance, prices and rates of output. Such considerations make the application of cost-benefit techniques in developing countries difficult, but the relative scarcity of capital makes them necessary. However, it is necessary to be aware of their limitations and of the important factors that do not enter into the calculations.

The difficulty of calculating marginal costs should not be exaggerated. For instance, if the transport system is underutilized, the actual transport costs are likely to be lower than the freight charges, and an intelligent guess may approximate these costs if an exact measurement is not possible. On the other hand, if the transport system is overloaded, the marginal costs may be far higher. A precise evaluation may be impossible, because it involves, for instance, the costs of congestion borne by others. It may be sufficient operationally, however, to calculate marginal costs as money costs increased by some rough estimate, or to specify that money costs represent an underestimate.

Far more difficult is the evaluation of external effects. For instance, the location of a project in some particular area may make it possible for other enterprises, either public or private, to come into existence; this should be counted among the benefits. The wages of labour which would otherwise remain unemployed are also a benefit from the national point of view, but it may be more difficult to estimate the increase in economic activity caused by such an increase in demand. The use of a multiplier would be indicated, but it would be far less reliable than in a developed economy, because the response to increased demand may result in sharp price effects due to inflexibility on the supply side.

The problem of city size is often one of the most important factors in location policy both in developed and developing countries. Most countries seem to think that their principal cities are excessively large, and consequently adopt policies of decentralization, particularly in the manufacturing industry. There is no factual basis for this policy, for no one knows when a city becomes too large. None the less, this is a matter of profound concern to many countries. This concern is based on a belief that certain sets of costs rise after cities have reached a certain size. Among the increased costs are those of traffic control, water and sewage disposal, shelter, policing, and some social costs. While it must be emphasized that there is no empirical evidence that costs actually do rise in such cases, the argument, in one of its most sophisticated forms, runs thus: any businessman or government agency,

in moving into a congested centre, will pay only the prevailing or average costs for labour, food, transportation, utilities and the like. The addition of the new activity to the size of the city will change these costs only imperceptibly for any user. The marginal costs however, that is to say, the addition to total costs due to the new arrival, will be much larger than the average costs. Thus, if costs rise with the increased size of the city, new activities will continue to be attracted far beyond the point at which the increasing marginal costs make this a relative or even absolute loss from the point of view of the national economy. A cost-benefit analysis would use the marginal costs arising from the external diseconomies of congestion and so forth in evaluating that location. If these costs were known, the central planning agency might require operating agencies to take them into account in their calculation, and the government might charge the full costs to private businesses by some form of taxation.

It was pointed out, however, in an earlier section, that there are reasons to believe that productivity may also increase with the size of the city. Among the factors mentioned were the facility of communications and the availability of information, the availability of specialized services, the abundance of inter-industry linkages, and the principle of massed reserves. If productivity increases with urban size, then the project or the businessman will take into account only the effects of these externalities on his firm, which in a sense may be termed the average productivity. But the project will not take into account, under normal procedures, the external economies that it produces for the other activities. In other words, the symmetrical analysis should be performed on the benefit side as well as on the cost side, and the public agency should take into account the marginal effect on total production in the city. If productivity is rising with size, the marginal product will be considerably larger than the average product. Reliable information is also lacking as to whether productivity rises with urban size, but a great deal of corroborating evidence suggests that it does. The magnitudes involved in terms of <u>per capita</u> income, net regional income, value added per industrial worker, local government expenditures, and cost of living indices for those few countries in which they are available, suggest that as far as large cities are concerned, the marginal product is far greater than the marginal cost, and that consequently, anti-urbanization policies err with respect to the goal of national production, for they compare marginal cost with average product.

The external benefits of a hinterland location are even more elusive. The contribution of the project to the external economies must usually be estimated not for an existing centre of economic activity, but for a future one, to which the particular project will contribute. Clearly, if it is difficult to evaluate the external effects in cities that exist, it will be even more difficult to do so in cases where the development is yet to come. This is particularly true if it is believed that there is a minimum critical threshold or take-off size for a growth pole. Current models, whether simple multipliers or more complex input-output or money-flow models, which are used to calculate growth in a local economy as a result of new industry, might be called incremental growth models and do not lend themselves to the study or prediction of the quantum jump implied in the concept of critical size. Nor do other important considerations lend themselves easily to measurement. Three of these are mentioned below:

(a) The project may contribute to the rise, in the less advanced parts of the country, of new attitudes, a new sense of awareness, and new patterns of behaviour better suited to economic advancement. In other words, a hinterland location may be viewed as an investment in human resources which may be of greater significance than the project which is located there;

(b) The location of a project in the hinterland will usually make the region better known, and help to integrate it into the information network of the more advanced sectors of economic activity. The increase of information will reduce the discount arising from uncertainty which is applied to other possible projects at that location. In so doing, it lowers the threshold at which local opportunities become attractive, and several new enterprises may become feasible;

(c) In most developing countries, especially those with a colonial background, the most important centres of development have coastal cities. In some of these countries, a turning inward towards the "empty" hinterland may acquire a particular significance as a symbolic act of national identification and thus create a new frontier challenging the enthusiasm and energy of the people.

In the above discussion attention has been focused on the goal of national economic growth, but many countries also want to move towards inter-regional equality of incomes, and are willing to sacrifice some measure of absolute growth to that purpose. Thus, a project may be located in an underdeveloped region even if project profitability (in terms of the internal accounts of the project) and national profitability (in terms of contribution to national economic growth) would be greater in the city. There is no formula to study the trade-off between national growth and national equality, and the decision is ultimately a political one. Because the choice is a hard one,

facts are all too often twisted to make it appear that in all cases both purposes are served simultaneously, whereas they are often at odds.

The objective of interregional equality has received relatively slight systematic consideration.[12/] It is a difficult subject to discuss in non-technical terms, because measures of regional equity tend to be more technical and far more dependent on geographic definition than those of national growth. Furthermore, since the population is usually free to move from one region to another, a clear distinction must be maintained between the geographic unit and the people involved. Thus, a project in a backward region which must bring in labour from outside may well raise the per capita income of the region but lower the welfare of the original inhabitants if it introduces shortages or higher prices. Similarly, a project may drain off surplus labour from a neighbouring region and may, in fact, raise the per capita incomes of both those who leave and those who remain behind. Moreover, a policy of developing growth centres in backward regions may or may not decrease the inequality of incomes between regions, but increase them within regions. It is often unclear whether the objective is to decrease inequality of income distribution for the national population as a whole, with the region serving as an instrumental concept for the guiding of policy, or whether the regions are viewed as organic entities and the equalizing of incomes between regions is itself the objective. A full discussion of these issues is beyond the scope of this paper and is unavailable elsewhere. Only a few observations will be made here.

Under conditions of mixed economies, industry is induced to choose hinterland locations by lower rates of interest, government loans or insurance of capital investment, or direct invertment by the government. There is a certain irony in the use of these inducements, for they will operate most strongly for industries which are capital-intensive, and, if technical substitution is possible, will encourage them to substitute capital for labour since they make capital cheaper. Such industries will tend to rely on skilled labour, which will often be brought in from outside the region; they are usually large-scale industries which tend to be self-contained and therefore less likely to promote local growth because of the sparseness of local

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12/ A good review of some of the issues and much of the literature is available in T. Reiner (1965) "Sub-national and National Planning: Decision Criteria", Papers of the Regional Science Association, Vol.XIV.

linkages. Only recently have a few developed countries, such as the United Kingdom and the Federal Republic of Germany, begun to experiment with similar inducements to attract labour-intensive industries. If the reasons for encouraging such locations are to put local surplus labour to work and to discourage migration to the cities, it would seem reasonable to try to attract industries for which the labour factor is preponderant.

The costs of subsidies, direct investment in infrastructure, or government services designed to attract industry to poor regions should be attributed to the goal of equalization in cases where, in the absence of such inducements, the industry would have come into existence elsewhere in the country. They are costs of making what may be termed a geographic transfer payment, and pertain to redistribution rather than to national production. The benefits derived from the industry should not be counted in the national profitability calculus of cost-benefit. They pertain to regional profitability, which is as distinct from national profitability as is project profitability. Only if the locational inducements create industry which would not otherwise have come into existence within the national territory do regional and national benefit calculations coincide, and even then secondary effects may differ if the location of industry shifts secondary activity from one region to another. The common confusion between equalizing and national production objectives is due to the assumption that regional benefits are identical with national benefits; the fact that one region may take from another is often ignored.

None of this must be interpreted as a disparagement of the equity goal as a valid criterion for the location of industry from the point of view of public policy. The point being stressed is that the analysis with respect to that goal is too often poorly handled.

Regional policy as a location factor

Regional policy is not commonly regarded as a location factor in its own right. It is rather viewed as the basis of particular programmes and actions which modify other factors. Thus, capital may be made cheaper in certain locations by preferential rates, or the disadvantages of a distant location may be mitigated by a subsidized transport rate, or, in more extreme cases, certain locations may be forbidden and others made mandatory by governmental decree. Regional policy in itself may, however, operate as a location factor in developing countries over and above particular government actions.

Much of the above discussion is based on the fact that the conditions assumed by the classical location theory do not apply to the conditions prevailing in developing countries. Among the divergences are the following: (a) there is a general scarcity of information in developing countries, and an even greater scarcity in the less developed areas of those countries; (b) in a country in the process of development, the modern economic base will be comparatively small; changes are therefore likely to be relatively swift and radical, so that there will be more structural fluidity and the traditional assumption implied by the statement "all other things being equal" will be less valid; (c) the shortage of all entreprenurial, managerial, and technical personnel both in and out of government is one of the principal factors impeding development.

Because of these departures from the world of classical economics, the very existence of a regional policy may affect the location of some projects. For instance, an announced and publicized decision to develop some provincial centre may call the entrepreneur's attention to that centre as a possible location independent of the concrete steps taken to develop it, whereas if no centre were designated by the government, the entrepreneur would not know which location to choose in the provinces and would be more likely to settle in the principal cities. If there is confidence in the constancy and efficacy of government action, a regional policy serves to reduce uncertainty in project analysis with respect to future structural changes in the economic picture of the country, and thus lowers the discount applied to expected returns to allow for uncertainty. Since regional plans normally are at the same time collections of information about the regions, they also serve to increase available knowledge. Thus the regional plan will play a role in reducing uncertainty as to present conditions and future structural changes.

This suggested effect of a regional plan is in some ways similar to the French concept of indicative planning; when diverse activities have common interests, it is sometimes sufficient to indicate a common goal, without the necessity of issuing commands or offering special inducements. If several projects are about to be undertaken, some by the government and others by private concerns, it may be assumed that, in the absence of a plan, some projects will be located in the principal city and some in the interior. The designation of a growth locality may call to the attention of planners in these communities the possibility of coming together and taking advantage of mutually induced external benefits.

The benefits that may be thus derived from the plan, however, do not absolve the government from its responsibility for taking concrete action, or from the need to study and take into account the complementarity of the needs of the participating activities, including government investment in infrastructure.20/

The establishment of a regional plan meant to play an indicative role raises a number of problems. The plan itself will be drawn up in an atmosphere of uncertainty and will probably have to be frequently revised as more is learned about actual conditions and opportunities. The success of the plan's indicative function, however, depends to a large extent on the confidence of the participants in its stability and in the government's commitment to reach the specified objectives. If these objectives change frequently, the utility of the plan as an instrument to reduce uncertainty will be nullified.

The shortage of entrepreneurs, managers and technicians limits the national capacity to collect and evaluate information. The recommendation that decisions regarding location be taken only after a careful examination of a multitude of variables is not realistic. Alfred North Whitehead has observed: "It is a profoundly erroneous truism, repeated by all copy-books and by eminent people when they are making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them. Operations of thought are like cavalry charges in a battle - they are strictly limited in number, they require fresh horses, and must only be made at decisive moments." Thus, one of the principal functions of regional planning may be that of economizing energy. This is achieved by indicating probable decisions for certain classes of projects and precluding other decisions. The plan may indicate what types of industry may

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20/ Among regional planners, balanced regional growth usually means that all regions grow at the same rate, or that the slower regions grow faster to catch up with the more developed ones. It has recently been pointed out that the "big-push" sectorally-balanced growth strategies of Rosenstein-Roden and others, which stress the complementarity of certain sectors, is likely to result in sharp differences in regional rates of growth, with an emphasis on the more developed centres, thus leading towards greater regional inequality, and "unbalanced" regional growth. See W. F. Ilchman and R. C. Bhargava (1966) "Balanced Thought and Economic Growth", Economic Development and Cultural Change, July issue. In the terms developed above, balanced sectoral growth is oriented to the goal of national growth, and balanced regional growth to the goal of equalization.

be concentrated, and what types should continue to be concentrated; it may indicate the most suitable locations for industries with certain characteristics; it may ensure rates of return on locations that suit certain general objectives, etc. Mention has already been made of indicated rates of interest or discount which might be made to apply to public projects. Similarly, shadow prices[1] or techniques for calculating them may be indicated for some commonly used inputs, so that these do not have to be recalculated by each project which undertakes a cost-benefit analysis. Moreover, a certain amount of information can be provided and distributed, including projections of basic variables for general use.

The use of regional planning with a view to economizing managerial and technical resources presents two aspects. The first is the collection and distribution of information which can be used by more than one project. The second is the ability to take a comprehensive view of the evolving spatial structure of the national economy. Indeed, an examination of the over-all picture may reveal patterns which are not discernible in the individual projects. Such a study may provide information regarding the advantages or disadvantages of certain types of locations for certain types of industries, or a long-term perspective of the growth of particular localities, (such as the growth of secondary centres in the interior of the country), or aggregative projections of traffic volume on certain arteries, indicating that saturation may be expected within a certain period. In the long range view there are certain to be fundamental structural changes in the economic macrogeography of a developing country, although there will be uncertainty about the precise form of those changes. Project analysis, however, tends to work with a constant structural matrix, focusing on specifics and using short-run curves. But the major changes in the economico-geographic matrix as a result of the investment process make the use of short-run curves and partial analysis more suitable for developing countries than for developed ones.

If resources were not limited, both the aggregative macrogeographic and the detailed project studies should be carried out in full. But since there are many limitations, the aggregative analysis can replace the detailed analysis to a certain extent and the use of both methods is more fruitful than the exclusive application of either one. If only detailed

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[1] Prices that are used when they differ from money costs.

project analyses are carried out, their joint effects and their long range consequences will not be anticipated, and important opportunities will be missed for lack of awareness of larger trends. On the other hand, if only a general analysis is made, many projects may have disastrous results for having overlooked important details, or, equally important, the country may find itself with excellent general policies, but without concrete programmes or specific projects to give substance to those policies.[22] In short, the lack of information in specific cases, the lack of technical personnel, and the rapidity of change in developing countries make the application of rules of thumb, general guidelines and policy all the more necessary.

Although profound changes are certain to take place in the economic structure of a developing country, present knowledge is too tenuous to permit anything but a guess as to the nature of these changes. Such conjectures are necessary, but because of new information and the fact that any plan for the future involves both judgement and opinion, regional plans tend to be unstable. It must be re-emphasized that frequent changes will reduce the importance of regional policy as a substitute for information, but undermining the confidence of project planners in the validity of the forecasts. At the same time, as new and more detailed information becomes available, new possibilities will present themselves. Thus, there is a certain contradiction between the function of the plan as a stabilizing element and the logical necessity of continued planning, feedback, and revision in the light of increasing understanding. There is no easy way to solve this problem.[23]

Since regional planning both produces and substitutes for information on the national economic situation, they play a more important role as a location factor for mature industries than for industries that are getting under way. As the latter industries are still uncertain about processes, relations to complementary activities, and other factors which call for adaptability rather than predictability, they will continue to favour

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[22] This vital point is documented in A. Waterston (1965) Development Planning: Lessons of Experience, Johns Hopkins Press, Baltimore, Maryland.

[23] A particularly interesting discussion of the relation of scientific knowledge and the exigencies of the actual situation in regional planning may be found in J. R. P. Friedmann and W. Stohr (1965) "The Uses of Regional Science: Policy Planning in Chile", Papers of the Regional Science Association, Vol.XX.

the principle cities. Thus, the influence of regional policy per se as a location factor will be strongest in the middle stages of economic take off, after the beginnings but before maturity, when the patterns have become clearer and information is easier to obtain.

In conclusion, two general points must be made in regard to regional policy as a factor in the location of industry. The first is that, in geographic terms, economic development may be viewed as a process of national economic integration. This means eliminating irrationalities in the production and exchange of goods and services throughout the country, overcoming ignorance, prejudice and inertia, and facilitating the means of exchange between different parts of the country.[24/] In this respect, it is necessary to take into account not only the benefits to be derived from any project in terms of production, or even the external effects of the project as such, but also its modernizing influence on the local population and the important role it plays in integrating the human and natural resources of the region into the larger fabric of the nation. There are no quantitative or other scientific methods to evaluate the trade-off between the economic efficiency of a project and its long range effect in the making of a modern nation.

The second and final observation is that regional planning in most countries is done by the executive branch of the government, while budgetary and sometimes substantive approval is given by the parliament. The executive branch is usually divided into functional divisions, such as ministries. The legislative branch, almost without exception, represents territorial divisions. Since technical planning is usually a function of the executive branch, most national plans have been sectoral plans, more or less formally representable in an input-output or some other social accounts table. The emergence of national regional planning in the last few years presents a formidable problem: from the technical point of view, planning is the responsibility of the executive branch, but inasmuch as it involves territorial decisions capable of promoting or hindering growth, it is of immediate concern to individual legislators. It is clear, therefore, that regional planning, in contrast to sectoral planning, will always be disrupted or enriched by local preferences, whatever the views of professional experts.

24/ See B. Balassa (1961) The Theory of Economic Integration, R. D. Irwin, New York, and J. R. F. Friedmann (1966) Regional Development Policy, MIT Press, Cambridge, Massachusetts.

2. PROBLEMS OF DISTRIBUTION OF INDUSTRY IN THE UNION OF SOVIET SOCIALIST REPUBLICS – THEORY AND PRACTICE

By N. Nekrasov[1]

Distribution of productive forces in the general system of planning

In the Union of Soviet Socialist Republics great importance has always been attached to the problems of the rational distribution of industry, and one of the main aims of Soviet economics is to find a scientific solution to these problems.

The rational distribution of the forces of production cuts down production costs, speeds up the rate of growth of the national economy, and makes possible a proper economic balance among the various regions of the country. The distribution of industry also has a bearing on the social and ethnographic problems involving differences in living standards, in urban development and in the social structure of the nationalities making up the population in various parts of the country.

From the first years of its existence, the Government of the USSR pursued a policy aimed at the rapid development of the former national suburbs of pre-revolutionary Russia by developing their traditional branches of industry and agriculture as well as new industries. This development of the national republics has radically changed their economic and cultural outlook and raised living standards. Even before the war, the national republics of the USSR had been turned from backward, mainly agricultural, republics into prosperous industrial and agricultural ones.

By 1939, basic industrial production of the republics of Central Asia was 19.5 times the level of 1928; in the Kazakh SSR – 22.9 times, in Byelorussian SSR – 12.6 times, while the average growth rate in the country for the same period was 7.8 times. By 1940 the volume of gross output of large-scale industry ha

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1/ Academy of Sciences of the USSR, Council for Study of Productive Forces, Gosplan, Moscow.

increased 4.1 times in the Uzbek SSR, as compared to 14.1; 19.4 times in the Kirghiz SSR, 5.5 times in the Georgian SSR, 23 times in the Armenian SSR while the average growth rate in the Soviet Union was 11.7 times.

The rapid industrial development of the Union republics laid a firm foundation for the rise in living standards. For example, the volume of retail trade turnover per head had increased by 1940, as compared to 1928, 15.4 times in the Kazakh SSR, 15.6 times in the Transcaucasian republics, 16.2 times in the republics of Central Asia. During the Second World War and especially in the post-war years, the national republics of the Soviet Union continued this development, tapping vast natural resources and setting up extracting and processing industries.

Industrial development is first of all connected with the volume of capital investments. In the USSR as a whole, the volume of capital investments per head was 240.5 per cent in 1962 as compared to 1952, in the Byelorussian SSR - 375.3 per cent, in the Kazakh SSR - 392 per cent, in the Uzbek SSR - 278.3 per cent, in the Lithuanian SSR - 501.2 per cent. The volume of industrial production for the same period had reached 279 per cent in the USSR, 336 per cent in the Byelorussian SSR, 315 per cent in the Kazakh SSR, 464 per cent in the Lithuanian SSR, 321 per cent in the Latvian SSR.

This development in the national republics has been due to the tremendous efforts exerted by the Soviet State and has resulted in important gains in social as well as economic endeavours.

Under the conditions of modern society the problem of locating an enterprise is not an isolated fact; extremely important social and economic consequences must be taken into account. Planning the distribution of productive forces in general and industry in particular is part of the larger problem of regional planning, which is primarily concerned with raising the level of well-being of the population of this or that region. The level of well-being is indicated by the extent to which the needs of the people are met, the needs which depend on the level of economic development as well as on social, historic, natural and other conditions.

In dealing with the problem of the distribution of productive forces one should take into account the following:

(1) the most rational distribution of production activity over the country's territory from the point of view of the economic efficiency of the whole country;

(b) Provision for a certain level of well-being of the people in the different regions of the country.

Thus, the criterion of effective distribution of productive forces in the Soviet Union can be defined as the maintenance of a given volume of production for the country as a whole at minimum cost, and the achievement of given levels of well-being for regional populations during the last year of the planned period. It is obvious that minimum cost is not an end in itself, but savings can be used for increasing the growth rate of the country's economy and for raising living standards.

Theoretically the problem of planning would presuppose the simultaneous determination of all the main parameters of the development and distribution of production activity, including every enterprise. In this case the criterion of efficiency would be the achievement of the maximum of personal consumption throughout the country, provided a number of conditions of nation-wide importance were observed. However, for practical purposes it is necessary to solve these complex problems one by one.

Two major lines of development stand out: (a) the determination of rates of growth and proportions of the development of the country's economy as a whole and of the rational structure of the branches of the economy; (b) the consideration of the complex of questions related to regional planning. In other words, the reconstruction of existing enterprises and the construction of new plants, agricultural enterprises, new transportation lines, towns and the like are functions of the volume of capital investments in every given period. In turn, capital investments are dependent on the national income and the rate of economic growth.

These two lines of development are independent, but the rates of growth and the proportions of development within the economy are to be determined first. Then comes the multi-stage process of planning the distribution of production and non-production activity for every region of the country, taking into account the existing differences in the factors affecting distribution as well as the aims of regional planning.

Before dealing at length with the methods of planning territorial proportions of production, it is necessary to determine how "branch" proportions are arrived at for the planned period. Theoretically it is possible to determine optimal branch proportions on the basis of a dynamic model of inter-industry balance. However, since it is too complicated to make such a model at present,

Also simplified models with a high degree of aggregation of industries are made. These models are valuable for analyzing and forecasting future processes of the development of the national economy but not for making recommendations to be incorporated into the State plan.

A long-term plan for the development of the country's economy is based on detailed plans for the separate branches of industry. These plans are unified and raised to the centrally planned targets which take into account the trends of technical progress and ensure a better production structure; but, first and foremost, the plans themselves must be brought into balance.

Detailed plans for the development of the country's economy usually are made for a five-year period. As experience shows, when planning the distribution of productive forces, it is necessary to plan for a ten to fifteen year period at least and for a still longer period when determining lines and parameters for the utilization of natural resources. Plans for that length of time, however, cannot be as detailed as five-year plans. That is why they appear more like long-term economic forecasts.

On the basis of these long-term forecasts, detailed five-year plans for the distribution of productive forces are made. They are part of the over-all State five-year plan for the development of the national economy.

The Council for Studying Productive Forces, affiliated with the USSR State Planning Committee, is responsible for drafting these long-term forecasts. Work on the general plan for the development and distribution of productive forces of the USSR for the period 1971-1980 has been under way for some time. Involved in this work are hundreds of research and designing institutes of various branches of industry, the economic institutes of the Academies of Sciences of the Union republics, departments and branches of the USSR Academy of Sciences in the regions of the Russian Soviet Federative Socialist Republic, planning committees of the economic regions of the RSFSR and the Ukrainian SSR.

The work on the "general plan" has not yet been completed, but the methodological principles on which it is based and the joint research experience of the hundreds of scientific institutions involved are of considerable interest.

Collection of initial data for making up the general plan

The general system of organization and the main principles used in elaborating the general plan for the development and distribution of productive forces of the USSR for the period 1971-1980 include:

(a) Determination of potential rates of growth and proportions of development of the branches of the economy and of a number of general economic parameters showing the country's major targets for the planned period;

(b) Defining the lines of development of the branches and sub-branches of industry, agriculture, transport and of the non-production sphere for the whole country;

(c) Determination of economically expedient proposals for development of the economy of the Union republics and separate economic regions with a quantitative estimate of the main parameters of production and non-production activity.

The first round of this research was carried out by the Council for Studying Productive Forces in conjunction with the central economic institutes of the country. The results were made available to those engaged in making up the general plan as guiding points to be defined more accurately in the process of investigation.

Elaboration of the parts of the general plan according to branches of the economy and regions

On the basis of the initial data, research and designing institutes of the ministries and the USSR Academy of Sciences elaborated several versions of the plan for the development and distribution of the various branches of the economy. A plan for the use of water resources was also made.

Economic institutes of the republics and institutes of the branches of industry worked out their own versions of the general plan, making use of initial data and plans for the development and distribution of branches of the economy.

Preparation of a summarized general plan

At this point the Council for Studying Productive Forces must make a summary. Scientific and technical conferences are held with the Union republics and in the ministries of the branches of industry with a view to defining rational proportions for the long-term territorial economic development of the country.

This system of balancing work to make up the general plan reflects certain methodological principles governing the relations between national and regional planning, branch and zonal approaches to the distribution of productive forces and the role of science and research.

Experience has shown that the branch approach to the distribution of single enterprises is insufficient. For example, from the point of view of the economy of a branch of industry it might be efficient to locate power- and water-consuming enterprises in the European regions of the USSR. However, from the point of view of regional economy the opposite might be the case. The abundance of cheap fuel, power, and water in the eastern regions of the USSR makes it expedient to locate power-consuming enterprises there. The methods of branch and zonal planning of the distribution of industry are considered farther on in this article.

The study and planning of the distribution of industry is elaborated to produce detailed results, including the location of single enterprises and their specialization. In analysing the distribution of branches of industry, the application of economic-mathematical methods, particularly the methods of linear programming, has proved valuable.

In the USSR and abroad there are many publications dealing with the laws of the distribution of branches of industry. On the basis of such studies of the technological coefficients of consumption of raw materials, of the fuel and power required per unit of produce, and of the weight ratio between end products and certain cost factors, it is obvious that producers of end products are attracted to the areas of raw material, fuel and centres of population.

Thorough studies have been made of such factors as changes in production costs due to specialization and increase in transportation costs following the growth of production. In these calculations the drive to cut down to a minimum the costs of production and transportation (while meeting the demands of the country) has been taken as the criterion of efficiency.

It should be noted that the number of proposals for the development of existing and the construction of new enterprises in various parts of the USSR is so large that, as a rule, it is impossible to make a comparative study of their feasibility manually. Nevertheless, experienced economists and engineers often find solutions similar to the ones made by the computer.

In the USSR, computer programming is widely used for solving the problems of optimal development and the distribution of the branches of industry. The country has a long experience in finding optimal models for development and distribution for such industries as: chemical, fuel, cement, forest, pulp and paper, machine building and others. Some success has also been achieved in developing corresponding models for agriculture.

The achievement of the optimal development and distribution of a branch of industry through computer programming ensures considerable improvement of the plan as compared to versions made without using mathematical programming. Capital investments and current expenditures on production and transport are reduced approximately 15 to 20 per cent.

Each industry is connected in numerous ways with others, and the various versions of development and distribution influence the other industries directly or indirectly. Thus, it is imperative that the optimized industry should be taken out of a more general complex of which it is a constituent part. At the same time, the branches of the country's economy with which it has developed the most ties should be similarly treated.

The optimal version of the development and distribution of an industry or a few industries (the optimized system) includes the developing or modernizing of existing enterprises and the building of new ones, determining the volume and range of manufacture and marketed goods and the technology to be used, and the transportation and use of produce, including foreign trade. All these factors enable the system to achieve for a given period the maximum value, which means obtaining maximum results with the smallest possible expenditure of labour and material.

The optimal version for the development of the system is chosen from among the proposals that meet the imposed restrictions. These restrictions include: the original state of the system, available resources (raw materials, power, labour, capital investment), demand for goods including the possibility of interchange, ties existing among the elements of the system, and conditions for the transport of raw materials and end products.

In defining restrictions, the rates of consumption of raw materials, fuel, power, labour, the equipment used and anticipated advances in technology must be considered.

The results of the calculations made by computers are not used as a complete and final plan for the development and distribution of an industry. Experts in the industry involved and econometricians conduct a thorough examination of the computer results.

To ensure a greater degree of reliability, the correctness of the optimal plan should be double checked in case the original information and restrictions of the problem should undergo certain changes. At this stage, the elements of the system incorporated in all versions of the plan should be identified and given first priority at the implementation stage.

Although the branch approach to the distribution of industry ensures reasonably accurate results within the chosen set of restrictions, it is not possible to ascertain the restrictions themselves by branch analysis. An inter-industry regional approach is needed.

Let us assume that the calculations for the development and distribution of light industry show that a number of enterprises should be located in Siberia. It is also known that labour available in Siberia is limited and that it is most effectively employed in the coal, oil and gas industries, power-consuming enterprises of the non-ferrous metal industry, the chemical industry, logging operations and wood processing. Drawing off some of this labour force into light industry may reduce the volume of production in these highly efficient industries. Bringing in new labour from other regions would create major expenditures exceeding the economic efficiency gained in the light industry. However, in some Siberian towns female labour may be available. To provide employment for these women, it may be necessary to construct enterprises of light industry. Thus by a thorough regional, interregional, and inter-industry analysis the amount of labour for the development of light industry in Siberia would be determined.

Such analysis can be applied to prove the expediency of using the cheap fuel and power resources of Siberia or the water resources of the European part of the country for locating an industry, or of using effectively the existing infrastructure of towns when locating enterprises.

The social and economic consequences of the distribution of industry in some areas are not taken into consideration with the branch approach, for example, the possibility of creating disproportions between the spheres of application of male and female labour, excessive growth of certain towns, air

and water pollution and other factors. So the solutions to the problem of the development and distribution of industry arrived at on this principle require considerable regional correcting even if mathematical programming has been used.

Experience shows that to use optimal models for the extracting and processing industries is expedient to varying degrees. For extracting industries or industries producing a limited range of heavy goods, computer programming is most effective in choice of location because of the specific conditions of production in these industries. The location of enterprises of these industries is usually associated with large deposits of minerals or forest resources, but transport facilities are also a determining factor. The demand for the produce of these industries can be defined with great accuracy in some regions. Thus the solution to the problems of the development and distribution of the fuel industry as a whole and its branches (on the basis of the optimal fuel-power balance), of cement, lumbering and some other industries can be arrived at with the help of linear models. Such models were used in drawing up plans for the development of the economy of the USSR.

In processing industries such factors as skilled labour, research facilities and scientific personnel, infrastructure, urban development, and the creation of industrial centres, are of great importance. However, the wide range of goods manufactured by these industries is difficult to account for in the models of development and distribution. Such models, therefore, must be thoroughly analysed, especially from the regional viewpoint.

Industries that produce goods to be consumed entirely within a major economic region are grouped together. They include industries producing various kinds of foodstuffs and building materials. It is possible to solve the problems of their optimal distribution within a region by mathematical programming, and the results received are of great practical value.

Plans for the distribution of industry should begin with a thorough economic and technical analysis of the distribution of enterprises of branches of the industry. The plans may have to be altered on the basis of a regional analysis, which often reveals the need for substantial changes in the plans for the development and distribution of processing industries.

In the Soviet Union, the theory and practice of the rational distribution of productive forces is based on the need to establish economically effective production in the different territories of the states. Usually the territory of a region or macrozone has specific economic, demographic, or other conditions.

The task is to work out optimal solutions for the economic development of the territory (region or macrozone) according to its conditions and its economic potential for the development of productive forces. Each region or macrozone is an integral part of the entire country as a result of multilateral and interregional economic ties. A quantitative growth of enterprises and production output in the whole country and in the regions effects the qualitative changes in the territorial proportions of economic development.

One of the most important lines of research in the Soviet Union endeavours to establish economically effective proportions for the European area of the USSR and the eastern part of the country. The main problems associated with the European area of development are:

(a) To provide the economy of the European regions with fuel and power at minimum cost by making maximum use of existing power resources and attracting large supplies of power from the eastern regions;

(b) To change gradually the structure of industrial production with a view to increasing the share of the processing industry;

(c) To develop a system of economic ties between large, medium and small towns.

The main objectives with respect to the eastern regions are:

(a) To enhance gradually but drastically the role of the eastern regions in the development of the country's economy;

(b) To establish a structure of industrial production that makes the best use of the natural and economic conditions of the eastern regions and also ensures the optimal technical and economic results of the development of specialized branches of industry (especially power-consuming, non-ferrous metal and chemical industries);

(c) To tap new territories having large deposits of various minerals and natural resources.

Territorial proportions of the economic development of the European and eastern regions of the USSR have been given first priority and the territories of the Union republics, second.

The territorial planning of the development of the productive forces of the Union republics is effected by the state planning committees of the republics. The territorial planning and the planning of the development of branches of industry take into account both the interests of the Union republics and the interest of the Soviet Union as a whole. For study purposes the Union republics are considered together according to their natural conditions and prospects for economic development. (Baltic republics, republics of Central Asia, Transcaucasian republics.) The problems of economic development of the Union republics are often similar. For instance, the high industrial

scarcity in Estonia, Latvia, and Lithuania has led to high employment which determines future possibilities for locating industry there. On the other hand, considerable growth of population in the Transcaucasian republics and the republics of Central Asia makes it necessary to increase their share of the processing industry in the over-all structure of economic production.

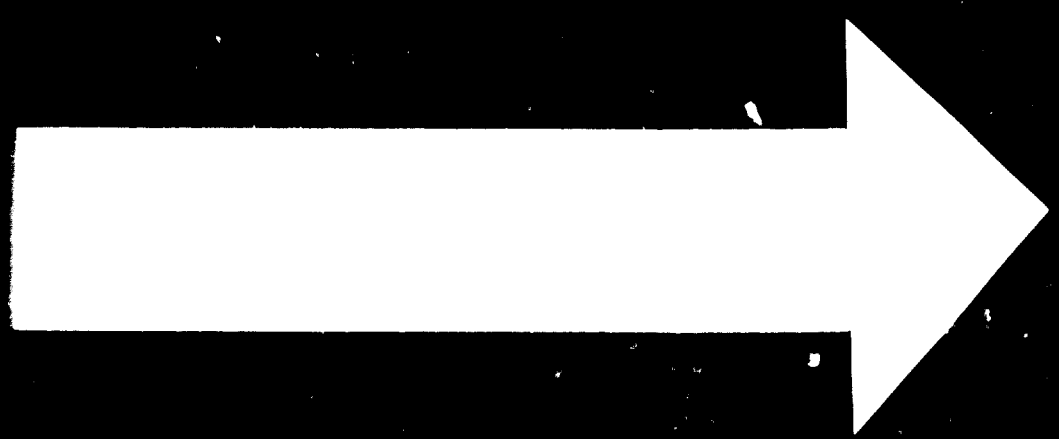
Third priority is accorded the large economic regions of the Union republics which cover vast areas. For instance, in the RSFSR there are ten regions: Central, Central-Black Soil, Volga-Vyatsk, North-Western, North-Caucasian, Povolzhski (land along the Volga river), Ural, West-Siberian, East-Siberian, and Far Eastern. The Ukraine has three economic regions. Apart from these there are district, regional, and city planning bodies responsible for the economic development of certain areas.

Territorial economic proportions determine the inter-industry (vertical) and interregional (horizontal) economic ties, depending on the specialized economy of the zones, Union republics, economic regions and districts. The division of the country into economic regions makes it possible to select economically similar territories, to compile statistics and to set up accountancy for each taxonomic unit. This information constitutes the basis, the main tool for an efficient and profound technical and economic analysis of the optimal development of the economy of each region, keeping in mind the targets for the country's development as a whole.

In analysing the territorial proportions of economic development, the group location of industrial enterprises (industrial centres) and the basic principles for economic development of new territories are of principal significance.

An industrial centre comprises a group of interconnected industrial enterprises located within a comparatively small area. The concentration of industry in some points (towns) and in urban agglomerations reflects the tendency to increase economic efficiency of production by creating a unified infrastructure (transport, power, water communications, residential districts, social services and the like). On this basis large petrochemical complexes having a diversified chemical production, or iron and steel works with coke-chemical production, large machine building complexes and others can be set up.

The optimal economic structure of industrial centres should be determined principally on the basis of the plans for the development and distribution of



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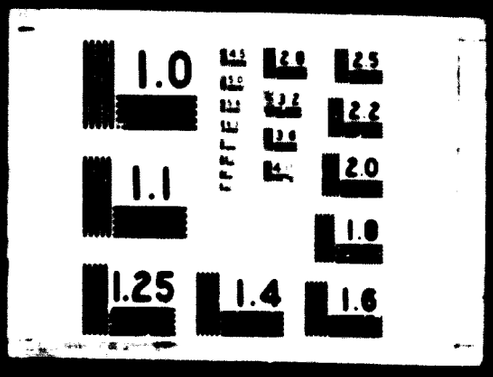

branches of industry over the national territory and the plans for the rational economic development of each economic region.

The guiding principle for determining the structure of an industrial centre is to limit the range of possible industrial enterprises to those for which development is expedient in the given economic region which allows a sharp reduction in the range of enterprises to choose from. This imposed restriction is based on the hierarchical arrangement of the system for solving the problems of the territorial planning of the industrial centres (structure of the country's economy; of the Union republics).

After determining the structure of an industrial centre, a specific problem remains with respect to the group distribution of industrial enterprises within this given centre. In the USSR there are dozens of specialized territorial-designing institutes affiliated with the USSR State Committee for Construction which are experienced in designing industrial centres.

Group distribution of enterprises reduces current expenditures and capital investments and permits more effective use of the infrastructure and auxiliary and servicing establishments. The following are the most important factors accounting for this reduction:

- A unified system of transport and storage facilities for all enterprises;
- A unified system of heating, sewerage and water supply;
- Interlocking of enterprises, buildings and installations;
- A single system uniting repair shops, tool rooms, stock, container-manufacturing and other auxiliary shops that cater to the needs of a group of technologically similar enterprises;
- Narrowing the industrial territory;
- Unified construction facilities;
- A unified system of housing and municipal services.

The amount of savings in current expenditures and capital investments depends on the kind of enterprises making up the group. It is important to select enterprises that can co-operate on the auxiliary production level as well as on the basic production level.

The data on planned group distribution shows up to 15 per cent reduction of capital investments and 10-20 per cent reduction of current expenditures compared to the corresponding figures of an isolated distribution of enterprises.

Reduction of investment and expenditures, however, is not the only advantage gained from the group distribution of enterprises. Of great and ever-increasing importance is the creation of conditions that will advance progress in technology, management and efficiency of production, and attract skilled labour and engineers and scientists. Planned group distribution establishes a firm policy to prevent the overgrowth of urban agglomerations and the unfavourable consequences stemming from it.

The analysis of the group distribution of enterprises should be coupled with an elaboration of the general concept for the development of urban and rural settlements in a given region. Often this point may be the most important one in deciding on localities where new industrial centres are to be developed and existing ones extended. This, however, does not apply to industrial centres directly engaged in the extraction and primary processing of mineral resources.

For the past 50 years new powerful industrial complexes developed in the Soviet Union have determined the character and lines of industrialization of the country. Such complexes include the Ural-Kuzbas and Khibini, oil producing regions along the Volga and the Ural rivers, Norilsk, Gazly and Mangyshlak, the Angara-Yenisei industrial complex. The Pechora and Kursk region, with its magnetic anomaly, and many other regions have united into a wide system of industrial centres. New industrial zones have appeared in the republics of Central Asia and Kazakhstan, in the Ukraine and the Transcaucasian republics, in the Baltic republics and Byelorussia.

The Soviet Union has grown economically mainly because of the intensified economic development of new regions with a high concentration of natural resources. This characteristic feature of the industrial development has established the country's modern raw material and power potential, ensuring high growth rates of the economy. Each five-year plan has served as the basis for the economic development of new regions.

The Soviet Union has recently entered a new stage of all-round economic development of territories possessing large deposits of minerals and natural resources. In the European area in the centre of the country, a large centre for producing iron ore is being developed on the basis of the magnetic anomaly in the Kursk region. A new oil-producing region is appearing in Byelorussia, and in the northwestern area of the Timano-Pechora region large oil, coal and gas deposits and timber resources are being developed.

It is in the east, however, that the scope for the development of new regions with a high concentration of natural resources is the greatest. In the southern regions of Siberia, which can boast of agreeable natural and climatic conditions, two large territorial-industrial complexes, the Sayan and Low-Angara complexes, are being developed.

The Sayan region, which lies south of the Krasnoyarsk area, possesses large economic hydropower resources, coal deposits in the Minusinsk basin, large deposits of various minerals and raw materials (mangarese, molybdenum, titanium-magnetite ores, natrium chloride, limestone, phosphorites, nephelines and others) as well as timber resources and arable land.

A combination of favourable natural conditions and resources, available labour, and a comparatively well developed transportation network foster the development of a new industrial-agricultural complex in the Sayan region. As the generation of power forms the basis of such a development, construction of the Sayano-Shushenskaya hydropower station with the capacity of 6.3 million kilowatts is under way. The composition of the Sayan economic complex, now under development, was defined in general by the Council for Studying Productive Forces in conjunction with other research, designing and planning organizations. Besides the Sayano-Shushenskaya and Mainskaya hydro-power stations, coal-fired thermal stations will be built to make use of the Minusinsk coal basin. Large-scale, power-consuming production of non-ferrous metals and alloys, ferro-alloys and high-grade steel, phosphorus, chlorine and their compounds and artificial and synthetic fibres is foreseen. The machine-building and auxiliary and servicing industries in the total complex will be proportionate. It will probably take ten to fifteen years to put the plans of the Sayan complex into practice.

The Low-Angara region, an area of over 300,000 square kilometres, is comprised of the territory along the Low-Angara river and the land in the middle part of the Yenisei river. A great complex of power-consuming industries can be developed there since large-scale hydro and thermal power stations can be built. Aluminium, lead and zinc-producing plants, steel mills producing ferro-alloys, and enterprises of the chemical industry are also possible in this region.

It will take twenty to twenty-five years and capital investments of about 15 billion roubles to develop the Low-Angara economic complex. About 600,000 to 800,000 people will be needed.

The northern portions of Siberia and of the Far East constitute a vast territory with severe climatic conditions. The territory is sparsely populated and has no year-round transportation facilities. However, two basic large regions have now been defined in the north and their development will radically change the economic life of the zone. They are the Yakut and Aldan-Chulman-Udokan areas in the west Siberian and Transbaikal regions.

The west Siberian economic complex is located within the boundaries of the west Siberian plain, an area of about 2 million square kilometres. Large oil and gas deposits, vast forests and other resources are found in the area. The extent of gas and oil fields is over 1.5 million square kilometres. Estimated oil deposits are said to be many billions of tons, the gas deposits - 16.5 trillion cubic metres. The output of oil in western Siberia is expected to reach 20 to 25 million tons in 1970 and of gas 16 to 20 billion cubic metres. In ten to fifteen years the annual output of oil may reach 150 to 200 million tons and of gas - 160 to 180 billion cubic metres. It has been proved that development of the gas industry in the far north is highly economic.

The total forest area is 135 million hectares, with timber resources of 7.6 billion cubic metres. Coal and aluminium ore deposits have also been found here and thermal waters containing iodine and bromine.

The foundation for the economy of this region has been laid in the past few years. A transportation system is being built and a number of oil and gas pipelines have been completed. Plans are in full swing to construct a system of large gas pipelines starting from the extreme north of the Tyumen district and extending to the European regions of the country. New towns have been built such as Urai (population: 18,500), Nefteyugansk (population: 8,000), Gornopravdinsk, Megion, southern Balyk and others.

An abundance of hydrocarbon raw materials makes it possible to set up a diversified chemical complex in the southern zone of Siberia, from Omsk to Irkutsk. The multiforest zone of Siberia is becoming an important centre for the chemical-mechanical processing of wood and the production of high-grade wood products in large quantities.

The large deposits of minerals and other natural resources found in the south of the Yakut Republic and in the north of the Transbaikal region make it possible to solve new major economic problems and will greatly effect future industrial development. Mineral resources discovered in this region include: a large coal field (40,000 million tons, mostly coking coal) in the south of

the Yakut Republic; the Aldan iron ore deposits (the Taezhni deposit alone contains 1.3 billion tons of good quality ore); the Udokan copper deposits (some of the best in the USSR); the Leno-Viluisk gas-bearing area (estimated deposits - 12.8 trillion cubic metres); and thick beds of rock salt in the basin of the Lena, Olekma, and Chara rivers. With these resources a large centre for the iron and steel industry can be established in the Far East and a new major centre of the non-ferrous metal industry in the Transbaikal area. The generation of power in the Far East and the Transbaikal area is possible because of the gas and coal deposits and hydro-power resources.

The zone of Central Asia and Kazakhstan is passing through a stage of intensive economic development. Among the new regions of special interest are the south-Tajiksi and Mangyshlak complexes. The south-Tajikski complex is based on the use of large hydro-power resources which can produce about 100 billion kilowatt hours per year. There are also considerable deposits of gas, lime, rock salt and dolomite in this region.

Power-consuming industries will be developed in this complex. The Yavanski electro-chemical combine, the Vakhshski nitric fertilizer-producing plant, and the Regarski aluminium-producing plant are now being built there. Favourable soil and climatic conditions and available power will make it possible to develop electrified agriculture based on mechanized irrigation.

The Mangyshlak industrial complex which occupies the Mangyshlak peninsula is still in an early stage. The estimated oil deposits in this region are well over billions of tons and there are deposits of coal, copper, and other minerals. Deposits of chemical raw materials such as chlorides, sodium sulphate, magnesium and potassium are nearby in the Bay of Kara-Bogaz-Gol. The Mangyshlak region is regarded as the country's new oil-producing centre and a major base for the chemical industry.

The Council for Studying Productive Forces has accumulated much experience in developing regions with a high concentration of valuable natural resources. However, to solve the complicated problems of setting up large industrial complexes on barren land, preparatory scientific and technical research in economic development is of paramount importance. In this connexion the following should be considered:

(a) Analysis of the major technical problems. Experience has shown that the "middle-sized" equipment and machinery that perform well in the middle zone of the country are not suitable for regions where the

climate is severe. The same is true for the technology of construction of industrial and transport facilities and of housing. Mechanization and automation of production, which lead to a reduction in labour, are particularly effective in the northern regions and in the desert land of the south. The economic development of new territories requires new technical ideas;

(b) Research on sociological problems to find ways to create favourable living conditions in the new regions;

(c) Elaboration of a single scientifically grounded plan for the development of industrial complexes. The plan for such development of the new territory is evolved from a scientific study of the region comparing possible versions of the most economic development of the whole complex.

On the basis of technical and economic research the model for the optimal inter-industry balance is made. This provides for the interrelated development of the branches of the economy and of production and non-production spheres. Experimental work in applying economic and mathematical methods is under way.

The factors affecting the distribution of enterprises and the estimation of their role in regional planning

In general the factors affecting the distribution of enterprises or groups of enterprise are: settlement of population and manpower, location of natural resources within the territory, infrastructure (especially transport facilities), and the existing economic conditions and technical progress in the economy of the country as a whole. These factors affect the distribution of enterprises and the lines of efficient economic development of economic regions in many ways and often in opposite directions. The problem of determining the optimal territorial proportions of development means finding the most efficient combination of the factors affecting the distribution of industry. Planning and research in the distribution of productive forces allows a comparative estimation of these factors.

Population and manpower

Population and manpower are the most important factors in the distribution of industry. On the other hand, the distribution of industry is one of the principal means for controlling the territorial settlement of people and the employment rate in every region. The study and planning of such settlement is closely connected with the urbanization process that is developing rapidly in advanced countries. In the Soviet Union the urban population has almost doubled

since 1940 (1940 - 63.1 million, 1966 - 124.8 million). As towns are the principal centres for the distribution of industry, a new and complex problem of planning has arisen. It involves analysing networks of towns - very large, large, medium, and small - into which new towns could be introduced. To a certain extent a network of towns is indicative of the total territorial distribution of industrial centres and their development. Such a network would provide for the restriction in growth of the largest towns, for the development of new industrial centres in the medium-sized towns and for employing on a greater scale the population of the small towns.

In the USSR great importance is attached to the problem of resettling populations, since the country is facing the task of developing the enormous resources of its eastern regions. The migration rate, especially to Siberia and the Far East is increasing. Material incentives have been introduced to attract settlers to the new territories.

When estimating manpower the factors of age, sex and professional qualifications must be considered. It is economically expedient to locate certain enterprises in regions where manpower is concentrated. These include enterprises requiring a relatively small consumption of raw materials, fuel and power per worker per year, in which the rates of unit labour costs to total unit costs is also relatively small, but the product itself is high-valued.

Calculations have shown that the costs of transporting raw materials to the production facilities and manufactured goods to the customer, even though the distances are long, are lower than the cost of transporting the labour force to the undeveloped regions. Labour-consuming industries include some machine building industries (instrument manufacturing, electro-technical, radio-technical and other industries) light industry, plastic goods manufacturing, chemical-pharmaceutical and others.

For sociological reasons, it is necessary to provide employment for both men and women in various types of plants. For example, experience has shown that in mining centres it is expedient to locate enterprises that employ women; in centres of the textile industry plants that employ men are needed.

Natural resources

The location of natural resources exerts a decisive influence on the distribution of industry. Land, forest, water and mineral resources determine the lines of development of productive forces in every macrozone and economic region.

Land resources in the USSR, even with its vast territory, must be used with maximum efficiency for agriculture, industry, transportation, national parks and for promoting tourism. Cultivated land in the USSR occupies 27.3 per cent of the country and forest 34.4 per cent; the remaining territory is tundra, marshland and brushwood. Land for cultivation is limited by the cold climate in the north, the deserts in the south and the mountain ranges in Siberia and in some southern regions. Industrial and transport facilities are located mainly in regions where the land is of little or no use for agriculture.

Forest resources occupy vast territories. Territorial planning envisages, on the one hand, large-scale chemical and mechanical wood processing, on the other hand, the preservation of large forest tracts as water-protecting zones. From a scientific and practical point of view land-forest-water supplies constitute a single interrelated and interacting complex of natural resources.

Water resources, in view of the current rate of the development of industry, agriculture and towns, assume utmost importance as a factor affecting the economy as a whole and especially the distribution of water-consuming industries (synthetic materials, chemical wood processing and others). Some territories of the European part of the USSR, Kazakhstan and the republics of Central Asia cannot be recommended for the location of water-consuming enterprises. Depending on the country's financial resources, water can be supplied to any dry region. Large hydro-technical installations can supply deserts with a considerable amount of water through canals, pipelines, man-made lakes and sources of deep ground water. Water supplied under these conditions, however, is expensive. It is anticipated that the desalting of sea water by nuclear power will provide great amounts of fresh water in the near future.

In many advanced countries the pollution of rivers by industrial wastes is increasing at a dangerous rate. The USSR uses two ways to control this problem: (a) compulsory construction of full-scale installations for cleaning industrial waste waters; (b) reduction of water consumption by industry and, consequently, the reduction of industrial waste waters. Although this increases capital investments and may raise production costs, the Government is willing to assume these additional expenditures, which are repaid by the preservation of fish resources and better recreation facilities.

Mineral resources such as oil, gas, coal, iron ores, non-ferrous metals, chemical raw materials and building materials constitute the basis for the country's industrial development. Because the most technically advanced

mining equipment is used, large-scale mining enterprises, characteristic of the present stage of industrial development, effect a considerable reduction in the production costs per unit.

When estimating the cost of extracting minerals from a territory to determine its potential value, capital investments for geological exploration, such as geophysical investigation and drilling operations, must be included in the total costs. For the development of large deposits of valuable minerals, a considerable amount of capital investment is economically justified For instance, although the distance is great, the cost of supplying gas from arctic regions of the Tyumen district to where it is consumed is comparatively low.

In the USSR a complex model of the country's fuel and power balance has been developed to determine the output of various kinds of fuels (including their interchangeability) and their transportation routes. This was done by assessing the costs of output, of transport and transmitting power, and of the consumption of fuel and power. It was possible to achieve such a balance because the total demand for fuel of each region can be determined accurately by analysing its development plans. Other resources are more difficult to determine because their consumption by each region is not so widespread. The results of research have considerably changed previous estimates of the cost of fuel and power in various regions of the country. Before determining the optimal fuel and power balance in the USSR, economic calculations of various plans for distribution were made, not on the basis of individual expenditures for deposits, but on the so-called "closing costs". For example, in one region there may be a few open-bed, low-cost coal operations that supply enough coal to meet a portion of the present regional needs; there may also be mines extracting coal at higher costs. A further increase in coal consumption in this region would lead to increased output of coal in the mines, because the open-bed operations have limited possibilities. Under these conditions, plans to locate new coal-consuming enterprises in this region must include the cost of pit mining in calculating the cost of fuel for these enterprises even if they were to consume coal from the open-bed facilities. Such calculations are called "closing costs". When calculating the cost of fuel or raw materials, it is necessary to determine the "closing costs".

The stage of economic development

The stage of economic development of a territory is one of the most important considerations in the distribution of industry. In a territory with an advanced stage of economic development, capital investments and current expenditures are comparatively small for setting up enterprises of the processing industry. Improvement in the quality of goods can be attempted and new kinds of goods can be produced in such a territory. In general, economically developed territories offer the advantages of a developed infrastructure, skilled labour, scientific and technical personnel, and opportunities for interrelated enterprises.

The transport factor

The transport factor determines territorial ties in the development of all elements of the country's economy. Advances in technical progress have brought about a gradual reduction of transportation costs. Paralleling the traditional means of transport, pipelines for transporting oil, oil products and gas, and long distance power transmission lines are rapidly increasing in number. The economic development of practically all regions of the USSR relies on a planned structure of transportation furthering those means of transport that are most expedient. Railway lines for transporting coal from Siberia to the European regions are being extended. Major pipelines have been built to transport gas from the regions of Central Asia to the Urals and the central part of the country. Construction of the pipeline "Northern Lights" extending westward from Ukhta to Leningrad is under way and a line to transmit power from Ekibastuz to the central part of the country is planned.

The average share of transportation cost in the total production costs of various industries in the USSR may be seen from the following statistics:

Industry	Transportation costs as percentage of total production costs
Cement industry	35-40
Iron and steel industry	20-25
Production of building materials	20-40
Sulphuric acid production	20-35
Sodium carbonate production	20-30
Hydrolizing industry	17-20
Pulp and paper industry	15-20
Low content phosphorus fertilizer production	15-30
High content phosphorus fertilizer production	5-10
Meat packing industry	5-18

Industry (cont'd)	Transportation costs (cont'd)
Machine building	0.7-3.5
Machine tool construction	1-2
Tool manufacturing	0.5-2.5
Leather and tanning industry	0.75-1.25
Textile industry	0.08-1.0
Knitted goods manufacturing	0.1-0.3

For fuel and raw-material consuming industries, transportation costs are substantial, whereas for the majority of the processing industries they are low.

Technical progress in industry and in transportation exerts a considerable influence on the distribution of industry and the economic development of new territories. For example, generation of cheaper power by atomic stations leads to an increased proportion of nuclear fuel in the country's fuel and power balance. Location of atomic stations in regions suffering from a fuel shortage provides an efficient supply of power and reduces the expense of long-distance transportation of fuel. The construction of large-diameter pipelines (2-2.5 m) not only increases the volume of transported gas, but also reduces capital investments and the proportion of metal consumption.

Machinery and equipment designed for "northern" or "southern" conditions effects a sharp increase in economic productivity in low-temperature arctic regions and in the deserts and semi-desert regions.

The advancement of technology greatly affects the distribution of industry. Factories producing synthetic rubber (butadiene rubber) from alcohol were formerly located in agricultural regions since alcohol from grain or potatoes was used. The use of synthetic alcohol and the butane-propane fraction of oil-processing plants has led to the location of many synthetic rubber factories near petrochemical plants. A new technology often determines the lines on which the economic development of a territory should proceed.

Methods for regional planning of industry

In the process of elaborating the "Plans for the development and distribution of productive forces in the Union republics and economic regions", the Council for Studying Productive Forces has worked out the basic methodological principles of regional analysis. According to these principles the first step in drafting a plan is to make a thorough economic analysis of the economy of each Union republic and each economic region and its past development (analysis of the original economic base). On the basis of this analysis the

future economic development is determined. An estimate is made of the quantities and economic use of minerals, raw materials, biological resources and land and water resources. Natural resources are analysed according to taxonomic units within the region and water and land resources mainly from the viewpoint of their availability and the need for them in the regional balance. Territories with scant water supply and territories with highly efficient agricultural lands where it is not expedient to build enterprises are indicated.

An analysis of social and economic conditions in the region determines the use of manpower for industrial or office work, and its distribution between urban and rural areas. Trends in urban development and changes in the structure of industry and the efficiency of its distribution are studied. The existing infrastructure in towns of various sizes and in rural areas is thoroughly examined. Technical and economic problems in industry, agriculture and transport and their effect of the distribution of industry are studied. The principle of examining the inner regional differences is adhered to through all stages of the analysis.

On the basis of such an analysis of the natural and economic factors of the region and its place in the territorial division of labour, concepts for the development and distribution of productive forces in each Union republic and each economic region are formed.

Determination of the rates and proportions of economic development of each Union republic and each economic region

The rates and proportions of economic development are determined after a careful examination of the country's targets for the planned period and of the analysis of the existing economy of the region and the concepts for its development. The attainment of the planned volume of production for the country as a whole and the advancement of living standards in the region with a minimum of capital investment and current expenditures (production and transportation) is taken as a criterion of efficiency.

Because this kind of criterion is taken, decisions based on minimum costs in a given industry may have to be changed. Thus, the plans for each industry based on the criterion of minimum costs differ in various degrees from the optimal plans from the viewpoint of the economy as a whole.

The plans for the extracting industries differ only to a very small degree. For the processing industries restrictions on the deployment of all available

resources must be taken into account, for instance, fuel and power and especial immovable and semi-immovable multipurpose resources (land, water, manpower, capital investments, some kinds of raw materials) which can be used not only in this given industry but in many others.

To bring the solutions for each branch of industry (mainly processing industries) closer to the optimal ones corrections in regional plans are made in three ways. First, since ir the optimal plan there is neither an estimation of resources nor "closing costs" (except the estimation of fuel), the resources of each region are divided into effective and non-effective categories in order of preference with respect to their use in the manufacture of goods.

The comparative efficiency of the manufacture of a certain product in the republic (region) is determined on the basis of the cost of effective or non-effective kinds of resources per worker. In the same way, the comparative efficiency of the production of all goods in this republic (region) is determined, each point corresponding to the planned growth rate for the period. Such an approach permits corrections to be made in the plans for the development and distribution of each branch of industry using the data on resources that approximate "closing costs".

The second method of correcting the regional plans for each branch of industry is also concerned with the limitation of immovable multipurpose resources which, as a rule, is not taken into proper consideration in the plans for each branch of industry. The task here is to examine the proposals for the distribution of industries in this republic (region) from the viewpoint of the availability of manpower, land and water resources, fuel and power balance, and balance of raw materials, the bases of the building industry, and from the viewpoint of meeting local requirements, such as sanitation, protection of nature, keeping a balance of male and female workers, and the total employment rate.

The third way of substantial correction of plans for each branch of industry is to analyse their effect on major social and economic problems such as the growth of large urban agglomerations, the development of the economy of medium-sized and small cities, raising living standards in the slowly developing territories within the republic (region), and equalizing successively the standard of living throughout the country.

Thus, the regional and interregional analysis, on the other hand, makes it possible to enhance the economic efficiency of the distribution of industry by a more thorough examination of all costs and by bringing all regional

proposals into balance; on the other hand, it presupposes the solution of a number of social and economic problems for which only quantitative methods are sought.

A general principle for drawing up plans for each republic and each region is to formulate in a preliminary way (taking into account the development of the region and the country's targets for the planned period) a summary of the solutions. Detailed calculations are then made that correct these results. In this way it is possible to bring the solutions offered in the separate plans for the republics and regions into balance.

Calculation of the volume of capital investments into branches of the national economy and non-production sphere

The volume of capital investments is determined by calculating the coefficients of capital consumption for the past period taking into account the structural changes and technical progress in the planned period.

After elaborating the forecasts of the summarized solutions, it is necessary to draw up approximate balances, especially, for immovable resources (manpower, water, land). The balances drawn up at this stage of the analysis and especially the balance of manpower, should be used to correct the forecasts of the summarized solutions and, in their turn, they should be corrected at later stages of the analysis. It is necessary to draw up the following balances: (a) the balance of manpower, water, fuel and power, and the most important kinds of raw materials and products; (b) the balance of production, consumption, and exports and imports for basic industrial and agricultural produce. When calculating the volume of consumption of fuel, power, metal and some kinds of raw materials the method of correlative analysis with the employment of correction factors in connexion with the planned changes in the structure of economy can be used.

Programmes for the development and distribution of the branches of industry

The planned structure of industry and the distribution of industries within a region is determined on the basis of the comparative efficiency of the branches of industry in the region. The volume of the total output of each branch of industry is determined, to volume of capital investments, the increase in labour productivity, the employment figures, the main production

targets in terms of units and an approximate ratio of reconstruction and construction work to be done. The plans for the republics and regions also contain programmes for the development and distribution of agriculture and transport.

The principles described above for drawing up plans for the development and distribution of productive forces in the Union republics and in the regions reflect the most modern methods of preparing data for planning since a precise mathematical method has not yet been attained. Intensive research attempts to create interregional, inter-industry models of the development and distribution of productive forces.

Such a model would probably determine the general optimal proportions of the development of regions that are to be specified in the plans for the development of each industry and for the development of each region. On the basis of the global interregional, inter-industry models an estimate of the resources in the regions can be made.

The problems of the distribution of productive forces of a country are diverse and complex. A rapid growth of industry requires planning based on a wide range of research. This article indicates only some aspects of a scientific approach to planning the rational distribution of productive forces in a country as a whole and in its regions.

3. THE PLANNED INTERREGIONAL LOCATION OF INDUSTRY: ARGUMENT IN FAVOUR OF A 'TRADE-NOT-AID' APPROACH

by T. Vietorisz[1]

General framework of the inquiry

The main policy issue in regard to industrial location and regional development is often posed as the choice between geographical centralization or decentralization. Strong arguments have been put forward for either alternative but professional opinion, increasingly influenced by a recognition of the technological advantages of large-scale production and industrial concentration, has recently swung towards favouring centralization. The importance of "growth poles", following the work of Francois Perroux,[2/] is widely recognized. Developing countries and regions are thus strongly cautioned against spreading their scarce investment resources too thin by attempting to follow a policy of geographically balanced growth. It is argued that such a policy would, among other things, drastically impair their capital/output ratios and thereby directly reduce their growth rates, while the resulting increased production costs would also damage their balance-of-payments positions with the outside world, with obvious further ill effects.

There can be no question concerning the validity of the technical/economic phenomena underlying this point of view. The existence of economies of scale and the closely related economies connected with the sharing of pooled productive facilities and resources (processes, machines, inventories, skilled workforce, technical services, organizational know-how, social-overhead facilities

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1/ The New School for Social Research, New York.

2/ See F. Perroux "Economic Space: Theory and Applications", Quarterly Journal of Economics, February issue; (1955) "Note sur la notion de 'Pôle de Croissance'", Economie Appliquée, Institut de Science Economique Appliquée, Paris, January-June; and (1961) "La firme motrice dans la région et la région motrice", in Théorie et Politique de l'Expansion Régionale, Transactions of the International Colloquium of the Institute of Economic Science, Liège, Belgium.

and services) has been established beyond doubt, and is in many instances quantified or on the point of quantification. Elaborate economic models can be and in some instances have been defined for the detailed numerical exploration of these phenomena; this line of inquiry will undoubtedly be pursued with increasing vigour in the near future, particularly with the coming of age of analytical techniques that can explicitly deal with indivisibilities and increasing returns to scale (integer programming, simulation).[3/] Yet something essential is missing from these models as currently formulated, notwithstanding their broad coverage and great sophistication. These models are based on a conceptual framework of resource allocation, emphasizing the accumulation of capital stocks and the productivity of these stocks under a given technology, taking into account alternative production processes, alternative geographical locations, and (in so far as data permit) alternative time phasings. What is underplayed or missing is content having to do with motivation, social interaction, institutionalization and political action. These elements, it is often asserted, should properly be introduced at the level of political decision-making, based upon the backdrop provided by the models that admittedly cover only some aspects of reality. But what if the orientation provided by such one-sided models is inherently misleading?

The point of departure of the present paper is that economic development must be viewed first and foremost as a process of qualitative cultural transformation involving human beings and societies, rather than a process of capital accumulation. The post-war experiences of rapid physical reconstruction in war-damaged countries, reflected by phenomenal growth rates over limited periods of time and typically terminated by a petering out of the so-called economic miracle, has already cast serious doubt upon the primacy of physical stock accumulation as the nucleus of the economic development process. This impression is reinforced by the tremendous and discontinuous expansion of the economic capabilities of a society under the impact of outside threat or radical structural transformation. This process is well documented by the descriptions of a number of war economies, or of the economic feats of revolutionary societies that have utterly dumbfounded conservative observers. In contrast, the economic development in some developing countries or regions may, in many instances and over relatively long historical periods be less dramatic than the phenomena

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3/ For some basic texts on mathematical programming see bibliography at the end of this article.

just mentioned. However, such development should not be prejudged as devoid of the salient qualitative features of cultural transformation that characterize those more dramatic instances. The latter cannot be interpreted primarily in terms of capital accumulation.

The fundamental objection to geographically centralized economic development, if pursued without a proper recognition of the fact that economic development means primarily a change in people rather than in things, is that it induces progress at selected growth centres while leaving large segments of the population untouched. As long as the focus is on capital and on the fact that at any given moment the existing stocks of capital are by definition scarce since they cannot be expanded in the wink of an eye, development policy will favour strategies that maximize the productivity of currently available stocks. Yet once the focus shifts to people, capital will appear in a different light. Instead of being just a scarce resource that must be husbanded with the greatest parsimony, capital will appear more than anything as a by-product of growth. If, therefore, a cultural transformation can be induced that will orient people individually and collectively towards economic growth, this process of growth will gradually yield the necessary capital required from moment to moment for the expansion of the economic base.[4/] Consequently, if the process of cultural transformation is limited to a few geographical growth centres, the human potential of the untouched segments of the population will be wasted; also it will necessarily prevent the capital formation that would have been induced as a by-product of a more generalized growth process. The end result will be a narrowly based developmental structure whose prototype is exemplified by the contrast between the capital city and the over-populated regions in the remote countryside of almost any Latin American country. The effects on the countryside, if any, will be but a trickle, painfully slow and inadequate. The nearly century-long time lag between the industrialization of the Italian north and south should be a sharp warning of what may be expected even under relatively favourable circumstances.

4/ The idea of capital as a by-product of growth finds convincing expression in some of the writings of Branko Horvat. See: (1958) "The Optimum Rate of Investment", Economic Journal, December issue; (1962) "Methodological Problems in Long-term Economic Development Programming", Industrialization and Productivity, Bulletin No.5, United Nations (Sales No.: 62.II.B.1) and (1964) Towards a Theory of Planned Economy, Yugoslav Institute of Economic Research, Belgrade.

This paper is an attempt to marshal arguments for economic development on as broad a front as is consistent with underlying material realities. It is based on the point of view that geographical centralization versus decentralization is a false alternative, grounded in a narrow view of economic development. What is required is a set of criteria for deciding on the desirable degree of centralization or decentralization of particular economic activities, within an over-all policy framework that stresses the broad aspects of cultural transformation connected with the process of economic development. This point of view leads to the adoption of regional self-financing as a policy objective for the planned interregional location of industry, at least at the level of major regions. To be effective, however, such a policy depends critically on a complementary policy of planned promotion of new, non-traditional export industries for underdeveloped regions within a developing interregional system. The two complementary policies will be referred to as the "trade-not-aid" approach to interregional development.

The general statement given above on the role of human versus technical factors in economic development and on stressing orientation to growth rather than resource scarcity is intended as a frame of reference for the following inquiry. In order to be useful, this frame of reference has to be translated into analytical terms that lend themselves to creating a quantitative back-up for the social decision process, encompassing not only whatever is valid in the currently available technical/economic descriptions but going beyond them.

It would be premature to attempt to define directly a new analytical structure that grows organically out of the frame of reference discussed above. Since the point of view expressed in this paper is by no means unique to the author, it is a fair guess that a proper analytical structure will eventually emerge from the concerted efforts. The best that can be attempted now is to make use of the existing technical/economic descriptions - and their integrations into economic models of the resource-allocation type - as a point of departure, and to indicate the modifications, extensions, or unresolved inadequacies of these models that are suggested by the shift in point of view. In this way a gradual transformation of these models is initiated that may eventually lead to fundamental revisions of the analytical approach as a whole.

The shortcomings of resource allocation models

The principal shortcomings of current resource allocation models that require modifications are the following.

All mathematical-programming type resource allocation models assume that a single objective function can be made subject to maximization. In dealing with separate regions, this is often an impermissible distortion of reality. We may get an entirely false view of the possibilities of interregional development if we fail to take into account the social and political factors that condition the interaction between regions. Little can be done to quantify the role of these factors; however, it is essential to recognize them in order to get away from the mechanical application of some global maximization of the benefits achieved in the entire system of regions, while treating the division of these benefits as a secondary consideration. On the contrary, the precise nature of the interaction may well determine the key features of the pattern of interregional growth.

Resource allocation models formulated in the customary way focus on the technological relationships involving production and transport, relegating to the sidelines relationships that depend on the quantification of motivations and behaviour. As a result, these models overstress the scarcity of material goods in the course of development, especially when these goods serve as stocks (means of production); and, conversely, these models do not sufficiently emphasize that the supply of material goods increases as a direct resul of the process of development itself. This leads to a neglect of feedback effects from the process of development to the supply of savings, skills, and innovations, all of which pertain to the human side of the development process.

The concentration on material goods often erroneously suggests that the scarcity of these goods is the sole constraint on development; yet the limited effectiveness of sheer doses of capital are well known to development bankers and foreign aid administrators. Thus the structure of job skills is crucial for determining the absorptive capacity of an economy for given doses of capital. Current models have a bias towards treating the creation of job skills in a manner analogous to the production of commodities; they assume that, given the proper inputs (including existing skills), any array of skills can be built up in the same way as a stock of goods. Hence the popularity of the concept of "human capital". Yet many crucial skills cannot be imparted independently from the gradual qualitative transformation of the structure of the entire productive and social fabric of the developing country or region.

The role of economies of scale in regional development is generally recognized as a crucial one, but this recognition has not yet been translated into workable locational or project-evaluation criteria. This is all the more important since many phenomena usually discussed under the heading of external economies or diseconomies also depend on economies of scale. These phenomena include the role played by social overhead capital, the economies of agglomeration and urbanization, and the interrelation of industries in a developing complex via the complementary generation of consumer demand for each other's products.

At present the required modifications can only be sketched out rather than precisely formulated; none the less, the very consideration of these modifications will tend to affect in a systematic manner the policy conclusions derived from locational and regional-development models. These modifications tend to strengthen the argument for a policy of systematic support to the underdeveloped regions through a planned division of industrial development that will offer to all regions the potential benefits of economies of scale.

REGIONAL DEVELOPMENT: COMMON OR CONFLICTING GOALS?

In efficient planning it is necessary to assemble and scrutinize available alternatives and to choose between them. Each of the alternatives has to be consistent and feasible, otherwise no meaningful choice is possible. The act of choosing, however, also pre-supposes the consideration of objectives, and this creates serious problems in regard to industrial location decisions when the welfare of more than one region is affected. How shall the planner weigh the welfare of separate regions against each other? In fact, the planner does not have full latitude to make binding decisions, since he can only put into practice what the social and political forces operating in the various regions will ratify. This ratification (or its opposite) may be effected by the direct political acceptance or rejection of a particular proposed plan, or in more subtle ways, either by the reasonably smooth fulfilment of the plan or else by its defeat through an accumulation of unforeseen difficulties, resistances and inefficiencies.

The divergence of welfare interests

The problem posed here in terms of the interests of different regions is not unique to interregional planning; it arises whenever a plan includes

different groups or different individuals, and is thus an inescapable feature of all planning decisions. It is not an easy problem to deal with analytically. Even if the preferences of individuals (as defined by neoclassical economics) are accepted as a valid analytical tool, they cannot be synthesized into public or social preferences.[5/] Accordingly, all joint decision-making (which is the ultimate sanction of planning) depends on the operation of a social or political process that cannot be reduced to the purely strategic functioning of isolated individuals, but must be studied on its own terms. This should hardly come as a surprise, since there is after all no reason to expect that the potentialities of man as a social being should be fully disclosed by his behaviour abstractly postulated for a hypothetical condition of total isolation. It is revealing of the preconceptions within which this particular line of economic inquiry has been pursued that the recognition should have come with the force of shock.[6/]

In searching for criteria for interregional planning decisions, care must be taken not to permit this approach to lead us into one of two opposite extremes: either to view all attempts at independent consideration of regional interests as arbitrary and therefore inaccessible to rational inquiry; or else, to short-circuit the entire problem through exclusive attention to global optimization.

In dealing with the problem at the level of regions, it will not be necessary in this inquiry to analyse the same problem at the full depth of separate individuals. There remains, even so, the question of how to define a region as a unit of welfare interest. Small or large regions can be chosen, even supranational regions composed of individual countries, as units of analysis. For planning purposes, it is probably best to work with a hierarchy of regions, explicitly considering the problem of units at the same level of hierarchy while provisionally abstracting from the existence of lower-level units. In this

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5/ K. J. Arrow (1951) Social Choice and Individual Values, Wiley, New York.

6/ This is interestingly evident in the metaphors of the language chosen for stating the fundamental mathematical theorems. In relation to individual preferences, a social preference function is described as being either imposed or dictatorial. Though these terms are given a precise mathematical interpretation, the overtones are unmistakable. Since social choices are irreducible to the preferences of isolated individuals, within this frame of mind they are incomprehensible and are therefore labelled as arbitrary or non-rational (imposed) or even inherently evil (dictatorial).

paper, attention will be restricted to regions at the same hierarchical level, since many of the conceptual problems to be clarified can be adequately dealt with at this level of abstraction.

This particular focus of attention in no way implies that non-geographical groupings of individuals are irrelevant from the point of view of the divergence of welfare interests. Occupational groups, social classes, nationalities, races or other social groupings can at times be equally meaningful units of analysis, and for some purposes they are more meaningful. For the planner, however, the welfare implications of interregional locational choices are especially important, because within the modern nation-state the crystallization of individual welfare interests tends, under normal conditions, to occur along regional lines.1/

The nation-state itself is an institution based on an operational grouping of individuals primarily by geographical criteria, in spite of historical, cultural, or ideological rationalizations which may be invoked to reinforce the ascribed role of nationality. The nation-state claims the primary loyalty of individuals, as its citizens, on the ground that it is the repository of their fundamental common interests, next to which their potential antagonisms are never permitted more than a subordinate role. Regional groupings are important because they rest on the same kind of geographical demarcation that defines the nation-state itself, and thus they attract to themselves some of the loyalties mobilized on behalf of the nation-state as a whole. Regional loyalties constitute a latent threat to central government since they can serve to support separatist political action whenever the bond of common interests within the state is overstrained by regional inequities. In fact, the continuing loyalty of such regional groupings is generally secured by giving them a significant share in the power of central government through some mechanism of political representation.

1/ Under other conditions, for example in the course of radical social change, entirely different groupings will play the key role, but these conditions are rarely the ones under which the economic planner will be primarily relied upon for professional advice.

The reconciliation of multiple objectives in programming models

For the formulation of programming models, this situation implies that there exist several partly autonomous goal-setting units instead of a single unit whose welfare aims can simply be maximized. All mathematical programming models, however, pre-suppose the existence of a unique objective or goal that is pursued single-mindedly as far as the economic limitations built into the model will permit. When an economic problem presents itself in terms of several autonomous objectives that have to be or are being pursued concurrently, it is mandatory to reconcile these objectives in one way or another before it is possible to formulate a programming model. The two principal means of achieving a formal reconciliation of multiple objectives are:

(a) The selection of one objective as the principal one that will be maximized.[8/] All the other concurrent objectives must then be treated as constraints; in other words, it has to be prescribed in formulating the model that these concurrent objectives will attain values at least equal to stated lower limits that are acceptable or tolerable. Mathematical programming offers no clue as to how these limits are to be arrived at. In dealing with problems of inter-regional growth, for example, it is customary to treat the growth of the system as a whole as the main objective while assigning lower limits to the growth of each region, either in absolute or in percentage terms. It is, however, a moot question how these limits are to be set.

(b) The assignation of stated weights to each objective, and the maximization of the weighted sum. The weights represent the relative importance of each individual objective. Again, programming offers no clue to the derivation of the weights, even though a great deal depends on just how the relative importance of concurrent goals is quantified by means of this choice of weights. The programming model cannot be formulated until this problem is solved.

The reconciliation of multiple objectives is achieved by both of the above methods in a merely formal sense, without touching the essence of the underlying problem of autonomous goal-setting units. The two methods exhibit a close mathematical interrelation: given either of the two formulations, it is possible to construct a model following the alternative formulation that will have an optimal solution in common with the first one.[9/] Thus from the

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8/ Minimization need not be treated separately, since it can always be converted into maximization by a reversal of signs.

9/ A formal exposition will be found in T. Vietorisz, "Locational Choices in Planning", in M. Millikan, Ed. (1967) National Economic Planning, National Bureau of Economic Research, New York.

point of view of flexibility in representing the underlying economic problem there is little to choose between the two methods.

The interaction of autonomous goal-setting units

Both of the above methods of achieving a formal reconciliation of multiple objectives in programming models pre-suppose an agreement between autonomous goal-setting units in regard to weights or appropriate distribution constraints. It is, however, far from certain that such an agreement can be smoothly reached. The development of lagging geographical areas may confer important advantages not only upon them but also upon their more advanced partners. These advantages often appear uncertain so that the policies required for initiating the catching-up process for a lagging region may appear as an immediate sacrifice. When geographical areas have their own institutions capable of promoting effectively a regional or sectional point of view (as is the case for legislative voting districts, more so for politically autonomous regions within a federal government, and overwhelmingly so for sovereign nation-states within a supranational planning association) the reconciliation of multiple objectives becomes not merely a matter of subordinating sectional views to an over-all consensus, but also a matter of bargaining.

In each of the above cases, the balance between the autonomous goal-setting units has two elements. First, these units have common interests which are represented by a central decision-making organ with more or less extensive powers for resolving conflicts between the units in the name of the common good. Second, the units also have opposing interests which they are more or less free to pursue in the framework of a strategic game in which the attainment of the objectives of any one unit is constrained only by the behaviour of the other units. This implies that the power of the central decision-making organ must be sufficiently limited to allow some latitude for this strategic contest. The emphasis given to each of the above two elements differs in particular cases.[10/] In nation-states with centralized governments the first

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10/ Current versions of game theory (for a recent synthesis, see J. C. Harsanyi (1966) "A General Theory of Rational Behaviour in Game Situations", Econometrica, July issue) lose much of their effectiveness in dealing with such problems by failing to recognize in the game situation the presence of an institutionalized representative of the common interests of the participants. This is a consequence of insisting on the conceptualization of individual behaviour in terms of preference functions. The latter cannot make constructive use of human interactions, represented by shared

element predominates and there is only a moderate latitude for bargaining and other strategic behaviour on the part of individual legislative districts or other institutions reflecting regional interests. In supranational planning associations the second element is most likely to predominate, since the individual units typically reserve for themselves veto power over central decisions. Federal governments are intermediate between these two, but probably closer to the first than to the second.

The market mechanism in its ideal form constitutes one possible institutional arrangement for the balancing of common versus opposed interests within a group of economic decision-making units, whether these be individuals, regions or nations. The market mechanism makes possible the attainment of common interests (consisting in the gains to be achieved by specialization and trade) and at the same time it provides a criterion for the distribution of these gains among the individual units. Their choice of strategy is greatly simplified provided that all units are subject to the rules of market behaviour: (a) They need no longer pay explicit attention to common interests in the formulation of their strategies, since the market mechanism assures the achievement of common benefits while individual objectives are being pursued; (b) They need no longer keep under observation the repercussions of their behaviour on the actions of all other units, since these actions are at all times summarized for each participant in the form of price signals which permit the formulation of simple individual objectives. Thus, the market mechanism does away with the need for collective value judgements involving jointly-achieved gains and

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(10/ cont'd)
psychological fields, in describing the core of the motivational structure of the personality. Yet it is entirely feasible and for many purposes highly fruitful to take a diametrically opposed point of view, and to conceptualize the core of the individual personality in terms of an introjected group situation. This permits a view of individual decision-making as consisting of the reconciliation of a number of diverse strivings, as though in the name of some "common interest" as represented by the integration of the ego. The resolution of social conflicts can then be viewed as the re-enaction of personal decision-making on a larger stage. As contrasted with such a view, the rationality that emerges from much of current game theory has the flavour of a theory of interaction between high-IQ psychopaths who are seemingly in perfect control of their behaviour, yet are utterly incapable of forming any human relationships. We must beware of permitting our mathematical models of interregional development to be cast in this mould.

their distribution, and with the need for complex strategic decisions in a constantly shifting precarious power play. The economy of effort on both of these counts is great enough to encourage support for the rules of the game. In addition, the market mechanism creates a link between effort and reward; even though this link is not the only criterion of distribution (as scarcity rents are an equally essential part of the system), it is sufficiently prominent to give the market mechanism something of an aura of fair play that may be valued for its own sake.

The market mechanism in its practical form, although far from ideal in its workings, has been a major social organizing principle for a long enough historical period so that its rationalizations - fair exchange, quid pro quo, reward in proportion to effort - tend to be carried over into situations in which strategic behaviour necessarily dominates. Thus, at the international level, it is met as the traditional free-trade doctrine. This doctrine can be used as a purely strategic device (in the form of a heavily promoted ideology) for the pursuit of the particular objectives of those players in the strategic game whom the rules of free trade tend to favour most; and it has been so used.11/ It should be noted, however, that an appeal to the same underlying ideology appears also in the principle, applicable to a supranational joint planning association, that each nation should obtain a share of the commonly achieved benefits in proportion to its contribution to the creation of these benefits.

This principle appears reasonable on the face of it, but upon reflection it is seen to be subject to serious ambiguities. Commonly achieved benefits could be divided up just as well in proportion to political power: the "lion's share" is an operational principle fully as time-honoured as the principle of sharing benefits in proportion to contributions; on the other hand, sharing benefits to some extent at least in proportion to needs will always have its proponents. Any one of these principles reflects and expresses collective value judgements.

One of the advantages of an ideal market is that its principle of division of benefits translates directly into a quantitative measure: under such a system, price signals express the contribution of each market participant. Under the other two principles, the measurement of power is as ambiguous as the measurement of need. If the criterion of an ideal market is, however,

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11/ For an interesting presentation of this point of view, see Joan Robinson (1962) Economic Philosophy, Aldine, Chicago, Illinois, pp.65-66.

carried over into a practical locational planning decision, even this advantage is lost. The benefits of joint planning are due as much (or often more) to economies of scale obtainable in larger markets (with which no price mechanism can effectively cope) as to the classical gains of trade through specialization. Moreover, if those effects of locational decisions which have no counterpart in a commodity traded on the market are also taken into account, the price signals will be deficient even in the absence of economies of scale. In this category are such phenomena as the welfare effects of migration, urbanization and land use. Thus, a price system is of no conclusive help in the determination of contributions to commonly achieved benefits, even if the principle is accepted that the distribution of benefits should be proportional to such contributions.

Self-financing and mutual support

Self-financing, coupled with mutual support between regions by a planned expansion of their joint markets, is suggested as a basic principle of interregional development policy. While this benefits most directly the underdeveloped regions, it also offers significant long-term advantages for the advanced regions. The principles of this policy are offered as a substitute for the policy of maintaining free interregional markets or for the policy of sharing rewards in proportion to contributions.

The basis for the suggested policy is the postulate that individual regions typically have a significant measure of political autonomy, but are at the same time subject to some degree of central decision-making. It is further postulated that regions have both common and conflicting interests. It will be argued that, under a sensible policy of planned interregional development, the common interests can be made to predominate sufficiently over the conflicting ones so that the autonomous regional goal-setting units will be motivated to keep the policy going.

The first element of the suggested policy is regional self-financing. This goes counter both to the notion of free capital markets as agents of development, and to the notion of global maximization as represented by conventional linear or other mathematical programming models. The underdevelopment of many regions of the world which persists in the face of reasonably free interregional capital movements testifies that such movements alone are far from

adequate for guaranteeing development. In fact there is reason to believe that under most conditions free capital movements drain resources away from underdeveloped regions rather than contribute to their resources by a capital inflow.

Among the factors working in this direction are the following: first, for movements of goods and capital across regional boundaries, absolute rather than comparative advantage becomes the criterion of investment, and underdeveloped regions tend to have a disadvantage on almost all investment projects of interest for development. Second, the investors who have access to savings in underdeveloped regions will under market institutions generally desire to diversify their portfolios as a protection against risk, by transferring a substantial portion of their investment resources to the more advanced regions. There have been many discussions of the fact that for an underdeveloped region it can be a serious disadvantage to be tied to an economically prosperous one: this has been cited in the case of southern Italy and northern Brazil, and in many ways it holds true for the developing world as a whole in relation to the industrialized countries, as long as primarily commercial-type relationships prevail between them.

In the face of the observed tendency for the polarization of development rather than its dispersal under conditions of free capital movements and the consequent drain of resources from the underdeveloped areas, it makes good sense to suggest self-financing as a suitable policy goal for increasing the net investible resources of the latter. In other words, since free capital movements tend to strip the underdeveloped regions of resources, these movements should be stopped as a matter of policy, in spite of the fact that net capital inflows to the same regions, if such net inflows could be achieved, would be beneficial. While self-financing appears to be a more modest policy goal than that of net capital transfers to the underdeveloped regions, it is in fact a highly ambitious goal that may not be at all easy to realize in practice because of the very real obstacles and contrary forces that have to be reckoned with.

The suggestion of self-financing may be attacked on the ground that neoclassical economic theory predicts a net capital inflow to underdeveloped regions if capital movements are free. The available facts tend to support the opposite conclusion. In spite of the great difficulties of measuring capital flight from the less developed countries of the world to the more advanced countries, evidence is building up that such transfers amount to

several billion dollars annually,[12/] offsetting direct investments and economic aid flowing in the opposite direction. There is ample reason to expect that the same pattern is repeated between the regions of individual countries.

The suggestion of self-financing might also be attacked from another angle, namely by asserting that polarized development may be favourable to a country as a whole. Some regions, this argument goes, are inherently inefficient, high-cost regions, and the scarce investible resources which the country as a whole might be able to generate should go preferentially to the more efficient regions; otherwise, over-all development will be slowed down. It is not difficult to construct illustrative models in support of this view, and it has adherents in countries both with market economies and with centrally planned economies.

This argument has indisputable merit for small regions, since the logic of dispersing development uniformly over geographical space must break down at some point; evidently there cannot be an integrated steel mill in every square mile of space; thus, economies of scale inescapably lead to a polarization of investments at some level of regional subdivision. For a system of larger regions this argument loses some of its force, but there are still many activities, particularly those associated with social overhead investments such as transport arteries and terminals, housing, and urban facilities, that continue to raise the same kind of problem. These investments are not only subject to major indivisibilities but, distinct from steel mills, their product cannot be transferred or utilized over a distance; thus a single large investment cannot serve the needs of many geographically distinct points, and therefore each region requires its own investment to function at a favourable cost level. This creates a force tending to favour the interregional polarization of investments even at the level of major regions. Economies of agglomeration and urbanization reinforce this tendency.

These tendencies, however, are not the only influences at work. The effectiveness of polarizing capital transfers is restricted both by unfavourable feedback effects on productivity and the supply of savings and skills in

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12/ See Göran Ohlin (1966) Foreign Policies Reconsidered, OECD, table IV.3, pp.68 and 69 and accompanying text. In spite of administrative and military expenditures, foreign aid, private investments and credit running to over 10 billion dollars annually, the import surplus of developing countries (including transport and similar services) does not reach 2 billion dollars annually, and is very unevenly distributed.

the regions that are losing resources, and by the limits on the absorption of large doses of capital in the advanced regions. If the development of these regions is already rapid enough to strain their capacity for structural change, the polarizing capital transfers will merely deprive the underdeveloped regions of the resources needed for growth, without contributing significantly to the development of the more advanced regions.

If the notion of self-financing (at least for regions of reasonable size) is provisionally accepted, the question will inevitably occur: in what way can different regions offer each other mutual support if capital transfers are ruled out? The main avenue of mutual support under these conditions is jointly planned industrialization. The more advanced regions can offer a decisive aid to the lagging regions by assisting the latter in converting their savings into the physical investment resources required for industrialization. This can be done by a planned sharing of industrial markets: in other words, by providing the underdeveloped regions with an outlet for their industrial exports from which needed capital-goods imports can be financed. The more advanced regions gain by this policy due to the widening of their own markets. To the extent that development does not remain restricted to the most advanced regions and income rises rapidly in the interregional system as a whole, all regions will benefit from the economies of scale that can be achieved in the wider joint markets.

The key to this policy is regional self-financing. It is emphasized that the viability of a policy of regional self-financing does not require a demonstration that the system of regions as a whole is necessarily better off with self-financing than if capital transfers were permitted. While strong arguments can be advanced to disprove the conventional view that any interference with spontaneous polarization tendencies will exact a severe sacrifice in terms of the growth of the system as a whole,[13/] the case for regional self-financing does not hinge on these arguments. It only needs to be reiterated that each region is to a considerable extent an autonomous goal-setting and decision-making unit. This unit may not be able to impose its preferences on the other regions, but it has a variety of devices by means of which it can exercise veto power over many aspects of joint or central decisions. Thus, a demonstration by means of simple programming models that certain resource transfers damaging

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13/ See the models presented below in tables 1 through 3. See also T. Vietorisz, op. cit.

to a given region are beneficial to the system as a whole fall far short of proving the case for such transfers, since the putative benefits may not be attainable under any set of realistic circumstances. When making a planning choice, each presumed alternative must actually exist. The burden of the present argument is that a serious infraction of regional equities will in all probability result in an illusory estimate of over-all growth possibilities. The case for reasonable standards of equity in interregional planning decisions is merely strengthened by a demonstration that, even when abstracting from considerations of regional autonomy, the additional global benefits that might be available as a result of polarized growth are modest or non-existent.

Regional autonomy and the formulation of programming models

Given the above considerations about regions as partly autonomous goal-setting and decision-making units, is it possible to use mathematical programming models as aids to the interregional planning process?

The answer is in the affirmative, provided that the limitations of such models are recognized. In the usual formulation, a global goal is maximized (such as the global product for all regions) while so-called welfare constraints are introduced for the individual regions, for example, in the form of prescribed minimum shares in the increase of global product. The foregoing argument does not imply that such formulations are necessarily beside the point; but it does imply that the models possessing the given formal characteristics have to be interpreted and used with a different point of view from the customary one.

It is usual to consider the regional welfare constraints as being in some sense an afterthought, introduced into the model after the essential, technical parts are assembled. It is also customary to talk about the cost of such welfare constraints in the following sense: if an additional constraint is imposed on a maximizing model, this will generally restrict the number of available alternatives and will reduce (or at best leave unchanged) the objective being maximized. Thus the cost of introducing a regional welfare constraint is a reduction in the global product (assuming that the latter is being maximized). What is not sufficiently appreciated, however, is that any constraint in the model can play exactly the same role. If we remove any one of the technical constraints (for example, the constraint on iron and steel inputs) then the formal solution to the model will yield a higher maximum. This maximum would never be interpreted on the same footing as the normal maximum since it is

readily apparent that the suppression of the constraining role of iron and steel inputs will result in an illusory improvement that cannot actually be attained under any set of circumstances. The economic significance of the estimate is that it measures the effective scarcity of iron and steel supply.

Given the fact that individual regions are partly autonomous goal-setting and decision-making units, the exercise of this autonomy can be described in terms of certain political constraints that are imposed on global maximizing decisions. These political constraints, however, are by no means gratuituous: their removal would lead to an entirely illusory improvement of global product, exactly as in the case of the iron-and-steel constraint discussed above. Therefore, such constraints are by no means to be interpreted as a grudging concession to a moral sense of equity on the part of the central planner. If the latter interpretation were allowed to stand, then it would become a matter of the central planner's exercising his own preferences in ascertaining how much of a global cost (decrease in global product) he would be willing to accept for a given improvement in regional equity. In this case welfare constraints could well be regarded as an afterthought; and there is good reason to suppose that in customary formulations of programming models they are generally so regarded. The very name welfare constraint suggests this; in representing the veto power of partly autonomous regional units, the name political constraint is more descriptive of actual conditions.

The consequences of the two differing attitudes to programming models, however, go beyond a mere change of names. Rigid constraints are an elementary way of representing the political autonomy of regional sub-units in programming models. A more sophisticated approach attempts to quantify the economic repercussions of inequitable interregional development policies, as reflected by productivity decreases, lagging supplies of savings and skills, diminished innovative activity and other indicators. This permits a more realistic appraisal of the consequences of different patterns of interregional development. Yet even this fails to come to grips with some aspects of regional autonomy, since it leaves out the possibilities of direct political action which can have a fundamental influence on the shape of the interregional development plan as a whole and which elude any attempt at simple quantification via maximizing models.

The attempt at quantifying some of the socio-political factors is, none the less, highly significant in spite of all imperfections and attendant difficulties. The more concretely the repercussions of different patterns of

interregional development are traced, the more will it be possible to define interregional development policies that emphasize the common interests of the individual regions, thereby reducing the sphere of conflicting interests that have to be resolved by primarily political means. The following section offers a few tentative first steps in this direction.

CAPITAL ACCUMULATION, CULTURAL TRANSFORMATION AND INTERREGIONAL DEVELOPMENT

The shortcomings of a maximizing approach to interregional development have been explored above and the introduction of social and political considerations into the formulation of resource-allocation models used to study interregional development has been urged. Some further shortcomings of these models will be analysed below, focusing on the inadequacy of the concept of capital accumulation for explaining the phenomena of economic development, even if the concept is extended to include the accumulation of human capital. This suggests a systematic modification of the parameters of such models in order to represent key aspects of the cultural transformation process that have a bearing on interregional resource allocation. These principles will be illustrated by three rudimentary, aggregate-level models of interregional development. The models lend support to a policy of regional self-financing and show the effects of such a policy on the growth of advanced regions, underdeveloped regions, and the interregional system as a whole.

Human capital

The concept of human capital is firmly linked to the concept of economic development as an accumulation process, and is in fact a powerful means of buttressing the dominant position of the resource-allocation framework in explaining the phenomenon of economic development. This is done by extending the concept of capital from the accumulation of physical stocks to the accumulation of labour skills, and hence treating human labour as a commodity, on a par with other commodities traded in the market. In a resource-allocation model used for programming each grade of skill, like each physical commodity, appears in two balances: a stock balance with an associated stock-rental price that depends on the scarcity of the stock accumulated up to the given time; and a flow balance with an associated flow price that represents the capitalized value of rentals in buying or selling a unit of the commodity. The stock-rental price of a unit of skill is its wage rate, while the flow price is the

capitalized value of wages. The latter can be interpreted as the value of a man's skills to himself - it would be the purchase or sales price of a skilled slave in a slave society; it also represents the social value of a skilled emigrant or immigrant. Skills are generated by educational or training activities that are defined as the exact counterpart of ordinary production activities; that is, their inputs are physical- and skill-commodity flows and stocks, and their outputs are the desired skill-commodity flows. There are, in addition, special activities that carry over physical- and skill-commodities from one time period to the next. These activities inter-link flow and stock prices and jointly determine the structure of discounted prices which underlies the concept of the rate of interest.

Figures 1 and 2 below present a linear programming model for human capital in Tucker's combinatorial format. Activity scales (X and H variables) appear in the bottom margins; prices (P and R variables) appear in the right margins. Slack variables are omitted. The sign convention is that outputs and supplies are positive while inputs, requirements, and demands are negative.

Such a model represents the qualitative cultural changes that take place in the course of economic development in terms of a gradual build-up over time of stocks of skills of ever higher order. Each higher skill embodies the inputs of physical stocks and flows as well as the requirements of crude labour and skills of lower grades that enter into its generation by means of educational or training activities.

For this model to have analytical value, education and training must be represented as taking place within the economic sphere, that is, as a part of the production process. From the point of view of production, various distinct grades of skilled labour are no more than intermediate commodities that can be produced directly or indirectly from crude labour and other primary inputs. In the simple model of figure 1 the only primary (non-produced) inputs are crude labour and the initial stocks of physical goods. If optimization over time consists of maximizing the value of terminal stocks, the growth of the system in any time period is limited only by crude labour, and by the stocks of physical commodities and labour skills that have been accumulated before that time period begins. The essential choices within the model relate to the extent and time-phasing of educational and training activities, in order to balance in the most effective manner possible the disadvantages of tying down labour in training activities against the benefits flowing from the higher productivity of the resulting upgraded labour force.

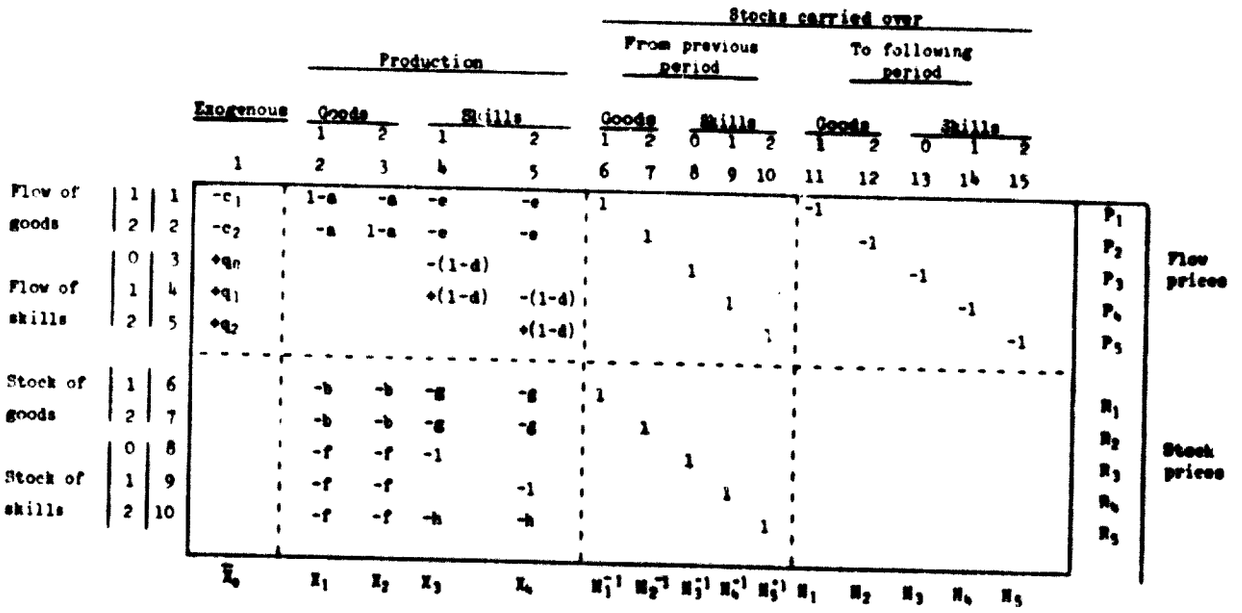
For the sake of simplicity, the model is depicted as allowing for the production of only two types of goods (labelled 1 and 2) and for the existence of only three grades of skill (labelled 0 for crude labour, 1 and 2). In practical use, however, the model would allow a wide range of choice in the types of goods produced, these production activities using skills more or less intensively. The model also assumes in general that increasing amounts and and higher degrees of skills are compensated in the over-all technological structure by reductions in crude labour and/or physical stock and flow requirements. While possibilities of substitution between production activities are at the heart of the techno-economic description provided by the model, crude labour and skill input-requirements within a production activity are assumed to be rigidly determined and precisely given.

In figure 1, the growth of the labour force is treated as an exogenous supply q_i for skill of grade i (i = 0, 1 or 2) in each time period. The parameter q_i comprises the effects of entries into the labour force (for skill grade 0); immigration net of emigration in each skill grade; and deaths or retirements from the labour force (a negative item). If any amounts of skills of grade i are generated outside the economic sphere covered by the model, e.g. by a socio-cultural process not subject to resource allocation considerations, these amounts have to be included in the exogenous supply.

As formulated in figure 1, educational and training activities always result in a direct debit against production, since they withdraw some labour from productive uses; there is, however, an indirect credit, in that the newly generated skills will make possible a higher productivity in a future period. The only possible exception to this rule is the training of crude labour under conditions where crude labour itself is in surplus; then the shadow price of crude labour is zero and the training activity is not debited with a cost item on this account. There will, of course, still exist debit items arising from tying down highly skilled teachers, as well as the costs of physical stock and flow requirements. The wage structure resulting from the training activities is such that the capitalized difference between wage levels in successive grades exactly compensates for the training costs incurred, including the opportunity cost of wages foregone while in training.

Figure 1

A simple programming model for human capital: Detail for a single period



Notes: 1. Rows represent resources of physical goods and labour skills, each accounted for separately as a flow and as a stock. Columns represent activities: the production of goods and skills; the carry-over of stocks of goods and skills from one time period to the next; and exogenously determined supplies and demands that are entered in the model as data. A given coefficient in the detail represents an output (supply) or an input (requirement, demand) of a given resource per unit of activity scale.

2. Row balances are obtained by first multiplying each coefficient in the detail by the activity scale of its column (the X or H variable appearing at the foot of the column in which the coefficient is located). This yields total output (supply) or input (requirement, demand) of a resource at the activity scale designated by the X or H variable. All products in a given row are then added algebraically and the sum is a surplus (if positive) or deficit (if negative) of the resource at the specified activity scales.

3. Column balances are obtained by first multiplying each coefficient in the detail by the resource price of its row (the P or R variable appearing at the right margin of the row in which the coefficient is located). This yields the total revenue (for positive coefficients) or total cost (for negative coefficients) associated with the sale or purchase of the resource in question at the prices designated by the P or R variables. All products in a given column are then added algebraically and the sum is the profit (if positive) or loss (if negative) of running the given activity at unit level, calculated at the specified resource prices.

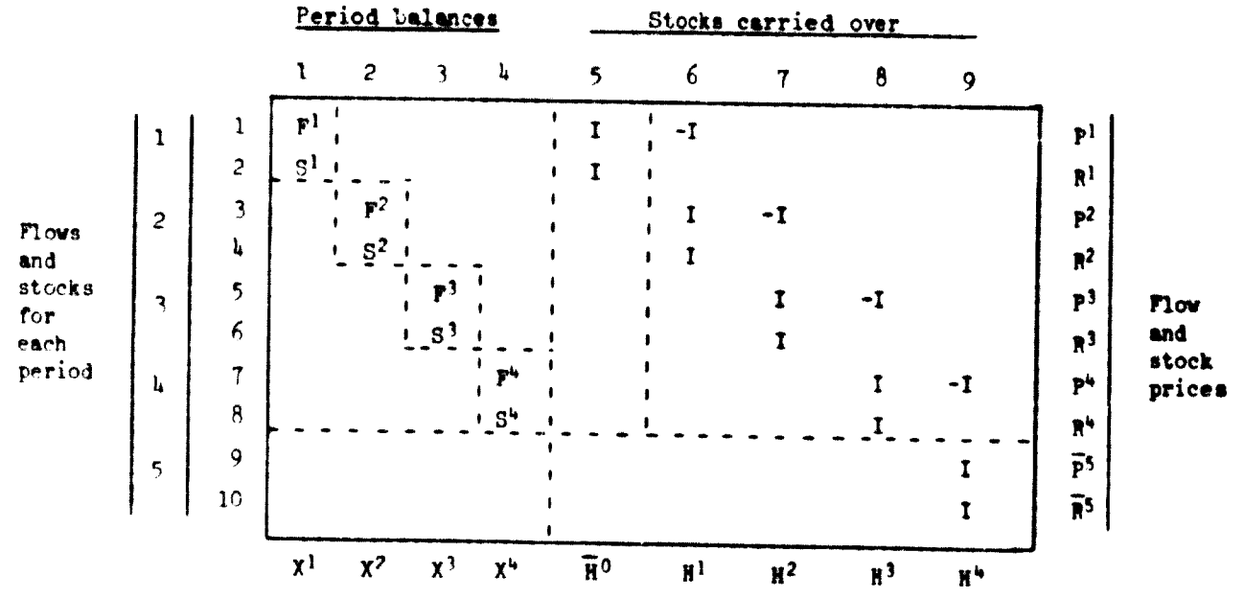
4. The e and g coefficients refer to ordinary flow and stock inputs of physical goods into the educational and training activities, such as electricity (a flow) or inventories of desks and benches (stocks). The -(1-d) and +(1-d) entries refer to the disappearance of lower-grade skills and the creation of higher-grade skills resulting from the educational and training activities; the d coefficients in particular designate the fraction of drop-outs at each level. The entries of -l and -h in the education and training activities represent the stocks of trainees and teachers respectively, tied down by these activities during the process of training. It is assumed for convenience that only skill-grade 2 provides teachers and that each activity is self-contained within a single time period; these assumptions can be easily relaxed and longer-term training activities as well as various time-lags can be introduced into the model in any manner desired.

5. It is assumed for convenience that all stocks are liquidated at the end of each time period; thus stock carry-over activities interconnect only to consecutive time periods. No depreciation on physical stocks is assumed; all withdrawals from stocks of skills, as already explained are treated as exogenous.

Figure 2 represents in condensed form the interconnexions between the sub-models, as illustrated in figure 1, that provide resource balances for single time periods. The X, H, P and R variables in figure 2 are vectors and the coefficients shown within the figure are matrices.

Figure 2

A simple programming model for human capital:
Interconnexion between periods



Notes: 1. All rules given for the detail in figure 1 are valid for figure 2 if the operations are undertaken following the rules of matrix algebra. In particular, the intersections of rows 1-5 and columns 1-5 in figure 1 are designated by the symbols F^t in figure 2, where the superscript t = 1, 2, 3 or 4 refers to the time period in question. Likewise, the intersections of rows 6-10 and columns 1-5 in figure 1 are designated by the symbols S^t in figure 2; and the diagonals made up of +1 or -1 elements are designated by +I and -I respectively.

2. Figure 2 is a simple accounting device. In order to use it for optimization, certain variables have to be pre-set to constant values. These include the exogenous vector for each time period, usually pre-set to unit scale; the stock carry-over vector $\bar{H}^0$ for

the zero time period, which fixes the pre-existing stock levels; and the stock and flow price vectors $\bar{P}^5$ and $\bar{R}^5$ for the fifth time period that establish the valuation of terminal stocks. The optimization can then be expressed in two interrelated calculations:

(a) Choose a programme of activity scales by setting the remaining X and H variables to any desired non-negative values. Among all possible programmes of this kind, identify as optimal a programme which maximizes the value of terminal stocks while leaving a positive or zero surplus (row balance) for each resource.

(b) Choose a pattern of resource stock and flow prices by setting the remaining P and R variables to any desired non-negative values. Among all possible patterns of this kind, identify as optimal a pattern which minimizes the joint profit on all exogenous activities, while leaving a negative or zero profit on all activities.

The maximand of the first calculation will coincide with the minimand of the second calculation provided that both problems do have finite optima. In this optimal solution, activities having losses will occur at zero scales, and resources having positive surpluses will have zero valuations (free resources). The avoidance of negative surpluses in the first calculation is an obvious device for preventing resource bottlenecks; the avoidance of positive profits in the second calculation corresponds to the well known efficiency condition that all profits are zero under perfectly competitive equilibrium. The maximization of terminal stock valuations is a device for putting the system in the best possible position for future growth. The minimization of profits on the exogenous activities is a device for reducing the scarcities of exogenously supplied resources while enhancing the values of exogenously demanded resources.

The optimal pattern of prices can be interpreted as a pattern of discounted prices. In order to determine a rate of interest connecting any two time periods, current prices are defined by reference to a common rate of interest, using the conventional discounting formula to connect current and discounted prices. Since each stock-carry-over activity actually used has a zero return in terms of discounted prices, this translates into a formula connecting the ratio of stock rent and flow price for a commodity (physical good or labour skill) with a percentage capital gain or loss in terms of current prices. Choosing a value-standard stock for which current prices are equal in the two periods yields a rate of interest defined as the ratio of rental price to flow price for the value-standard stock. The rate of interest is not a fundamental property of the model, since it varies with the choice of the value-standard stock; but the pattern of discounted prices, emerging directly from the optimization, is fundamental.

The tour de force of representing the cultural transformation incident to economic development as an extension of the process of stock accumulation is worthy of admiration as an intellectual feat, and in fact it yields an excellent description of the purely technical aspects of the labour training and educational process. Moreover, when technical inputs into labour training, other than labour inputs, can either be safely ignored or can be reduced to further indirect labour inputs, the model also yields an acceptable description of the differentiation of the labour force as corresponding to the different amounts of congealed unskilled labour that are implied by the emergence of each skill category. None the less when the phenomena of cultural transformation are forced into the procrustean categories of resource allocation, some of the key features are left out of consideration.

Three of these key features that have to be allowed for are: (a) the direct interaction between education/training and consumption; (b) the direct interaction between education/training and production; and (c) the instability of the technical coefficients related to labour inputs under conditions of social and institutional change.

Direct interaction between education/training and consumption

The resource-allocation framework pre-supposes a neat division between the production and consumption spheres in society, whereby any activity can be classified either as work, contributing to production, or as consumption (i.e. utility generation). Given this classification, the amount of work that can be performed is limited by the available labour supply. Yet the most

fundamental determinants of productivity are impossible to classify in this manner. Basic language, literacy, and social skills whose lack totally demolishes labour productivity are acquired as a matter of course by all members of a given society, entirely regardless of their needs as individuals to do productive work for a living. Higher education, the leading edge of productivity advances, is sought after by many of the socially most productive individuals as an end in itself. Thus educational and training activities cannot be neatly assigned to the sphere of production, and conversely their lack or relative backwardness cannot be simply reduced to deficient stocks of teachers and deficient training activities within the sphere of production. By the same token, a rapid upsurge of these activities can at times take place spontaneously, in spite of the fantastic imputed costs (and consequent additions to gross national product) that would be implied if all of these activities were accounted for at conventional (that is, commercial or administered) resource prices. To appreciate the margin of uncertainty in this regard, it is sufficient to note that with an institutional work year of 2,200 hours (50 weeks at 44 hours/week) and a labour-force participation rate of 40 per cent, barely 10 per cent of total population-hours are spent in work. This is the maximum that can be assumed as subject to resource allocation, either by the market or by some planning mechanism that acts as a surrogate for the functions of the market, such as programming. Given this 10 per cent and regarding the 67 per cent of waking time as the fund of vital hours available to the culture, only 15 per cent of the vital time-fund is allotted to the economic sphere, while the disposition of 85 per cent is culturally rather than strictly economically determined. The education and training of children, decisive for later labour productivity, draws on these hours; so do the unaccounted-for productive activities of housewives that, as experience indicates, can be considerably contracted, for example, during war time; and so do the culturally patterned recreational and other spare-time activities of workers. With this tremendous slack at the disposal of society, it is hard to argue that the speed of cultural transformation is primarily determined by economically scarce stocks of skills, except under highly formalized and rigid institutional conditions. It is true that there may be severe bottlenecks in some critical skills, and also that there is in general a well-defined time lag associated with all educational undertakings that in some ways mirrors the time lag incident upon the accumulation of stocks; yet the existence of this vast slack more than adequately explains the cultural breakthrough that can be achieved at times spontaneously, or in a purposeful and controlled manner with literacy campaigns,

adult-education programmes, and other institutional means of accelerated cultural transformation.

In a purely formal manner, these phenomena can be subsumed under the resource-allocation model in at least two ways.

First, all educational and training activities can be assigned to the production sphere. This implies a vast increase in the hours of activities classified as work, which have to be accounted for in terms of a corresponding increase in the hours of available labour supply per unit of stock of each skill grade. In the model of figure 1, for example, the increase in yearly work hours available from a stock of one worker and the reclassification of non-productive individuals as workers is reflected in the expansion of all skills (including crude labour) inherited from the base period (increase in the $\bar{B}'$ parameter vector in figure 2) and corresponding increases in the exogenous labour supply in each time period (parameters q_0, q_1, and q_2 in figure 1). Accordingly, the physical and/or skill outputs that can be attained in a given population can be increased. In formulating such a model care must be taken to sub-classify the newly expanded labour resources properly, since otherwise the educational activities involving, for example, the time of small children (that are now accounted within the productive sphere) might show up as a sudden expansion of crude labour available for industrial tasks, and the like. It is also essential to specify that the expansion of the labour supply incident upon this redefinition of the productive sphere of the economy be matched by a corresponding increase in savings, since the redefinition must not be allowed to expand consumption; thus whatever additional income is generated must be formally shown as being saved and reinvested in additional stocks of skills.

Second, educational and training activities taking place outside the conventional economic sphere can be represented as exogenously determined supply and demand parameters: in particular, this applies to supplies of specified flows of new higher-grade skills matched by withdrawals of corresponding amounts of lower-grade skills, and demands of physical and skill resources associated with the unspecified educational and training phenomena.

It is clear that these purely formal solutions to the problem achieve very little, since all of the really difficult questions remain outside the analytical framework. In the first case, there is no way of analysing the amount by which the redefined labour supply will expand in each time period and by each skill class; the formal expansion of savings required for mopping up extra

factor income cannot be properly specified except ex post; and the usual optimizing criterion, that is, the maximization of the value of terminal stocks, has to be modified, again in a manner that cannot be determined except ex post, in order to allow for the apparent over-scheduling of certain educational/training activities known to be valued for their own sake. In the second case it is even more evident that the key questions are hidden behind exogenously determined parameters.

Direct interaction between education/training and production

The evolution of skills, in the resource-allocation framework, proceeds independently of the technological evolution of the productive process. A complete set of technological alternatives can in theory be embodied in the set of physical production activities, and the adoption of the most advanced technological alternatives is limited only by the availability of the corresponding skills, as reflected in their shadow prices. Thus, as long as certain advanced skills are scarce while crude labour or low-grade skills are abundant, the available stocks of these advanced skills will be allocated only to selected critical activities with an exceptionally high productivity in terms of these skills and correspondingly low inputs of other grades of labour and physical commodities. These critical activities will then set the shadow prices of the advanced skills, and will do so at a level sufficiently high to rule out the profitable use of these skills in any but the corresponding activities themselves. As development proceeds, additional stocks of the higher skills can be generated by education/training activities, and this will be done in so far as the resultant productivity increase justifies the training costs.

One socio-cultural aspect of this process, which has typically not been built into programming models but has received detailed attention at the aggregate level, is the impact of upgraded skills on the total wage bill and thus on the balance between consumption and savings. Another aspect which is critical to the present evaluation is the inseparable, organic relationship between the evolution of work skills, organizational skills, advanced technical/scientific skills, and the evolution of technology as represented by the collection of actually available alternative production activities. There is an interpenetration of the process of production and the process of innovation that results in joint activities having a triple character: by means of physical and skill inputs they produce, first, physical commodities; second, a net surplus of higher-grade skills, and third, information pertaining to new production activities that may be added to the set of available alternatives in future time

periods. Thus a resource-allocation framework that treats education/training as independent of production and innovation is forced to postulate, in a patently unrealistic fashion, that workers can be trained, in complete isolation from the production activities, for predetermined slots in the production process; while the latter process itself is viewed as consisting, in addition to currently utilized activities, of alternatives at no cost using higher-grade skills that are waiting to be incorporated at the right moment within the accumulation sequence.

There has been much recent work on one aspect of these problems, namely the costs involved in generating new technical alternatives and the inclusion of decisions pertaining to the allocation of resources to cover these costs within the over-all framework of resource allocation. This, however, still leaves open the question of how such costs depend on the interaction between the productive process and innovation; and how both interact with the simultaneous upgrading of the labour force. While it is easy formally to define activities that produce physical outputs, upgraded labour skills and new technical alternatives for future use as joint products, this device begs the question, since it throws no light on how the technical coefficients of such activities are to be determined. Thus the key phenomena of cultural transformation remain hidden behind arbitrarily defined parameters.

The instability of technical coefficients related to labour inputs

These technical coefficients within resource allocation models that depend directly or indirectly on labour productivity are notoriously unstable compared to technical coefficients that depend primarily on physical phenomena. Thus, for example, in the production of caustic soda and chlorine by electrolysis, the proportions of these joint products as well as their ratios to the required input of electric current are determined primarily by Faraday's law, and are accordingly highly stable. In contrast, the output of a mechanical workshop depends heavily on labour productivity even if its machine park, product assortment, and outside operating conditions are standardized. The technical coefficients of such a workshop are strongly affected by at least two kinds of cultural conditions: first, by conditions pertaining to learning, both at the level of the individual and at the level of the social organization; and second, by conditions pertaining to motivation, including both material and social/political incentives.

The phenomena of learning have been studied in some detail and can be described as a gradual improvement of performance that tends to level off

asymptotically towards an empirically determined limit.[14/] It is theoretically possible to build such learning behaviour into resource allocation models by means of integer-type sequencing constraints that prohibit the employment of more efficient technical variants within a learning sequence until the less efficient variants have already been undertaken.[15/] The rate of improvement can be adequately described by period-to-period coefficient changes, while the ultimate level of improvement is given within error limits by the last activity in the sequence. The key unanswered questions implied by this formal description refer to the rate and the limit of improvement under different socio-cultural settings.

The phenomena pertaining to motivation are even harder to assess. There is no question that material conditions of living feed back on the productivity of the workers, and so long as a given socio-cultural setting can be assumed to be essentially stable, it is possible to relate material incentives to effort put forth. This relationship is covered by numerous investigations of incentive systems. The broader aspects of the effects of the social, cultural and political setting on productivity are, on the other hand, inherently much harder to quantify. Some of these effects may be summarized under the heading of morale which, as indicated by the celebrated Hawthorne experiments,[16/] is a highly elusive concept. While it is plausible that a high rate of economic growth and a general atmosphere of purposefulness and optimism create a favourable feedback on productivity, a similarly favourable feedback may on occasion also be obtained from an atmosphere of challenge and crisis. It has been asserted that under one set of particularly dramatic circumstances increases of productivity in a country paralleled the sharp rise of international tensions in which this country as a whole had a vital stake.[17/] If technical coefficients

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14/ H. Asher (1956) Cost-Quantity Relationships in the Airframe Industry, Report No.R-291, RAND Corporation, Santa Monica, California.

15/ For the logic of sequencing constraints see H. M. Markowitz and A. S. Manne (1957) "On the Solution of Discrete Programming Problems", Econometrica, January issue, pp.86 and 87.

16/ For a comparative discussion of these and related experiments, see H. F. White (1956) "Human Relations in Industry", The Delphian Quarterly, Spring issue; relevant portions reprinted in M. L. Barron, Ed. (1964) Contemporary Sociology, Dodd, New York, pp.318-320.

17/ A. Gilly (1964) "Inside the Cuban Revolution", Monthly Review, New York, October issue, p.84.

can on occasion exhibit this degree of instability over the very short run, it becomes obvious that their longer-term trend must be subject in cardinal ways to socio-cultural determination that is entirely outside the analytical scope of the proposed resource-allocation models.

To summarize, the concept of human capital represents the most far-reaching attempt, within the resource-allocation framework of thought, to come to grips with the phenomena of economic development including the qualitative cultural transformation incident on the acquisition of higher skills and broader education. Some shortcomings of this approach have been reviewed above and it was concluded that, while the key objections can be met in the purely formal sense, the resulting models conceal the analytical difficulties behind ad hoc definitions of parameters. Resource allocation of stock accumulation models, whatever their aesthetic appeal, are useful analytical and planning tools only to the extent that their parameters can be operationally derived and are reasonably stable. The foregoing discussion has focused attention on the non-operational character and instability of the parameters introduced into these models when an attempt is made to extend them to cover some critical questions of qualitative cultural transformation incident on economic development.

The modification of resource-allocation models

What can be done to introduce an alternative point of view into the discussion of the development process? As noted earlier, it is premature to attempt the construction of an entirely sui generis framework for dealing with these problems. Possible leads in this direction are provided by attempts to construct computer-simulation models of social change; but these are far from being standard working tools. A systematic modification of resource allocation models is preferable. Where these models assume stable parameters, systematic parameter shifts should be introduced, illustrative of forces of cultural transformation that, while not adequately quantifiable at present, can be shown to exert a characteristic influence.

There are three kinds of systematic parameter shifts that can be regarded as rudimentary illustrations of qualitative cultural transformation phenomena. These illustrative parameter shifts are chosen because they directly modify the conclusions to be drawn from the mechanics of interregional capital accumulation. These are:

(a) A steady progressive advance of the savings ratio over time that cannot be speeded up abruptly and that is subject to sharp limitation

when there is an interference with the development process, for example by draining away resources from the area or region in question;

(b) A steady progressive advance in the absorption capacity for capital over time, with a sharp increase in the capital/output ratio when this capacity is exceeded;

(c) A steady progressive advance in capital and labour productivity over time that cannot be speeded up abruptly and that is subject to the same limitation as (a) above.

The progressive advance of the savings ratio, the absorption capacity, and the capital and labour productivity of a geographical area illustrate the process of what is here termed as normal development. This is taken to be characterized by an orientation to growth; a systematic transformation of the attitudes, thoughts and habits of individuals; and a remoulding of the institutional setting within which the development process takes place.

Under the conditions prevailing in many developing countries such a progressive growth process is thwarted by a variety of social and political rigidities. In order to limit the scope of the discussion, this paper will deliberately bypass the crucial problem of breaking through these rigidities and introducing a social and political setting within which an orientation to growth and the consequent progressive characteristics of economic development are possible. Since it is the purpose of this paper to study the policy choices concerning the planned interregional location of industries, it will be assumed instead that a general orientation to growth is already present at least in the key parts of the social-political unit, for example, in the advanced regions or at some geographical growth poles. Detailed study will be given to the effect of potential resource transfers between regions upon the process of growth itself, taking into account the effects these transfers have upon the normal course of development as defined above. In traditional formulations of resource allocation models that do not have systematic parameter changes of the above three kinds built into them, the focus is on stock accumulation, and conclusions tend to favour the geographical polarization of investments. In models with these systematic parameter changes introduced to reflect the underlying cultural transformation process, such conclusions are modified in the direction of considerably greater geographical decentralization of the growth process, based on regional self-financing.

Three aggregate-level interregional growth models

Tables 1 through 3 contain the three illustrative, aggregate-level interregional growth models referred to in the previous section. Each of these tables isolates for study systematic shifts in one set of parameters. The models refer to a simple, closed, two-region economy, with an advanced region A and an underdeveloped region B.

Table 1 illustrates the behaviour of the savings ratio.[18] In most of the conventional growth models savings are treated either as a constant fraction of national (regional) product, or as a constant fraction of the share of profits. It should be emphasized here that these mathematically simple and elegant assumptions prejudge completely the conclusions that are to be drawn from such models in regard to interregional investment policy. Instead of assuming such constant ratios the author stipulates that the behaviour of the savings ratio in the course of a normal development process, characterized by cultural and political orientation to growth, is a steady progressive advance to some reasonable upper limit. This limit is determined in practice, not by considerations of foregone consumption, but rather by technical and organizational considerations pertaining to the effective utilization of additional investment funds, that is, by the absorption capacity of the economy for additional doses of investment. For the purposes of the model of table 1 this upper limit has been set at 30 per cent of regional product and the annual advance has been specified as 2 per cent, a figure in all probability excessive but which serves to bring out the features of the model in a more pronounced fashion than a lesser increase would. In other words, it is assumed that in the course of economic development there is a progressive recognition of the benefits of setting aside an increasing portion of net output for accumulation purposes, and that this recognition is translated into an advancing savings ratio via the decisions of individual households and business firms (in predominantly private-enterprise economies) or the political decisions embodied in investment targets (in centrally planned economies). Growth models that incorporate such systematically advancing savings ratios have been investigated by Branko Horvat.[19] The most salient feature of such models is the fact that

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[18] This table has been taken (except for an interchange of the symbols A and B) from T. Vietorisz, op. cit.

[19] See references cited in footnote 4.

Table 1

An aggregate-level interregional growth model with systematic shifts in the savings ratios of the regions

(a) No capital transfers

Year	Regional product			Capital			Savings ratio		Savings		Investments		Investment ratio	
	Y_A (1)	Y_B (2)	ΣY (3)	K_A (4)	K_B (5)	ΣK (6)	s_A (7)	s_B (8)	S_A (9)	S_B (10)	I_A (11)	I_B (12)	v_A (13)	v_B (14)
0	100,000	100,000	200,000	650,000	350,000	1,000,000	20	20	20,000	20,000	20,000	20,000	20	20
1	106,667	105,000	211,667	670,000	370,000	1,040,000	22	22	23,467	23,100	23,467	23,100	22	22
2	114,482	110,775	225,257	693,467	393,100	1,086,567	24	24	27,476	26,586	27,476	25,586	24	24
3	123,632	117,422	241,054	720,943	419,686	1,340,629	26	26	32,144	30,530	32,144	30,530	26	26
4	134,336	125,055	259,391	753,087	450,216	1,203,303	28	28	37,614	35,015	37,614	35,015	28	28
5	146,861	133,809	280,670	790,701	485,231	1,275,932	30	30						

(b) One half of region B's savings transferred to region A

0	100,000	100,000	200,000	650,000	350,000	1,000,000	20	20	20,000	20,000	30,000	10,000	30,000	10,000
1	109,990	102,500	212,490	680,000	360,000	1,040,000	22	12	24,198	12,300	30,348	6,150	27,592	6,000
2	120,096	104,038	224,134	710,348	366,150	1,076,498	24	8	28,823	8,323	32,985	4,162	27,466	4,000
3	131,080	105,079	236,159	743,333	370,312	1,113,645	26	6	34,081	6,305	37,234	3,153	28,406	3,000
4	143,479	105,867	249,346	780,567	373,465	1,154,032	28	5	40,174	5,293	42,821	2,647	29,845	2,500
5	157,738	106,529	264,267	823,388	376,112	1,199,500	30	4.5						

after an initial lag in consumption (as compared with alternative models that maintain the savings ratio at its starting value) the consumption profile not only catches up with the consumption profiles of the alternative models, but outdistances them spectacularly within a short span of time. On reasonable assumptions pertaining to the parameters of the model, the lag in consumption amounts to somewhere from one half to one full year at its greatest; that is, a given consumption level is reached this much later in calendar time as compared with the alternative model with a static savings ratio. The time required for catching up is approximately ten years. It should be noted that neither the consumption lag nor the time required for catching up depends on the upper limit set on the savings ratio, but exclusively on the pace of the year-to-year advance of the latter; in other words, as far as consumption levels are concerned, there is no impediment for the rise of the savings ratio to 50, 70, or even 90 per cent of total product. What prevents the rise of the savings ratio to these stratospheric heights is the impossibility of effectively utilizing the resulting phenomenal doses of capital, that is, the built-in inertia of the cultural transformation process.

While a steady autonomous advance of the savings ratio has been stipulated as the normal behaviour incorporated into the model, it is assumed that draining off capital from a given region for the purpose of transferring investment to another region will choke off the flow of savings. This assumption is incorporated in the model by means of a rule that resets the base-line for the autonomous increase of savings to the actual investment ratio of the preceding period whenever savings are drained off.[20/] While this rule is

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20/ The formula for the savings ratio is the following:

$$\sigma_i^t = \text{Max}\,(\sigma_i^{t-1} + \alpha,\ \rho_i^{t-1} + \alpha,\ L)$$

where:

σ_i^t = savings ratio in region i at time t

ρ_i^t = investment ratio in region i at time t

α = period-to-period autonomous advance of savings ratio (a fraction per time period)

L = upper limit to advance of savings ratio.

It is noted that in table 1 the advance of the savings ratio in region A remains below 0.30; thus the limit on the autonomous advance of the savings ratio does not come into play up to the fifth time period. Apart from the

analytically convenient, it is a drastically over-simplified illustration of the disincentive effects exercised upon autonomous development of a region by draining off the resources of that region. Such a curtailment of savings might result, in practice, from the reduced profitability of private investments when the funds needed for complementary private or social-overhead type investments are drained off (in a private-enterprise economy); from the collapse of political support for a high-savings policy (in a centrally planned economy); or possibly from a mixture of the two. In addition, there will be adverse effects on the morale of workers and managers alike that are translated into reduced labour productivity and a retardation of the process of technical advance and the generation of higher skills, which are superimposed upon the effects due to a reduction of the savings ratio. It should be recognized that the device of reducing the base-line for the autonomous advance of savings to the investment ratio of the preceding year is no more than a broad-brush attempt to represent the nature of such disincentive effects; in practice the effects might well be delayed or distributed over several periods of time and might have an unequal incidence in different sectors of the regional economy. None the less, the model is put forth as an essentially valid illustration of the kind of effects that are to be expected from interregional capital transfers.

In part (a) of table 1 there are no interregional capital transfers; the growth of regional product in the advanced (A) and underdeveloped (B) regions can thus serve as a benchmark for studying the effects of capital transfers. The total base-period capital investment is assumed to be higher in the advanced than in the underdeveloped region (650 vs. 350 units); while the marginal capital/output ratio is set to favour the advanced region (3 vs. 4). Assuming initial incomes of 100 units in each of the two regions, these grow to 146,861 and 133,809, respectively, by the fifth period, while the initial joint capital stock of 1,000 units rises to 1,275,932 units. In part (b) of table 1, it is assumed that one half of the savings of the underdeveloped region are at all times drained off and transferred to the advanced region for reinvestment. The usual expectation in such a case would be that the joint

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(20/ cont'd)
systematic shifts in the savings ratio explained in the text that critically alter the growth path over time, the growth of each region from period to period follows the simplest type of Harrod-Domar postulate; i.e., the increase in regional product is obtained by dividing investment in the region by its capital-output ratio.

interregional product would now rise faster than before, since a given dose of investment yields a higher return in the advanced region whose capital/output ratio is more favourable. This conclusion, however, rests on the implicit assumption of fixed regional savings parameters.[21/] This paper's assumptions concerning the normal advance of the savings ratio together with the disincentive effects due to the withdrawal of regional resources, however, profoundly alter such a conclusion. While the autonomous year-to-year increase of the savings ratio in the advanced region is unaffected by the resource transfer, savings in the underdeveloped region are cut back drastically. Thus, the system as a whole loses more when deprived of part of the potential savings in the underdeveloped region than it gains by reinvesting the actual savings of this region at an improved capital/output ratio. By reference to table 1 it can be seen that growth in the advanced region is stimulated considerably less than the growth lost in the underdeveloped region; accordingly, the levels of national product and capital stock, jointly for the two regions, rise slower when capital is drained off from the underdeveloped region than when each region grows on the basis of its own capital resources. In the fifth year, combined regional product for the two regions is only 264,267 with capital transfers, as against 280,670 in the case of regional self-financing; while the corresponding combined levels of capital accumulation are 1,199,500 and 1,279,939 respectively.

It should be emphasized that this result is due to a fundamental asymmetry in the assumptions concerning incentive effects. It is assumed that a strong disincentive effect in the losing region is not balanced by a corresponding positive incentive effect in the region that gains resources, because the rate of autonomous cultural transformation cannot be effectively speeded up by additional doses of capital investment. These assumptions are perhaps vulnerable to the charge of being too strong. The disincentive effects in the losing region might not cut into the flow of savings quite as strongly as has been postulated, while the receiving region might in fact succeed in speeding up slightly its cultural transformation process under the influence of the extra abundance of capital resources. Yet there is no question that the considerations here adduced have a powerful modifying effect on the usual conclusions

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21/ Alternately, symmetrical incentive and disincentive effects between the two regions will lead to the same result. See T. Vietorisz, op. cit.

that tend to support geographically concentrated growth. These considerations must therefore be incorporated into the usual industrial location criteria in order to escape from the biases to which the latter now give rise. This will be pursued further in the final section.

Table 2 illustrates the second of the three interregional growth models selected for study. This model concentrates on the growth of the absorption capacity of a region. Part (a) of the table again serves to create a benchmark for comparison. The assumption here is that in the absence of interregional capital transfers each region will experience a growth corresponding to the natural expansion of its absorption capacity. In order to simplify the model and concentrate attention on the absorption capacity, the autonomous advance of the savings ratio in each region has been omitted; in any realistic model its inclusion would be crucial. Thus, it is postulated for the purposes of defining the model that in each region the savings ratio is a stable 20 per cent and that the absorption capacity of the region grows in step with the capital growth which corresponds to the reinvestment of the resulting savings. This absorption capacity is designated by the symbol Ψ and is seen to coincide, in part (a) of the table, with the total amount of capital. Once the absorption capacity is exceeded, as in part (b), when half the savings of region B are transferred to region A, the capital/output ratio becomes more unfavourable. In the present case the capital/output ratio has been assumed to rise from 3 to 5 in region A as the absorption capacity of the region is exceeded; in region B it has the value of 4.

In part (b) of the table the value of Ψ for each region is the same as in part (a) but the value of K, total capital, can now exceed Ψ. When this is the case the addition to the product of the respective region (region A in the illustrative model) is assumed to consist of two parts. The first part is calculated from that portion of total investment in region A which corresponds to the increase in absorptive capacity: this portion is divided by the capital/output ratio of 3. To arrive at the second part of region A's product increase, the rest of the total investment in region A is divided by the capital/output ratio of 5, reflecting the deterioration of the effectiveness of extra investment as the region's absorption capacity is exceeded. All other computations are straightforward. An inspection of the growth profiles in the table discloses that region A's gain is more than offset by region B's loss and that, correspondingly, both total interregional product and total capital accumulation are reduced as a result of the capital transfer from region B to region A.

Table 2

An aggregate-level interregional growth model with a systematic shift in the capital absorption capacity

(a) No capital transfer

Year	Regional product			Savings		Investment		Capital	Absorption capacity		Changes in regional product				Capital	
	Y_A	Y_B	ΣY	S_A	S_B	I_A	I_B	K_A	Abs. Ψ_A	Chg. $\Delta\Psi_A$	$\Delta Y'_A$	$\Delta Y''_A$	ΔY_A	ΔY_B	K_B	ΣK
0	100,000	100,000	200,000	20,000	20,000	20,000	20,000	200,000	200,000	20,000						
1	106,666	105,000	211,666	21,333	21,000	21,333	21,000	220,000	220,000	21,333			6,666	5,000	200,000	400,000
2	113,770	110,250	224,020	22,754	22,050	22,754	22,050	241,333	241,333	22,754			7,104	5,250	220,000	440,000
3	121,347	115,763	237,110	24,269	23,153	24,269	23,153	264,087	264,087	24,269			7,577	5,513	241,000	482,333
4	129,428	121,551	250,979	25,886	24,310	25,886	24,310	288,356	288,356	25,886			8,082	5,788	263,050	527,137
5	138,048	127,628	265,676	27,610	25,526	27,610	25,526	314,242	314,242	27,610			8,620	6,078	286,203	574,559
													9,194	6,382	310,513	674,755

(b) One half of region B's savings transferred to region A

0	100,000	100,000	200,000	20,000	20,000	30,000	10,000	200,000	200,000	20,000	6,666	2,000	8,666	2,500	200,000	400,000
1	108,666	102,500	211,166	21,733	20,500	31,983	10,250	230,000	220,000	21,333	7,104	2,130	9,234	2,563	210,000	440,000
2	117,900	105,063	222,963	23,580	21,013	34,087	10,507	261,983	241,333	22,754	7,577	2,267	9,844	2,627	220,750	482,233
3	127,744	107,690	235,434	25,549	21,538	36,318	10,769	296,070	264,087	24,269	8,082	2,410	10,492	2,692	230,757	526,827
4	138,236	110,382	248,618	27,647	22,076	38,685	11,038	337,388	288,356	25,886	8,670	2,560	11,180	2,760	241,526	573,914
5	149,416	113,142	262,558	29,883	22,628	41,197	11,314	371,073	314,242	27,610	9,194	2,717	11,911	2,829	252,564	623,637

Thus, a limit imposed on the amount of capital that can be absorbed at favourable capital/output ratios counteracts differences in the effectiveness of investment between regions. It might be objected that the model overstates the strength of these effects. In particular, it might be adduced that in many cases the economy of the receiving region (advanced region A) operates well below its own limit of capital absorption capacity, and that in such cases the effect of a capital transfer from region B to A will be favourable. As far as capital absorption capacity alone goes, this might well be the case, in particular if the interregional system as a whole, including its advanced regions, operates under conditions of semi-stagnation due to social and political rigidities. It is noteworthy, however, that the argument gains in persuasiveness precisely to the extent that the development process as a whole proceeds in a satisfactory manner, that is, that the generation of capital as a by-product of growth pushes strongly against the absorptive capacity of both advanced and underdeveloped regions. This also underlines the need for considering the limit on absorption capacity, not independently of the autonomous advance of the savings ratio as was done here for purely expositional purposes, but in conjunction with the latter, since an autonomous advance in the savings ratio is certain to raise savings eventually to such a high level[22/] that the absorption capacity becomes the binding constraint. Thus, the draining of capital resources from the underdeveloped to the advanced region becomes a rational policy, as far as absorption capacity is concerned, only under conditions of semi-stagnation: an ironical result, since stagnation, from the social point of view, is the height of irrationality.

Table 3 illustrates a systematic shift in labour productivity. Technology is here assumed to be described by a Cobb-Douglas function of the form

$$Y = Y_0 K^{0.5} L^{0.5}$$

with a Harrod-neutral technological improvement of 2.5 per cent per year that

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22/ As emphasized earlier, there is no constraint based on considerations of foregone consumption that would exclude a rise of the savings ratio to levels near unity.

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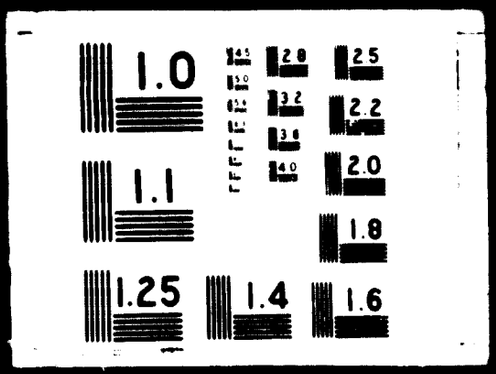

Table 3

An aggregate-level interregional growth model with systematic shifts in labour productivity

(a) No capital transfers

Year	Effective labour force		Equivalent capital		Regional product			Savings		Investments	
	L_A	L_B	K^*_A	K^*_B	Y_A	Y_B	ΣY	S_A	S_B	I_A	I_B
0	100,000	100,000	300,000	400,000	100,000	100,000	200,000	20,000	20,000	20,000	20,000
1	105,000	105,000	320,000	420,000	105,830	105,000	210,830	21,166	21,000	21,166	21,000
2	110,250	110,250	341,166	441,000	111,973	110,250	221,223	22,395	22,050	22,395	22,050
3	115,763	115,763	363,561	463,050	118,444	115,763	234,207	23,689	23,153	23,689	23,153
4	121,551	121,551	387,250	486,203	125,261	121,551	246,312	25,052	24,311	25,052	27,311
5	127,629	127,629	412,302	510,513	132,441	132,441	127,629				

(b) One half of region B's savings transferred to region A

0	100,000	100,000	300,000	400,000	100,000	100,000	200,000	20,000	20,000	30,000	10,000
1	105,000	102,500	330,000	410,000	107,471	102,500	209,971	21,494	20,500	31,744	10,250
2	110,250	105,063	361,744	420,250	115,300	105,063	220,363	23,060	21,013	33,566	10,506
3	115,763	107,690	395,310	430,756	123,507	107,690	231,197	24,701	21,538	35,470	10,769
4	121,551	110,382	430,780	441,525	132,113	110,382	242,495	26,423	22,076	37,461	11,038
5	127,629	113,142	468,241	452,563	141,140	113,142	254,282				

can be represented as an equivalent expansion of the labour force alone.[23/] Assuming a simultaneous biological expansion of the labour force by another 2.5 per cent per year, part (a) of table 3 shows a cumulative 5 per cent annual increase of the effective labour force in each region. Part (a) is again used to establish a benchmark for growth under conditions of no capital transfer between regions. When capital is drained away from the underdeveloped region, it is assumed that this will create disincentive effects of sufficient impact to choke back technological improvement: accordingly, the growth of the effective labour force will be reduced to the biological growth rate of 2.5 per cent per year. Part (b) of the table indicates that under these conditions both the increase of the joint income of the two regions and the total accumulation of capital is reduced, indicating that the benefits accruing to region A are more than offset by the damage done in region B. As before, the issue might be raised whether the model does not overstate the impact of capital withdrawal on regional productivity. Since the institutional conditions surrounding a policy of such capital transfer are likely to be highly unfavourable to the underdeveloped region, it can be argued that under such conditions the entire cultural transformation process is likely to be slowed down critically, if not stopped; thus the postulate of a strong impact is reasonable, even though its exact quantification can be the subject of debate.

To summarize each of the three parameter shifts that have been individually embodied in illustrative aggregate-level models have the effect of modifying in the same direction the conclusions drawn from the neoclassical versions

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23/ For a summary of relevant technical concepts, see Hahn and Matthews (1964) "The Theory of Economic Growth, a Survey", Economic Journal, December issue. In the formula given in the text, Y is regional product, K capital, and L the effective labour force. The constant Y_0 is set to yield a base product of 100 units in each region with a capital/output ratio of 3 and 4, respectively, in region A and B; its value is thus $1/\sqrt{3}$ and 1/2, respectively, if capital endowments are assumed to be 300 and 400. It will be noted, however, that the endowment of region A is less than that of region B which is contrary to the assumptions of the models in tables 1 and 2, in which the advanced region was assumed to be endowed with more capital. This inconsistency can be resolved if it is assumed that the Cobb-Douglas function used in the computations is merely an approximation to the true production function in the range relevant for computations. The true production function, specifically, must be assumed to have an initial range of increasing returns to capital. Thus the amount of capital actually employed in each region can be considerably higher than the amount that is assumed to be operative in the approximating Cobb-Douglas function. Table 3 contains only the latter amounts which are designated by the symbol K*.

of these models. In each case, the effect is one of discouraging the transfer of resources from the underdeveloped region to the advanced region.

Some of the possible objections to the assumptions embodied in the models have been mentioned. These objections centre on the overstatement of the adverse effects of resource transfers. Yet the force of these objections is considerably diminished when it is taken into account that the three effects that have been isolated for purposes of presentation in fact work together and reinforce each other; besides, there are additional effects (some of which have been mentioned in the discursive part of the paper) that have not been quantified in separate models. Taken together, the joint impact of these effects has a decisive influence on interregional industrial location criteria.

Before passing on to the definition of such criteria two further objections will be considered.

First, it may be asserted that the resource transfers embodied in the models are excessive and that their impacts are largely discontinuous; thus if consideration were given to smaller transfers with graduated impacts, it might well turn out that some resource transfers are at times advantageous for the system as a whole. Thus, in considering the absorptive capacity for capital, instead of postulating a discontinuous deterioration of the capital/output ratio from 3 to 5 as the absorption capacity of region A is exceeded, it might be postulated that the deterioration is gradual and related to the extent of the excess. Thus a modest overstepping of the nominal absorptive capacity would raise the capital/output ratio only slightly in region A, while leaving it still below that of region B. Under these assumptions the degree of resource transfer would be optimal when it lowers the capital/output ratio of region A to that of region B. In a similar vein, the reduction in the technological improvement in the third model might be made gradual in response to an increase in the ratio of transferred savings rather than being treated as an all-or-nothing proposition. Here again the more favourable capital productivity of region A might offset the adverse effects on region B as long as the degree of transfer is small.

There is merit to these objections, but only in so far as the assumption of gradual impacts can be complemented in practice by the assumption of carefully graduated policies that adjust the system to an optimal balance of opposing forces. This is not likely to be the case. Policies in this area tend to be embodied in broad directives or operational principles that in many cases

have an all-or-nothing character. If it is decided to channel resources into favoured areas or to permit market forces to do so,[24] this policy is likely to be carried beyond the point of balance - which is in any case almost impossible to measure; moreover, such a policy is likely to go hand in hand with an actual neglect of the underdeveloped areas, because of an exclusive concentration of technological factors and a disregard of the social, cultural and political issues of broad-based development.

Second, it may be objected that the analysis leaves aside all economies of scale, of agglomeration and of urbanization; that these are the controlling considerations in decisions of spatial resource allocation, overriding such allegedly secondary issues as the ones on which this paper has concentrated.

The methodological problem connected with these economies is the fact that they cannot be explicitly included in aggregate-level models, since they operate at the level of individual productive activities. Yet allowance can be and in fact has been made for them, precisely in the form of the more favourable capital/output ratios that have invariably been used to characterize the more advanced region in each model in spite of the fact that the underdeveloped regions have many investment opportunities that can be exploited under conditions that avoid the diminishing returns associated with the high-intensity operations of advanced regions (e.g. extractive activities). This argument therefore hinges on the exact value of the capital/output ratio that can be legitimately postulated for regions of varying size and level of development. The values inserted in the models can be taken to characterize sizable regions, having at least one major metropolitan concentration. As the size of regions decreases, the qualitative arguments concerning the need to bring out the full human and productive potentials of the inhabitants still hold in full force; however, it is obvious that an attempt to reproduce the economic structure of the major regions in the microcosm of regions based on individual villages or hamlets would run counter to fundamental technological realities involving economies of scale, of agglomeration and of urbanization, and would be futile. Exactly where the line has to be drawn between major regions and

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24/ The publicly announced development policy of a government may at times pay lip service to the opposite strategy of channelling resources into the underdeveloped regions, but the modest amounts of aid that flow to these regions are on the whole heavily outweighed by large capital flows of various kinds that typically move from the underdeveloped to the advanced regions.

micro-regions cannot be precisely stated; but the three aggregate models discussed above lose their validity in analysing the problems of the latter. It is beyond the scope of the present paper to explore alternative approaches to interregional development at this level. The key issues that arise include at least the following: the choice of strategies for technical progress in agriculture; the issue of a hierarchical organization of economic activities, with the larger-scale and technically more sophisticated activities concentrated in the larger centres; the issue of the development of local industries aimed at satisfying local demand, the reliance on secondary and local resources for local development; the integration of the seasonal labour requirements of industrialization objectives; and many more issues.

CONCLUSION: CRITERIA FOR THE PLANNED INTERREGIONAL LOCATION OF INDUSTRY

The previous argument lends strong support to the policy conclusion of regional self-financing, at least at the level of major regions. Thus the development of each region is to proceed on the basis of capital resources generated within the region as a by-product of the growth process itself. Net transfers of resources from the advanced to the underdeveloped regions are ruled out as next to impossible to achieve in private-enterprise and mixed economies; even in centrally planned economies the probability of achieving major net transfer of this kind is low. The policy objective then becomes twofold: (a) attempt to restrict or to eliminate net resource transfers from the underdeveloped to the advanced regions; (b) define an industrial location strategy that will significantly support the autonomous development efforts of the underdeveloped regions, without creating a drag on the development of the advanced regions.

The present section will concentrate on the second policy objective. The instrument of choice is an interregional counterpart of the "trade-not-aid" policy which has been extensively discussed in the international context, but which is equally applicable, in fact considerably easier to apply, at the level of regions within a single country.

The discussion is again based on the simple illustrative conceptual model consisting of two regions, an advanced region A and an underdeveloped region B. The system of two regions is closed. Interregional capital transfers are now ruled out by assumption; thus for each region the mutual imports of goods and

services are equal to the mutual exports of goods and services. It is assumed, as in the first model (table 1) of the previous section, that there is a progressive autonomous increase in the savings ratio up to a limiting ratio L that takes place in the course of development of each region unless choked off by constraining influences. Since capital transfers are ruled out, the principal constraining influence in the underdeveloped region is assumed to be its inability to convert its potential savings into investment. The savings ratio in region B is thus prevented from taking its normal, autonomously rising course.

Region B is assumed to have only traditional exports to region A. The demand for such exports in region A has an income elasticity lower than unity; thus the growth rate of these exports is lower than the growth rate of region A.

Imports to region B equal exports from region B. In order to make our point in the strongest possible form, we will assume that these imports consist entirely of investment goods, which region B is incapable of producing at a reasonable capital/output ratio due to scale limitations. Under these conditions, the growth rate of investments in region B is limited to the rate of growth of its exports, which will always be below the growth rate of region A's income.

All of these assumptions, while extreme, represent in a simplified way concrete aspects of economic reality. While interregional capital movements can actually differ from zero, it is not an unreasonable assumption that the overwhelming portion of the capital required for economic growth has to come out of the internal resources of each region. This question has been dealt with at length in the previous section. The nature of traditional exports and the income elasticities characteristic of these can be accepted without further justification; likewise, the great limitations on the ability of the underdeveloped region to produce capital goods are not open to serious doubt, provided that exception is made for such items as construction. The most questionable assumption is that imports to region B will consist entirely of capital goods; however, if this assumption is weakened, the lag of the underdeveloped region is made that much more pronounced, thereby strengthening the conclusions to follow.

What can the advanced region do within the context of planning to promote the growth of the lagging region, given the above assumptions? First, to the extent that it breaks any constraints upon its own growth, it will follow the

autonomous upward path of the savings ratio discussed earlier, with a corresponding self-accelerating growth pattern up to a given limit. The effect of this accelerated growth in region A will be translated into a higher demand for traditional exports from region B to region A, and a correspondingly higher growth of investments in region B, leading finally to a higher rate of growth in region B. This will benefit region B, but it will still tend to widen the relative gap between the two regions.

Second, while capital transfers are ruled out by assumption, region A can break the constraints upon the conversion of potential savings into investment in region B. Region A can do this by planning to import certain commodities it requires from new productive sources located in region B which are financed out of the savings of region B itself. By thus assuring a market for this new investment, region A helps region B to create new exports in lines other than the traditional ones and thereby raises the supply of investment goods to region B. Total exports of region B increase above the amount corresponding to traditional exports alone, and the constraint on the procurement of investment goods in region B is relaxed. Savings can now rise to the level permitted by the availability of investment goods. Thus, the way is opened to the progressive autonomous expansion of the savings ratio in region B, until it eventually reaches the limiting saving ratio, at which point region B is in the process of full-fledged rapid development.

Some care is needed in specifying the mechanism of the expansion of total exports of region B under the condition of zero capital transfers when new non-traditional export markets are opened up. In order to create these additional exports, region B has to channel its limited supply of investment goods into newly built capacity for non-traditional exports. This can be done either at the expense of investment in traditional export lines (needed for the routine expansion of these traditional exports) or it can be done at the expense of investment in consumer-goods production for the domestic market. For maximal growth, the former investment has to be left untouched, in order to be able to add the new exports on top of the normal growth of the traditional ones. This course of action, however, may imply (depending upon the parameters of the problem) a faster increase in the savings ratio than the autonomous year-to-year increase will permit. In this case, the situation may arise that savings in region B temporarily fall short of the amount that would be required to take full advantage of the new export markets. Such a situation can be avoided if the planning of new lines of supply for region A, based on productive investment

in region B, is co-ordinated with the available increase of savings in region B. The same co-ordination will also ensure that the new markets created for region B are sufficiently extensive to permit the eventual raising of the savings ratio in region B all the way up to the final limiting ratio, and not only part of the way.

The investments in region B aimed at serving new, non-traditional export markets will typically take place at considerably more favourable capital/output ratios than could be achieved in the same lines of production if they were intended solely for the internal market of region B. This is due to the economies of scale that can be achieved when serving the combined markets of both regions. Therefore, whenever there is an internal market in region B for a new line of production that becomes a non-traditional export line, the export-oriented investments produce an additional benefit by reducing the unit capital requirements for producing the same commodity for the internal market. Thus the channelling of investments into export industries does not cut into domestic consumption possibilities as deeply as might otherwise be the case. This is readily apparent in the case of consumer goods or their intermediates. When the new exports happen to be in a capital-goods or intermediate producers' goods line, there is a similar extra benefit over and above the value of exports generated to the extent that an internal market exists that can be supplied at a reduced capital/output ratio.

What are the over-all benefits of planned "trade-not-aid"? The benefits to the underdeveloped region have been indicated above; those to the system as a whole are almost equally evident. When the planned trade-not-aid policy is pursued, capital accumulation in the advanced region is unaffected, while capital accumulation in the lagging region is sharply increased; consequently, the growth of the system as a whole must increase unless the additional capital accumulation within the system is more than compensated by an increase in the average capital/output ratio for the system as a whole. This issue is considered next.

Under a rational development policy, the industries or branches selected for the trade-not-aid approach will be the ones which have an absolute cost advantage in the underdeveloped region or are at least reasonably footloose, that is, whose cost structure is not critically influenced by geographical location. In the combined market of the two regions, such footloose industries will typically achieve economies of scale not available in either market alone. If in the absence of a trade-not-aid policy such industries were located in region A,

their products would be excluded from region B except for the modest shipments (under our assumptions consisting entirely of capital goods) that could be financed out of region B's traditional exports to region A; thus the economies of scale of serving the combined markets would be foregone in these industries. The disadvantages would, however, not stop here. Those industries which under a trade-not-aid policy would continue being located in region A could also achieve economies of scale in the combined regional markets; moreover, there are traditional gains from trade that could be achieved even in the absence of economies of scale by regional specialization. Without a trade-not-aid policy most of these benefits would also be foregone, except for the minor ones that would still be captured by the modest amount of trade permitted by the market for region B's traditional exports.

Under a trade-not-aid policy all of the foregoing benefits will accrue to the system as a whole, reducing the average capital/output ratio. However, industrial location in region B for serving the combined markets will also have disadvantages: extra transport costs, lower productivity and quality, or unfavourable net differentials in agglomeration and urbanization-type economies and diseconomies. These extra costs have to be charged off against the benefits enumerated above.

When such a cost comparison is attempted on an industry-by-industry basis it must be clearly understood that no more than an approximation can be achieved. For exact results it would be necessary to compare the entire development profile in the presence as well as in the absence of a trade-not-aid policy; moreover, within the over-all policy of trade-not-aid and jointly planned regional development the best possible division of productive activities between the two regions would still remain to be determined. Since economies of scale are significant the resulting problem is non-convex and cannot be exactly solved by systematic revisions of trial programmes. Approximations, none the less, are of great value.[25/]

The industry-by-industry locational comparison is one such approximation. This approximation can be undertaken at a crude aggregate level, concentrating

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25/ For a detailed discussion of the problems raised by nonconvexity, see T. Vietorisz (1968) "Decentralization and Project Evaluation Under Economies of Scale and Indivisibilities", Industrialization and Productivity, Bulletin No.12, United Nations (Sales No.: 68.II.B.3).

on the capital/output ratio, or at a more sophisticated level, [illegible] detailed programming models (linear or convex non-linear) that yield appropriate shadow prices for all resources, permitting a more exact [illegible] costs and benefits. In either case what requires quantification is the play of the factors mentioned before: economies of scale in the [illegible] market, economies of specialization, and increased capital formation on one side, as against extra costs, productivity and quality losses, and economies of agglomeration and organization on the other side. Three cases may arise in the course of such a comparison.

1. If the comparison of costs alone, not allowing for increased capital formation in the underdeveloped region, favours the latter, the planned trade not-aid policy will benefit not only the underdeveloped region, but also the advanced region.

2. If the cost comparison favours region A, relocating the industry in region B will increase costs, that is, in terms of crude aggregate models it will raise the capital/output ratio. Such an increase may nevertheless be more than compensated, as far as the system as a whole is concerned, by the additional capital generated in region B. In such a case the planned trade not-aid policy will favour the underdeveloped region and the system as a whole, but not the advanced region.

In dealing with this case particular care should be given to the exact definition selected for the postulate of no capital transfers between regions. If an industry has a locational disadvantage in region B but is nevertheless located there in order to give region B an export outlet, then notwithstanding the resulting over-all benefit for the system, region A will experience a rise in the price of the respective commodity, provided that factor prices in the two regions are held constant. Such a price rise, however, would amount to an actual capital transfer from region A to region B which, under our initial postulate, must be excluded. This can be achieved by subsidizing the transfer price of the commodity from region B to region A, the subsidy being taken out of region B's factor incomes. In this way region A can be left no worse off than before, as long as there remains a net benefit to region B after the transfer-price adjustment.[26/]

26/ A similar adjustment might also be required in some marginal situations falling within the domain of case 1, above; e.g. when an industry has a slight locational advantage in B, yet the delivered price in A rises somewhat due to a longer transport haul.

2. The cost comparison can prove so much to the disadvantage of a location in region B that any additional savings generated in the region are more than offset by deterioration of the over-all capital/output ratio. In this case, insistence on selecting this particular industry within the framework of the trade-not-aid policy will result in an actual reduction of the income of the system as a whole. If this should prevail for all industries, the development of the lagging region cannot be stimulated within the framework of this model without a reduction of the income of the two-region system as a whole. Political constraints, discussed earlier, may of course still dictate location in the underdeveloped region.

To summarize the planned trade-not-aid policy produces benefits because, first, it raises capital formation in the lagging region by removing the constraints on the conversion of savings into investment; second, because it creates economies of large-scale production in the combined market of the two regions; and third, because it yields the conventional gains from trade incident upon interregional specialization. The combined effect of these benefits will raise the joint product of the two regions except in the unlikely event that it is impossible to find any industries that can supply the combined markets of the two regions from a location in region B without incurring overwhelming cost disadvantages. To outweigh the benefits accruing to the system as a whole, these cost disadvantages have to be heavy enough to offset not only the potential economies of scale and specialization, but also the additional savings and the resultant investment and growth created in region B. In addition, the advanced region generally shares in these benefits to a considerable extent due to the broadening of the markets for its industries, not only as a result of the combination of the separate regional markets, but also following region B's induced, accelerated income growth. These benefits to the advanced region can be negated only by strong cost disadvantages of locating new export industries in the underdeveloped region, when over-all system benefits depend exclusively on the additional savings induced in the latter region. Political constraints arising out of the cohesion of the interregional system may, even so, dictate a trade-not-aid policy in favour of the underdeveloped region.

These conclusions acquire particular force to the extent that the social and political conditions for rapid development, with autonomously rising savings ratios, productivities and skill levels, are already present. Under conditions of stagnation or semi-stagnation all secondary questions of social rationality, such as the precise criteria for the interregional location of industry, become irrelevant in comparison with the key question of a strategy for establishing the pre-conditions for a social orientation to growth.

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4. INDUSTRIAL LOCATION AND REGIONAL DEVELOPMENT IN AFRICA

by S. Jack[1]

African governments are faced today with serious locational maladjustments as a result of unguided population movement and an unprecedented development of urban areas. The growth of the "primate city" has become an inevitable concomitant of economic development on the continent. With these cities have come the social and economic problems connected with excessive urban centralization and severe congestion of both population and industrial enterprises. While these urban-industrial centres exist and flourish in each country, a vast interior awaits settlement and development.

In all countries efforts have been and are being made towards dealing with these problems, but not always on a comprehensive regional basis in order to determine the underlying cause of locational maladjustment. Development planning in Africa has been characterized mainly by a great deal of single-function planning in such fields as housing, irrigation, water supply and highway construction; however, this planning has rarely been guided by a sound location policy embracing all interrelated factors.

As the problems of locational maladjustment continue to increase, the need for comprehensive planning on a regional basis is gradually being realized. It is in this respect that a new approach is beginning to influence development planning in Africa. There is a growing awareness among central governments that planning should not concern itself only with the ideal sectoral allocation of investments, but should also ensure that the geographic location of economic activities resulting from such investments develops in economically and socially desirable directions and in the national interest as a whole. In other words, as stated on page 71 of Uganda's Second Five-Year Plan the geographical structure of the national economy should be planned.

1/ United Nations Economic Commission for Africa.

This paper is a brief review of the problems of location policy in Africa and the various ways in which some governments are trying to formulate and implement a satisfactory solution.

Economic development and the geography of concentration in Africa

It has been said that in order to lift an economy to higher income levels, one or several regional centres or "growth poles"[2/] must first be developed. This concept is nowhere truer than in Africa.

A glance at an economic map of the continent will show that a distinct feature in the economic geography of most of the countries (certainly in all of the larger ones) is the polarization of economic activities into one or two centres within the national territory. Zambia provides a classic example of this feature: the region embracing the copper belt and the "line of rail" is by far the most prosperous since it is here that virtually all the country's main industrial undertakings are located. In Kenya the industrial concentration around Nairobi has a *per capita* monetary product twelve times higher than the national average. The same is true of the Ivory Coast where the Abidjan district is the country's only highly concentrated industrial region and its fastest growing growth pole. In Ethiopia the Addis Ababa-Asmara areas and the narrow strip lying along the Franco-Ethiopian railway stand out distinctly within the national territory in terms of economic advancement. This picture repeats itself in Uganda where industrial development is mainly confined to the narrow belt around Kampala and Jinga.

The processes by which these concentrations grow in the early stages of development are the same in Africa as elsewhere. Many industrial processes are generally attracted to the same location and the process is cumulative. The initial attraction, for example, may have been the availability of raw material, or the presence of some source of energy, or such favourable nodal situations as a major port or a national administrative capital. Whatever the initial reason for the establishment of industrial enterprise, the very existence of industry often makes the location attractive to other industries. Some may want to use the product of an established firm as their material; others may want to use a by-product, previously wasted, and therefore available at a low cost. New industrial undertakings may also be established to furnish existing firms with various goods and services. As the nucleus grows,

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2/ A. O. Hirschman (1958) The Strategy of Economic Development, Yale University Press, New Haven, Connecticut.

it gradually becomes a centre of concentrated earning power and hence, of purchasing power. It becomes an increasingly better market for the consumer goods industries, which will in turn be attracted to the already growing centre. Service industries will also grow with the expanding centre, as will the labour force, both in quantity and in the variety of its skills. This adds further to the attractiveness of the concentration for yet other processes.

Through such geographic concentration, opportunities for economizing in certain areas will increase. Just as a single industry can, up to a point, achieve internal economies as it expands its output and capacity, so can the mass of industries in a concentrated area as the industrial capacity of the area grows.

As the nucleus grows, banking and insurance facilities become available, maintenance and repair services are established, journals are produced and a host of tertiary activities develop.

Enormous economic advantages can thus be derived from the concentration of economic activities within a few large centres. Consequently, the development of these concentrations is inevitable in the early stages of industrial development, and, therefore, their existence in African countries is to a large extent justified.

Economic growth, however, if not checked by appropriate measures, has the tendency to limit itself to its original centres or regions. The reasons for this, as Hirschman has pointed out, is implicit in the phrase "nothing succeeds like success".[3] In African countries as in all developing economies, when a region becomes developed, it tends to make other areas appear backward and unpromising. Private enterprise easily overestimates the external economies accruing to these growing centres. They have scavenged the opportunities that exist in the centres but are reluctant to venture out of the area to investigate possibilities elsewhere. Government policy unfortunately tends to be influenced by this impressive picture of growth poles. Thus it is that in all African countries the bulk of public investment in new plants and projects goes to centres that have already "taken off". Like private operators, the majority of governments in Africa are either too timid or find it too difficult to break away from the charmed circles of growing centres to establish new basic industries in underdeveloped regions.

3/ Ibid.

Even though it seems justifiable for economic growth to be concentrated within a few areas in a developing economy, if the concentration process is left unchecked, negative aspects will develop to the detriment of the economic and social structure. These undesirable aspects are already being felt in some African countries and are having an influence upon the governments concerned.

At some stage in the development of an industrial complex, maximum economies of scale are achieved and further expansion may result in diseconomies which offset or more than offset the economies. In Africa, these diseconomies are manifesting themselves in several ways. There is, for example, the constant competition between various industries which increases the price of materials and other factors of production such as skilled labour, land, capital and transportation. There are militant labour unions whose activities affect wages and attitudes towards labour. Strikes are frequent and widespread. When the provision of services and amenities increase in cost, taxes are raised to pay for them. Costs rise as a result of congestion and the strain on existing services such as transportation, water supply and waste disposal. Masses of the rural population attracted by employment opportunities in growing centres, migrate to these centres in quest of jobs ranging from work in trades, administration and services, to labouring jobs such as digging, carrying, loading and cleaning. The urban-industrial complexes are usually ill-prepared to receive the "in-migrants". The preparation of building sites, the provision of roads and services and the construction of houses cannot keep pace with the influx. Without money or possessions and willing to live at a lower standard than other residents, the newcomers crowd in with friends who have arrived earlier, become squatters and create shanty towns; in extreme cases some band together into gangs and go foraging.

The negative aspects of economic concentrations are not only localized within the concentrations themselves, but at the national level they have produced one of the most urgent problems facing the large African countries today, namely the problem of regional inequality and stranded or neglected areas. Although most large African countries are characterized by ample physical and human diversity, some regions are happily circumstanced while others are not. Undue emphasis has too often been laid on the development of these privileged areas. Consequently, other regions, some of them very promising "growth poles", have been left relatively inaccessible and virtually neglected.

Without investments, adequate infrastructure and proper communications, misery and inefficiency develop in isolated areas. Unemployment and underemployment become rampant and there is no rational use of available labour. Obsolete production techniques, a low standard of living, scarcity of local capital, an insufficiently developed agriculture and outmoded agricultural enterprises are usually characteristic of isolated areas. Economic and social distress induce the population to drift to more prosperous areas which augments the diseconomies that already exist in them. The result is that instead of becoming reciprocal partners with the more advanced areas, neglected areas generate problems that act as a drag on the national economy. These problems are often translated into political issues and sow the seeds of instability and national disintegration.

Many African countries are aware of the problems issuing from regional imbalance or locational maladjustment. The Government of Uganda, for example, acknowledges that "one region of the country shows disproportionally higher material well-being than others ... that industrial development is confined to one narrow area of the country ... and that the state of development of the Karamoja District compared to other areas is so low that it calls for emergency action".[4/] In Zambia, regional disparity is such that in 1964 a total of five out of the eight provinces of the country contributed only 11.. per cent of the gross domestic product.[2/]

It is evident that the need for dispersion exists. If the locational mistakes of some of the now highly industrialized countries are to be avoided in Africa, efforts should be made immediately to lay the foundations for a healthy geographical structure of national economies. African governments today have a large stake in the results of locational development. They also have great power to influence that development and a heavy responsibility to guide it in socially desirable directions. Every government must, therefore, formulate a conscious locational policy to ward off the characteristic economic and social disadvantages of uncontrolled economic concentration, and to minimize disparity in the levels of development of the various regions within its country.

1/ Some Aspects of Development Planning in Uganda, paper presented by the Government of Uganda at the Second Conference of African planners, Addis Ababa, 4-15 December 1967.

2/ Computed from First National Development Plan 1966-1970, Office of National Development and Planning of the Republic of Zambia, Lusaka, 1966.

Palliative measures are being taken in the majority of countries towards achieving these ends; however, these measures are seldom comprehensive enough to assure over-all success.

Industrial location in relation to urban congestion

In many countries government action on the problems of urban-industrial concentration has been in the form of projects in public housing, slum clearance, urban renewal, road construction and improvement and the establishment of peripheral industrial areas or estates.

The establishment of industrial estates, in particular, has in the past five to ten years become one of the most prevalent means by which African governments have tried to relieve excessive urban congestion. Industrial estates are planned in several countries; they have already been established in Gambia, Ghana, Kenya, Mauritius, Nigeria, Senegal, Uganda, the United Arab Republic, Tanzania and Zambia.

The estates are usually organizations set up to improve and subdivide tracts of land, and frequently to erect factory buildings (in advance of or following demand) which are for sale or lease to prospective occupants. The estate is developed according to a comprehensive plan which provides streets, railroad tracts and utilities. The developing agency establishes control over the area and buildings by means of zoning and restrictive covenants to protect the investments of both developers and occupants.[6/]

Although the primary objective in setting up these estates is to promote industrialization and employment opportunities and to foster and modernize small and medium-sized enterprises, their physical location in or near main cities has always been closely related to local decentralization policies. These policies have used industrial estates to transfer industry and population from congested or slum areas of main centres, to encourage expansion and provide new economic bases in more congenial surroundings, and as a means of increasing opportunities for urban development.

It is too early to evaluate the extent of the success of industrial estates as tools for promoting local dispersal policies. However, the

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6/ The Physical Planning of Industrial Estates, United Nations (Sales No.: 62.II.B.4).

findings of a United Nations survey[1] reveal that in some countries industrial estates are being created as planned as self-contained projects unrelated to or only vaguely with broader programmes of industrial development. Sometimes the competence of the municipal agency of estates extend beyond the limits of the estates themselves. The result is that industrial estates are usually improperly located in terms of national and regional requirements, and there is usually no official control over subsequent development in the areas surrounding the estates.

The latter shortcoming is particularly important since the establishment of industrial communities often gives rise to secondary growth. Related industries may spring up in adjacent areas to take advantage of the infrastructural facilities established. This will promote further employment opportunities in the fringe areas of estates, which will in turn generate new demand for housing facilities and other public services. Thus the very problems which the establishment of industrial estates sought to solve are multiplied. Unauthorized development, new shanty towns and industrial slums may develop around estates in a very short time.

This indicates that control of land use beyond the estates is of great importance if these estates are to alleviate rather than aggravate the physical problems of congested urban areas.

The need to locate estates within the context of broader policies of regional and national development is vital. The ever-increasing problems of urban-industrial areas are such that they cannot be solved by piecemeal town planning projects alone. The problems call for solutions based on comprehensive regional considerations and a more balanced urban-rural approach. The main cause of the physical problems prevailing in African urban areas is not so much the establishment of industries, but the uprooting of large masses of rural peoples who repair to these centres seeking the opportunities afforded by their industries. This is the basic problem to be remedied.

Planning and policies for regional balance

To arrest the migration of people from the backward rural areas to the private cities and the urban-industrial centres, the disparity between metropolitan and rural areas must be reduced. Policies must be applied that

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[1] Industrial Estates in Africa, United Nations (Sales No.: 66.II.B.2).

attempt to promote opportunities and improve living conditions in the backward areas, so that the inducements that pull people to the cities are less effective. Only a small number of countries embarking on regional planning operations aim at achieving these ends.

Regional planning on the continent seems to be carried on in two related fields. In the first place, it concerns the practice of making plans for particular regions of a country. Such plans are usually drawn up by local or regional authorities. This is normally done in order to provide an opportunity for local interests to participate in the over-all planning effort and to enable the central planning authorities to know and, where possible, to satisfy the aspirations of the local communities.

This type of regional planning is very common in most African countries. In Gabon's present five-year plan, for example, regional planning committees have been charged with preparing a report on the participation of their respective regions in the national plan. Some of these plans are given high national priority. In Togo planning committees have also been established to examine local problems and to propose projects for investment.[8/] Uganda has had considerable experience in this type of regional planning. Here district planning committees have for some time been charged with the task of preparing programmes and plans for the development of their districts.

Very often, however, local plans and programmes are not adequate. Local planning authorities usually fail to grasp national development priorities, and their plans are seldom geared towards those priorities. Whatever their shortcomings, such local plans serve a useful purpose in that they are, for the first time, bringing central planning to the local scene.

Effective regional planning in Africa involves more than just the preparation of local plans. Emphasis is increasingly being placed on the organization of territorial space in such a way as to balance the progress of the various socio-economic regions while maintaining their necessary diversity. The desire to achieve these ends is exemplified, for example, in Zambia's current development plan, which has been broken down into provincial programmes. The idea, is to "localize investment ... in the less favoured provinces of the country".[9/] Elsewhere, in Kenya for instance, the Government has assumed

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8/ Government of Togo (1965) Plan de développement 1966-1970, SIMAG, Paris.

9/ First National Development Plan 1966-1970, Office of National Development and Planning of the Republic of Zambia, Lusaka, 1966, p.6.

responsibility for the development of all areas, regardless of how poor and remote they may be, as a matter of obligation to the people. And in Uganda it has been decided that development planning should not apply only to Kampala and Jinga during the five-year period of the present development plan.

In taking the first steps in the orientation of their national plans towards regional development, some African governments face a vast range of problems. Large-scale regional planning is a complicated and long-term process. It involves preliminary field surveys and sound research. Its success depends on the availability of adequate, detailed resource information.

Few African countries today have carried out detailed regional resource inventories. The assessment of national resource endowments is far from complete. Very few systematic studies are available to provide the basis of a well-formulated, factual co-ordinated approach to regional problems. Among the causes of this deficiency is the chronic shortage of professionals in departments and ministries, the burden of work arising from general understaffing in ministries, and the lack of trained people in the central planning organizations. Much of the required information is likely to be found in old files and reports of departments and district officers; additional information can be derived from supplementary surveys. In most countries, however, there is no established machinery for drawing together the information thus available in such a way that it would provide a basis for regional or district planning or programming, or even for ensuring that programmes and projects being undertaken are adequately co-ordinated.

A further factor hindering the progress of regional planning and inhibiting the use of its machinery and techniques has been financial difficulties. Developing a remote area is expensive. Such areas are generally sparsely populated, and the cost of investments in roads, water supplies, power and telecommunications are not only high in themselves but also in relation to the population they are to serve. It is this reason that precludes a start in regional planning in such countries as Gabon, for example. The meagre resources of that country's regions, the lack of financial resources and technicians have prevented the Gabonese Government from making an all-out effort to diffuse large investments.

While some governments have attempted to remedy regional disparities despite these problems, certain issues affecting development policies must be taken into account.

The regions of a country differ considerably in resources, level of productivity and living standards of their inhabitants. Governments should not try to equalize too quickly the living conditions and development levels in all regions. Rather they must seek a middle course between this objective and that of "favouring areas most likely to develop rapidly so that additional resources gained may help to achieve eventual satisfactory progress elsewhere".[10/]

Further, in order to stabilize uprooted rural peoples who migrate to the large cities, urban functions must be decentralized. This implies the creation of a more even distribution of urban centres of various sizes. New towns should be developed in areas with promising growth potential. The location of industrial estates in such areas would foster this development. Lewis has suggested a workable approach in this respect which bears repeating here. He suggests that all plans for further development in towns whose population exceeds 500,000 should be restricted, and that for each city so restricted some four or five other cities with a population under 100,000 should be selected for special development and expansion.[11/] In this exercise planners are up against a powerful natural trend. However, once secondary urban centres start to grow in the course of industrial decentralization, and if supported by an adequate infrastructure throughout the country, a new equilibrium can be reached within urban communities and between urban and rural areas.

Summary

A prevalent trend in African countries is the development of prosperous and rapidly growing major cities or single urban-industrial centres, while other regions remain vast, neglected, backward areas that act as a drag on the national economy.

Serious dislocation problems exist in these growing centres as a result of excessive centralization of industrial undertakings. The problems are considerably aggravated by the presence of a large floating population of rural origin. Outside the growing centres misery and inefficiency are usually rampant.

10/ Report of the Ad Hoc Group of Experts on Housing and Urban Development, United Nations (Sales No.: 63.IV.1).

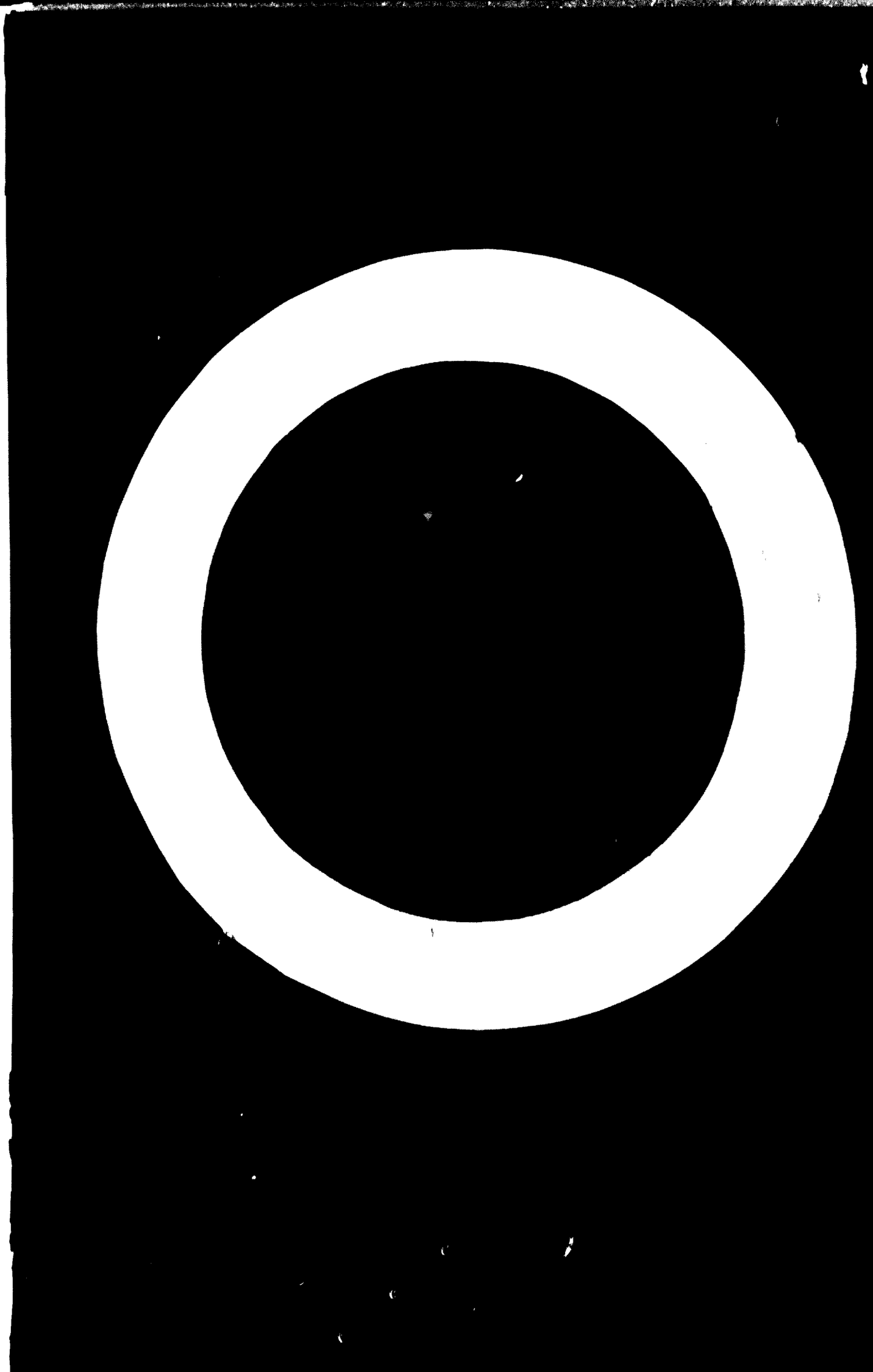
11/ W. A. Lewis (1966) Development Planning, Harper and Row, New York.

Until now action dealing with these problems has been in the form of separate programmes aimed at relieving congestion in the urban communities and at reconstructing rural areas. These measures have not always struck at the root of the problem which is uncontrolled urbanization and unguided population movement. What is needed is a comprehensive approach at the regional level based on the judicious location of industries that would benefit national interests as a whole.

Up to now few African countries have tried this approach. Such an approach should not aim at accomplishing regional equality at once; it should first try to strengthen the economic base of the existing centres and then enhance the growth potential of other regions by creating alternative centres. These centres should be made attractive to displaced rural peoples and investors through the location of diversified new industries.

PART II FACTORS IN THE LOCATION OF INDUSTRY

1. Inter-industry relations, external economies and regional economic development, by C. Michalopoulos
2. Relevance of intermediate industries and industrial services for correct location planning, by E. S. Tosco
3. Regional location and efficiency of industrial complexes in relation to the provision of infrastructure, by J. A. Shubin



I. INTER-INDUSTRY RELATIONS, EXTERNAL ECONOMIES AND REGIONAL ECONOMIC DEVELOPMENT

by C. Michalopoulos[1]

Economic development can be viewed as the end result of a series of induced investment decisions stemming from increments in a country's productive capacity. Such a view focuses attention on the interdependence of economic activities and investment decisions.

This interdependence can be examined from two standpoints, depending on whether the focus is the region or the nation. If the focus is the region, and the objective the maximization of regional economic growth, the task is to identify industries which, through their impact on related industries, can generate induced investment within the region and accelerate regional economic growth. Research on regional multipliers has stressed this aspect by examining the multiplier effects of specific industries on regional income and related activities.[2]

However, the allocation of investment and the ensuing distribution of industry that maximize the growth of a given region or regions may diverge from the investment allocation and distribution of industry that maximize national economic growth.[3] If the focus is the nation and the objective, maximization

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1/ Clark University, Worcester, Massachusetts.

2/ See, for example, F. T. Moore and J. W. Peterson (1955) "Regional Analysis: An Interindustry Model of Utah", Review of Economics and Statistics, XXXV, November issue, p.375.

3/ C. L. Leven (1964) "Establishing Goals for Regional Economic Development", Journal of the American Institute of Planners, XXX, May issue, provides some good arguments to the effect that the spatial distribution of industry that maximizes regional growth might be inconsistent with the distribution that maximizes national growth. See also H. B. Chenery (1962) "Development Policies for Southern Italy", Quarterly Journal of Economics, LXXVI, November issue, pp.526-28, and L. Lefeber, "Regional Allocation of Resources in India", in J. R. P. Friedmann and W. Alonso, Eds. (1964) Location Theory, Regional Development and Planning, M.I.T. Press, Cambridge, Massachusetts. pp.643-653.

of national, rather than regional economic growth, then the task is to examine the location of industry and allocation of investment that would maximize induced investment for the country as a whole.

This study concentrates on the national sphere and has the following objectives: first, to identify those industries which in a national context offer the maximum potential inducement to investment; second, to determine whether expansion in these industries leads to a pattern of regionally balanced growth; third, to examine the policy implications for regional development and planning of a pattern of national expansion which attempts to maximize the inducement to invest.

The study uses empirical material from several developing countries, but the data on regional distribution of industrial activities have come preponderantly from one country - Greece. Greece was chosen for several reasons: in recent years, it has generated a high rate of per capita industrial output growth. At the same time, the geographic distribution of Greek industry is typical of many other developing countries. Furthermore, the regional distribution of Greek industry has been the subject of considerable study and the available statistical information is detailed and of high quality.

An attempt will be made throughout this paper to distinguish between conclusions and policy implications that are relevant only to Greece, and those that are applicable to developing countries in general.

Industrial interdependence and linkages

The nature of the inducement mechanism

Investment in the industrial sector of less developed countries is often inhibited either by a narrow domestic market which does not permit the establishment of efficient large-scale plants, or by excessive domestic factor costs.

In a country with a market economy, prospective profits induce entrepreneurs to invest. The profitability of a project is determined by the cost-price relationship at different levels of output. This relationship is, in turn, strongly influenced by the output decisions of producers in related fields. Any expansion of production in a given industry A which raises output demand or reduces production costs in a related industry B may increase the profitability or reduce the unprofitability of investment in B. If it does, then it

can be said that the expansion in industry A has generated external economies which are appropriated by industry B.[4/] If such economies are sufficiently large to stimulate investment in B, then external economies generated by expansion in A have induced investment in B.

Investment in any industry normally appropriates the external economies generated by pre-existing industries and generates some itself. The objective in this part of the analysis is to identify those industries which are likely to be net generators of external economies. A developing country should, other things being equal, promote investment in such industries to provide maximum inducement for additional investment.

Expansion in industry A can cause an increase in demand for the output of related industry B through either residentiary or backward linkages. Residentiary linkage is indirect and works through changes in factor income. Increasing output in industry A causes income of its employees to rise, leading to an increased demand for the output of consumer goods in industry B. For example, expanded textile production leads to higher incomes for textile workers, who spend their incomes in the purchase of shoes and other consumer goods, thus raising demand for such consumer manufactures.[5/]

Backward linkage is direct and results from the vertical interdependence of manufacturing activities. Expansion in any industry A would entail an increase in demand for the output of industry B which is used as an input by A. For example, higher production of fabricated metals would cause an increase in demand for iron, steel, aluminium or other intermediate products.

A third type of industrial interdependence which may stimulate external economies will be called forward linkage. Such a linkage is also based on the vertical interdependence of industrial activities, but unlike backward linkage,

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4/ T. Scitovsky (1954) "Two Concepts of External Economies", Journal of Political Economy, LXII, April issue, pp.143-51.

5/ The basic elements in this linkage mechanism were identified in Rosenstein-Rodan (1943) "The Industrialization of Eastern and Southeastern Europe", Economic Journal, LIII, June-Sept. issue, pp.202-211, and elaborated in R. Nurkse (1953) Problems in Capital Formation in Underdeveloped Countries, Oxford University Press, New York, and in subsequent writings by the same author. This effect has often been recognized by regional economists. See, e.g., D. C. North (1955) "Location Theory and Regional Economic Growth", Journal of Political Economy, LXIII, June issue, pp.249-51.

the stimulus proceeds from earlier stages of production to later ones. If production in industry A is characterized by economies of scale, expansion in A's output will cause a reduction in per unit costs of industry B which uses the output of A as an input.[1/] An example of forward linkage might be the reduction in per unit cost of producing aluminium consumer goods resulting from the expansion and increased efficiency in producing aluminium plates, or strip.[2/]

Expansion in any industry will usually transmit impulses to related industries through all three linkage mechanisms, but some industries are more likely to stimulate investment through one linkage mechanism than through another. The analysis that follows examines the relative strength of the three linkage mechanisms and the kinds of industries associated with each. An attempt is made to show that one linkage mechanism is more likely to induce additional investment than the others and that less developed countries wishing to provide the strongest inducement to industrial investment should emphasize expansion in industries that send strong impulses to related industries through this linkage mechanism.

1/ The nature of linkages resulting from vertical interdependence was first given prominence in A. Young (1928) "Increasing Returns and Economic Progress", Economic Journal, Dec. issue. Subsequently, the discussion was enriched by the contributions of J. E. Meade (1952) "External Economies and Diseconomies in a Competitive Situation", Economic Journal, March issue; T. Scitovsky, op. cit.; M. Fleming (1955) "External Economies and the Doctrine of Balanced Growth", Economic Journal, LXV, June issue, pp.251-256; and especially A. O. Hirschman (1959) The Strategy of Economic Development, Yale University Press, New Haven, Conn., pp.78-119. The terms backward and forward linkage used here were first popularized by Hirschman. See also: H. B. Chenery, "The Interdependence of Investment Decisions", in M. Abramovitz Ed. (1959) The Allocation of Economic Resources, Stanford University Press, Stanford, California, pp.82-120.

2/ Expansion in industry A might cause external economies by reducing costs to other industries in other ways as well. Chief among these might be the beneficial effects that expansion A might have in training workers, improving the attitude of workers towards industrial employment, improving the attitude of the community towards industrial enterprises, establishing research or community facilities, all of which might reduce costs in another industry. Important as these economies are, this analysis will ignore them and concentrate on the so-called pecuniary external economies discussed above for two reasons: first, the conditions under which such economies might materialize are too vague and difficult to assess systematically; second, and more important, it is almost impossible to determine a priori the nature of the industry that might generate them or the nature of the industry that might appropriate them.

Residentiary linkages

Let us consider first the generation of external economies and the resulting stimulation of investment through residentiary linkages. Impulses transmitted by a given industry A, in this manner, will be stronger the larger the factor income generated by expansion in this industry. Factor income per unit of expansion in gross output will be highest in those industries where the ratio of value added to gross output is highest.

The rise in demand for the output of consumer goods in industry B, resulting from expansion in A, would raise the price of B's output. It would raise B's profitability and stimulate investment in B only to the extent that economies of scale are significant in the production of B. If the increase in the price of B's output, resulting from the increase in demand, reflects the now higher opportunity cost of factors of production employed in B, then expansion in A has not bestowed any external economies on B.[8/]

The demand stimulus generated by expansion in A is important to B only if production could not have been undertaken because of a limited domestic market.[9/] In the absence of economies of scale in industry B, the demand-creating effects of A's expansion are desirable only in the general sense that any expansion of industrial output in a less developed country is desirable.

Even if production in consumer goods industry B were characterized by extensive economies of scale, expansion in industry A need not increase the profitability of investment in B for another reason: expansion in A might cause an increase in the prices of factors of production employed by B, thus increasing the latter's cost schedules and reducing its profitability. For example, expansion in the output of metal products might increase the cost of skilled labour which is an input in the production of textiles or food processing. The extent to which this occurs would depend on the elasticity of supply of factors

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8/ H. B. Chenery, "The Interdependence of Investment Decisions", op. cit., p.96.

9/ Strictly speaking, in an open market where international trade is possible, demand limitations do not exist except insofar as transport costs prohibit exports. On the other hand, Linder has argued that the creation of an export industry in manufacturing is highly unlikely in the absence of large domestic demand. S. B. Linder (1961) An Essay on Trade and Transformation, Wiley, New York.

used by A and B. In the limiting case where this elasticity is zero, that is, supply of factors is fixed, expansion in A cannot but impose external diseconomies on B and in fact reduce the incentive to invest in it.[10] On the opposite extreme, if B utilizes factors of production with no alternative uses, for example, previously unemployed or underemployed agricultural labour, the increase in demand for B's output resulting from A's expansion might well raise profitability in B.[11]

To summarize, the residentiary linkage effect depends on the importance of scale economies in consumer goods industries, and on the elasticity of the supply of factors used in manufacturing. The establishment of a specific consumer goods industry will also depend on the income elasticity of demand for its output and on its minimum economic scale of operations.

Advocates of theories of balanced economic growth have emphasized the importance of the inducement to invest provided by the residentiary linkage mechanism. Nevertheless, as the analysis has already suggested, this mechanism appears to suffer from serious drawbacks.

Empirical studies have shown that economies of scale are not as significant in consumer goods industries as they are in producer goods industries.[12] Expansion in a given industry A is more likely to increase profitability in producer's goods industries vertically linked with it than in horizontally-related consumer goods industries. Moreover, unless the increase in factor income generated through the initial expansion is large, its impact would be diffused throughout the economy as the income recipients spread their expenditures over a large range of consumer goods. The original expansion necessary to induce investment in consumer goods industries may be so large as to be unattainable, given the limited resources available for investment in less developed countries.

10/ M. Fleming, op. cit., pp.246-47.

11/ H. B. Chenery, "The Interdependence of Investment Decisions", op. cit., p.96.

12/ United Nations Economic and Social Council, Committee for Industrial Development (1966) Industrial Planning and Programming: Criteria for the Development of Manufacturing Industries in Developing Countries. (E/C.5/111/Add.1) New York, pp.27-29; J. S. Bain (1956) Barriers to New Competition, Harvard University Press, Cambridge, Massachusetts; and B. Balassa (1961) The Theory of Economic Integration, Homewood, Illinois, pp.[illegible].

Should the initial expansion be large enough to impart strong demand impulses to consumer goods industries, it is likely that the expansion would give rise to serious diseconomies resulting from increases in the prices of factors of production. There are two reasons why such diseconomies are likely. First, industrial production is not usually intensive in the use of factors of production such as unskilled labour in which less developed countries are well endowed. On the contrary, industrial technology utilizes the factors of production in which advanced economies are relatively well endowed, such as capital goods, intermediate products, and skilled labour.[13/] Second, it is probable that the elasticity of supply of these factors in less developed countries is low, so that increased demand for such factors in one industrial sector is likely to impose diseconomies in other sectors.

Historical experience tends to suggest that expansion of activities with strong residentiary effects alone has not been sufficient to provide the stimulus for sustained econonomic growth. Ohlin, for example, reports that the expansion of consumer goods industries played only a minor role in the industrialization of ninetheenth century Europe. Rather, external economies were abundant and resulted from the vertical interdependence between industries (backward and forward linkages), particularly in the producer goods sector.[14/] North has also emphasized vertical interdependence as a stimulus to the industrial growth of North America, stemming in this instance mostly from the forward linkage stimuli generated by the primary sector.[15/]

Backward linkages

The backward linkage stimulus to investment hinges on the impact that expansion in a given industry A would have on industry B's output which is used by A as an input. The larger the ratio of raw materials and intermediate inputs to total output in industry A (or what amounts to the same thing, the lower the ratio of value added to total output), the stronger the impulse that

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13/ S. Eckaus (1955) "The Factor Proportions Problem in Underdeveloped Areas", American Economic Review, XLV, June issue, pp.538-65.

14/ G. Ohlin (1959) "Balanced Economic Growth in History", American Economic Review, XLIX, May issue, pp.351.

15/ D. C. North, op. cit. However, see C. M. Tiebout (1956) "Exports and Regional Economic Growth", Journal of Political Economy, LXIV, April issue, pp.160-69, for an argument stressing the importance of residentiary linkages.

industry A will increase. In particular, that a specific industry B supplying A's inputs would be established varies directly with the portion of A's input that B's output will provide and inversely with the minimum economic scale of operation in B.[1]

Compared to resistentiary linkages, the backward linkage mechanism is more likely to stimulate investment in additional industries, as economies of scale appear to be more prevalent in the capital and intermediate goods sectors than they appear to consumer goods industries stimulated through the resistentiary [illegible].

In some reservations regarding the supply of factors of production to B resulting from an expansion in A apply to backward linkages as well as to resistentiary. Rising output in A might raise the cost of inputs used in both A and B and thus inhibit investment in the latter. In addition, if the increase in demand for B's input is not sufficient to induce investment - or at any rate until investment in B occurs - expansion in A might inhibit investment in a third industry C, which also uses B as an input, by raising its price.

For example, let us assume that aluminium productive capacity in a less developed country is increased by the establishment of a modern plant processing bauxite ore and producing alumina (backward linkage). This will increase demand for inputs of electric power. Suppose, however, that this increase in demand is not sufficient to induce expansion in the productive capacity of electric power, but simply leads to an increase in its price. This might inhibit expansion in another industry also using electricity as a major power input. However, from the standpoint of factor supply, in the long run and for the economy as a whole, the backward linkage mechanism is a stronger stimulus to investment than resistentiary linkages insofar as it tends to increase the supply of produced inputs and thus raise the supply of produced and primary inputs available to the economy as a whole.[2]

Forward linkages

The stimulus to invest provided by the forward linkage mechanism depends on the effect that expansion in a given industry A would have on industry B, which uses A's output as an input. If the price of A's output is reduced as a

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[1] A. O. Hirschman, op. cit., p.101.

[2] M. Flemming, op. cit., pp.240-250.

result of expansion, this will reduce costs and increase profitability in B. Forward linkage thus depends primarily on the existence of economies of scale in the producing industry A. The higher the proportion of A's output delivered to other industries (to satisfy intermediate demand) rather than consumers (to satisfy final demand), the stronger will be this stimulus through the forward linkage. The probability that investment in a given industry B will be undertaken varies directly with the portion of B's total input which A's output represents and by the amount by which expansion in A reduces per unit input cost in B - that is, by the importance of scale economies in A.[18]

A comparison of the forward and backward linkage mechanisms shows that expansion in any given industry will induce investment in a related industry only if economies of scale prevail in input producing industries, that is, raw materials, intermediate and capital goods. Both mechanisms depend on economies of scale in these industries. The forward linkage mechanism attempts to exploit these economies directly by investment in such industries, which in turn might stimulate investment in industries using their outputs as inputs. The backward linkage process works indirectly. It attempts to stimulate investment in input producing industries - which are characterized by scale economies - through expanded demand for their products generated by the establishment of input using industries. However, from the crucial standpoint of supplies of factors of production the forward linkage mechanism should be preferred over the backward linkage process. Expansion in any sector is factor-using and, in all likelihood, within the context of a less developed economy, imposes certain external diseconomies in other sectors by increasing factor scarcity. If the input producing industries are established first, however, making use of forward linkages the supply of inputs is increased directly, thus offsetting expanded factor usage by A. On the other hand, the backward linkage mechanism promises to increase factor inputs only indirectly. If the stimulus is not strong enough to induce expansion in the input producing industries, backward linkage is likely to cause net external diseconomies in related industries much the same way that expansion through residentiary linkage is likely to do.[19]

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[18] A. O. Hirschman, op. cit., p.109.

[19] Of course it can be argued that in an open economy, no supply limitations for produced inputs can exist because such inputs can be procured through international trade. However, this argument is valid only if the less developed country can procure unlimited amounts of foreign exchange. Since this condition is not likely to be fulfilled, it is quite clear that supply rigidities in the market for intermediate and capital goods inputs are likely to prevail. See: C. Michalopoulos, "Imports in Economic Development: The Greek Case", in P. B. Kenen, Ed. (1967) Aspects of International Economy, New York.

A school of thought represented by Hirschman has argued that the backward linkage mechanism induces investment because backward linkages are imperative; they create shortages of inputs which, after a certain level of demand is reached, must be relieved through domestic production. Investment decisions in countries characterized by a scarcity of entrepreneurial talent are more easily taken in the presence of rising prices for inputs rather than in the presence of cost reductions which permit domestic production of goods with locally produced inputs.[20]

As Hirschman recognizes, however, there is no such imperative about backward linkages in an open economy. An increase in domestic demand for certain inputs, instead of calling forth domestic production, may simply lead to more imports. Because of this inbuilt safety valve,[21] the imperative aspect of induced investment via the backward linkage is weakened.[1]

Import-substituting industries with a high material input ratio to total output, on the contrary, derive their investment through backward linkages, suffering from similar drawbacks. Forward linkage emphasizes initial expansion of industries such as food processing, printing, milling, leather or wood working, with high material input but small value added. Such emphasis is contrary to the objective of economic development, namely the attempt to capture as much as possible the value added in the industrial sector and to move resources as forcibly away from the simple processing operations associated with a peasant, less developed economy. In the words of Hirschman, "we want to be able to chip off as large pieces of value added at a time as the underdeveloped country can possibly digest."[22] This will not be achieved by emphasizing the inducement to invest through backward linkages.

In addition, the emphasis on the backward linkage mechanism and the establishment of industries with low ratios of value added to total output means that the impetus of residentiary linkages in these industries will be weak, since the strength of this impetus depends, among other things, on the amount

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[20] A. O. Hirschman, op. cit., pp. 109-10.

[21] The safety valve could be closed by the imposition of trade controls. However, the reason is protected for this reason is similar to the answer associated with any other kind of protection. In the absence of complete and informed planning, such restrictions might lead to a serious resource misallocation.

[1] A. O. Hirschman, op. cit., p. 110.

of value added. On the other hand, nothing precludes that expansion of high forward linkage industries will not generate strong residentiary effects. Such residentiary effects might well be instrumental in stimulating expansion of consumer goods industries not vertically linked with the originally expanding industry, in view of the over-all increase in input supply generated by the expansion of the input producing sector.

In the light of these considerations, it can be presumed that the strongest stimulus to additional investment can be generated through the expansion of industries with high ratios of intermediate to final demand - that is, through the forward linkage mechanism.[23/]

To summarize briefly, there is never a guarantee that establishment or expansion of any industry A will lead to the establishment or expansion of a related activity through forward, backward, or residentiary linkage. Yet other things being equal, investment in activities which are net generators of external economies offers the less developed country the best chance for sustaining growth through a series of induced investment decisions in interdependent industries.

Of th three linkage effects examined, the residentiary linkage mechanism is the weakest because of: (a) the lack of important economies of scale in consumer goods industries; (b) the magnitude of original expansion required to increase aggregate consumer demand; and (c) the strain it imposes on limited factor supplies.

Both the forward and backward linkage mechanisms hinge on the importance of economies of scale in raw material, intermediate, and producer goods industries. The forward linkage mechanism is preferred because: (a) it increases input supply directly and thus reduces the possibility of external diseconomies resulting from increased factor use in the expanding industry; (b) stimulation through backward linkage involves the establishment of industries with low ratios of value added to gross output which, among other drawbacks, reduces the potential residentiary stimulus imparted by any industrial expansion.

23/ Fleming is apparently of the same opinion. See op. cit., p.250. For an example of the forward linkage impact of the steel industry in contemporary United States, see W. Isard and R. E. Kuenne (1953) "The Impact of Steel Upon the Greater New York-Philadelphia Industrial Region: A Study in Agglomeration Projection", Review of Economics and Statistics, XXXV, November issue.

In North America forward linkages stemmed mostly from the primary sectors; in continental Europe and the Union of Soviet Socialist Republics from the development of the iron and steel industry; in England from the processing of imported textile fibres; in a less developed country like Greece, from the processing of food, textiles or steel, using either domestic or imported inputs. Both on theoretical and on empirical grounds, industries with high forward linkages appear to offer the strongest inducement to additional investment in related fields.

Forward linkage industries

The input-output tables of a country offer the best means of identifying empirically an industry's potential in triggering investment in related fields through forward linkages. The potential for forward linkage presumably would be highest in those industries which show the highest ratio of intermediate to total demand. Whether this potential is realized and external economies are generated will depend on whether production in these industries is characterized by economies of scale.

To determine the industries with the highest ratios of intermediate to final demand, a sample of five countries was taken: Israel, Italy, Japan, Norway and the Republic of South Africa. A seventeen-industry breakdown was used, employing mostly an ISIC two-digit classification. The seventeen industries in each of the five countries were ranked according to their ratio of deliveries to intermediate relative to total demand. The results are shown in table 1.

The ratios used for Italy, Japan and Norway are, with minor qualifications, those computed in an earlier study by Chenery and Watanabe.[24/] The ratios for Israel were computed from the input-output tables for 1958, and the Republic of South Africa from similar tables for 1956-1957.[25/] Internaticnal comparability of intersectoral relations was determined by calculating the coefficient of

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24/ H. B. Chenery and T. Watanabe (1958) "International Comparisons of the Structure of Production", Econometrica, XXVI, October issue, pp.507-520.

25/ These tables can be found respectively in: M. Bruno (1962) Interdependence, Resource Use and Structural Change in Israel, The Bank of Israel, Jerusalem; and D. C. Krough (1961) "An Input-Output Analysis of the South African Economy, 1956-7", South African Journal of Economics, XXIX, December issue, pp.258-275.

Table 1

Industry deliveries to intermediate demand in selected countries

Industries	ISIC[a]	As per cent of total output					Ranking according to ratio of intermediate to total demand					Best ranking (M)
		Japan	Italy	Norway	Rebublic of South Africa[b]	Israel[b]	Japan	Italy	Norway	Republic of South Africa	Israel	
Non-ferrous metals	342	66.9	94.0	48.7	44.4	99.9	6	1	5	7	1	1
Petroleum and coal products	321,322 329	82.5	70.5	74.2	31.7	71.5	1	5	1	9	5	2
Chemicals	311,312,319	70.0	71.1	46.4	51.6	67.8	5	4	6	4	6	3
Paper and products	271-2	80.2	75.3	42.5	64.8	35.7	3	3	8	1	12	4
Iron and steel	341,350	74.8	88.2	38.9	46.4	61.7	4	2	9	6	8	5
Mining	12,14,19	81.8	59.5	51.6	11.3	87.1	2	6	3	16	3	6
Textiles	231,233,239,244	49.5	57.5	45.6	47.9	84.4	8	7	7	5	4	7
Printing and publishing	28	28.8	0.	51.1	61.6	61.2	13	17	4	2	9	8
Rubber and products	300	56.2	39.7	15.8	55.8	40.3	7	10	13	3	13	9
Non-metallic minerals	33	30.7	25.1	18.6	20.7	89.1	11	12	12	11	2	10
Grain mill products	205	13.0	48.6	67.7	24.6	40.1	17	8	2	10	14	11
Machinery	360,370	32.9	22.4	9.4	34.1	54.1	10	13	14	8	10	12
Lumber and wood products	250,260	29.6	43.1	29.1	19.8	52.5	12	9	10	13	11	13
Leather and products	241-2, 291-2	47.1	31.8	27.7	20.6	23.1	9	11	11	12	15	14

Industries	ISIC[a]	As per cent of total output					Ranking according to ratio of intermediate to total demand					Best ranking (W)
		Japan	Italy	Norway	Republic of South Africa[b]	Israel[b]	Japan	Italy	Norway	Republic of South Africa	Israel	
Transport equipment	381-3 385-6, 389	15.1	4.3	[illegible]	13.3	63.6	[illegible]	15	[illegible]	14	[illegible]	15
Processed foods	201-9, 211-4, 220, except 205	16.9	[illegible]	5.7	[illegible]	12.2	14	14	16	15	[illegible]	16
Apparel	232, 243	16.5	3.0	3.8	3.[illegible]	10.0	15	16	[illegible]	[illegible]	[illegible]	[illegible]

Sources: H. B. Chenery and T. Watanabe (1958) "International Comparisons of the Structure of Production", Econometrica, XXVI, October issue, pp.507-520; M. Bruno (1962) Interdependence Resource Use and Structural Change in Israel, Bank of Israel, Jerusalem; D. C. Krogh (1961) "An Input-Output Analysis of the South African Economy, 1956-7", South African Journal of Economics, XXIX, December issue, pp.258-275.

a/ The breakdown by ISIC category follows closely the breakdown in Chenery-Watanabe. The major adjustment to their categories involved the exclusion of most primary and service sectors.

b/ The input-output table of Israel employed a 77 x 77 sectoral breakdown, using producers' prices for the year 1958. The input-output table of the Republic of South Africa referred to interindustry relations in 1956-1957, employed a 49 x 49 matrix, and also used producers' prices. Both tables had to be reduced in most instances to match the sectoral breakdown of the Chenery-Watanabe study.

concordance between the five rankings. The coefficient of concordance was found to be 0.612, significant to the 0.01 confidence level. This means that the probability that such concordance is due to chance is no more than 1 per cent. There is thus conclusive evidence that the high forward linkage industries are by and large the same in different countries.

Furthermore, these results suggest strong similarities in the production functions of the same industries in different countries in spite of differing factor endowment and industry heterogeneity.

The fact that the coefficient of concordance was found to be statistically significant allowed us to compute a "best ranking" paring all countries according to the proportion of each industry's deliveries to intermediate demand.[26/] (These best rankings are calculated by inversely ranking the sums of the ranks of each industry in each of the five countries, and are also shown in table 1.)

The results of the best ranking procedure are similar to earlier finds by Chenery-Watanabe. The highest forward linkage potential is exhibited by industries such as non-ferrous metals, building materials, steel, chemicals and paper; the lowest by apparel, leather and products, food processing and transport equipment. It is significant that the industries which exhibit the highest forward linkage potential are those in which, according to a recent United Nations study, economies of scale appear to be important.[27/] This means that these industries not only show a potential for generation of external economies, but also that, should expansion occur, this potential will be realized because of the existence of scale economies.

Forward linkage and geographic balance

Spatial distribution of Greek industry

Having examined the nature of industries likely to generate the strongest inducement to investment, the question of major interest from a regional

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26/ H. M. Walker and J. Lev (1953) Statistical Inference, Henry Holt, New York, p.286.

27/ United Nations, op. cit.

[illegible] to what extent will the pattern of economic [illegible] differ from that pattern [illegible]

[illegible] to investigate the impact of [illegible] linkages on the regional distribution of Greek industry. A detailed examination of the factors responsible for the present geographic distribution of Greek industry has been made by Coutsoumaris elsewhere.[1] The present discussion is concerned only with the future implications.

It will be assumed that the present distribution of Greek industry conforms to the principle of location theory in the sense that locational decisions of Greek firms are rational and efficient from the point of view of private profitability calculations.[2] The argument will also assume that the Greek industries of cement, non-ferrous metals, chemicals and the like have high forward linkages, whereas the reverse is true of the food, textile and clothing industries. The assumption is justified by the evidence cited in the international comparability of intersectoral relations mentioned earlier.

Armed with these assumptions, an examination of the degree of spatial concentration in each Greek industry in order to determine whether the fact of induced investment - the industries with high forward linkages are spatial - [illegible] distributed evenly among regions.

[illegible] of the geographical concentration of Greek manufacturing industry [illegible] the regional distribution of income. [illegible] Ullman and Mansfield investigated empirically the dispersion of [illegible] coefficients of localization in detail.[3]

1/ T. P. Coutsoumaris (in Greek) The Problem of Spatial Concentration of Greek Industry (in Greek), Lecture Series No.4, Center of Economic Research, Athens, p.[illegible].

2/ This was one of the main conclusions of Coutsoumaris' study. Such a conclusion in no way implies that the present regional distribution of Greek industry maximizes social profitability (though Coutsoumaris apparently believes this happens to be the case - ibid., p.26). The reason of possible divergence of the locational distribution maximizes private profitability from that which maximizes social profitability is that locational decisions taken by individual firms to maximize their profits do not take into account the possible external economies or diseconomies that such locational decision imparts on the rest of the economy.

3/ T. P. Coutsoumaris, op. cit., pp.22-[illegible]; P. Mansfield (in Greek) Greek Regional [illegible], Center of Economic Research, Athens, p.[illegible].

Unfortunately, the use of the coefficient of localization as a measurement of industrial dispersion has its drawbacks when applied to a country like Greece, where a large portion of total industrial employment and population is concentrated in one large metropolitan area - Athens. About 45 per cent of total Greek industrial employment is in this area. "If a large portion of a country's total industry is concentrated in relatively few metropolitan areas, a specific industry also heavily concentrated in these same areas will quite likely show a low coefficient of localization (implying considerable dispersion) when the coefficient is calculated with total industry employment (as it was in the case of Greece) as a base."[31/]

An alternative measurement of industrial dispersion, also using industry employment as a base but avoiding the implicit weighting of the individual regions by their respective shares of the base magnitude has been developed by Thompson and was used in this study. This is the coefficient of spatial variation (CSV).[32/]

If X_j^r is the ratio of employment in industry j in region r to total industrial employment in region r, and N the total number of regions, then the coefficient of spatial variation of industry j equals $\frac{s}{\bar{X}_j}$ where:

$$s = \sqrt{\frac{\sum_r \left(X_j^r - \bar{X}_j\right)^2}{N}} \quad \text{and} \quad \bar{X}_j = \frac{\sum_r X_j^r}{N}$$

This is simply the standard deviation of the proportion of total industry employment that employment in a given industry accounts for in each district, divided by the mean proportion for the country. The higher the CSV, the higher the concentration.

Table 2 shows the CSV's of Greek industries according to the seventeen-industry breakdown used earlier. The highest concentration is found in heavy

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31/ W. Isard (1960) Methods of Regional Analysis: An Introduction to Regional Science, Wiley, New York, p.264.

32/ W. R. Thompson (1957) "The Coefficient of Localization: An Appraisal", Southern Economic Journal, XXIII, January issue.

Table 2

Degree of Localization of Greek Industries

Industry	Coefficient of spatial variation (C.V)	Ranking by C.V	Ranking by ratio of intermediate deliveries to total output (%)
Apparel	0.177	16	17
Transport equipment	0.421	11	15
Leather and products	0.317	14	14
Processed foods	0.413	12	16
Grain mill products	0.644	8	11
Rubber and products	0.961	5	9
Textiles	0.313	15	7
Machinery	0.522	10	12
Iron and steel	1.761	2	5
Non-metallic minerals	0.297	13	10
Lumber and wood products	0.07[illegible]	17	12
Chemicals	0.829	6	3
Printing and publishing	0.728	7	8
Mining	0.586	9	6
Petroleum and coal products	1.140	3	2
Non-ferrous metals	1.842	1	1
Paper and products	1.040	4	4

Source: National Statistical Service, Greece (1963) Recensement des Etablissements Industriels et Commerciaux. As the detailed data of regional distribution of industry on which these calculations are based have not been published at the writing of this paper, the author expresses appreciation to the National Statistical Service for permitting their use.

Note: The CVVs were calculated for a breakdown of Greece in five regions: the Athens area, Central Greece, Northern Greece Southern Greece, and the Islands.

industries, iron and steel, non-ferrous metals, petroleum and coal products, paper and products, rubber and chemicals.

There are several reasons for this concentration. One major factor is that the scale of operations for these industries is relatively large. As Florence has shown, a strong positive link exists between the optimum scale of operations for an industry and its degree of regional concentration.[33/] This consideration is extremely important in Greece and other less developed countries where the limited domestic market might not allow for the establishment of many optimum size plants in any of these industries.

A second important reason for concentration in these industries is that they tend to import a large portion of their inputs. In Greece, just as in other less developed countries, there are few important points of entry and industries dependent on imported inputs will tend to minimize transport costs and, other things being equal, locate near the port of entry.[34/] This tendency is reinforced in Greece, as in many other countries, because the main concentrations of demand are also located near the ports of entry, thus increasing the attraction of industry.

Finally, the requirements of these industries for skilled labour are usually higher than average. Since skilled labour inputs are an important factor in determining the location of industries[35/] there is a tendency in Greece, as in many other developing areas, to concentrate the available pools of skilled workers; industries employing relatively large amounts of this input also tend to be concentrated.

Concentration and forward linkage

The index showing the geographical dispersion of Greek industries was in turn compared to the index ranking industries according to their potential in generating economies through forward linkage (W). Table 2 shows the industry rankings according to CSV and according to W. Comparison of the two rankings

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33/ P. S. Florence (1948) Investment, Location and Size of Plant, Cambridge University Press, London.

34/ C. F. Coutsoumaris, op. cit., p. 57.

35/ S. Schiavo-Campo (1966) "Wages, Skills and Regional Location of Industry: The Case of Mexico". Paper presented at the Second Inter-American Congress of Regional Planning, Rio de Janeiro, 17-19 August 1966.

lends strong support to the hypothesis that industries with high forward linkages tend to be concentrated. Textiles is the only highly dispersed industry that shows some potential in generating forward linkages. This discrepancy can be explained by the fact that the minimum economic scale of operations in textiles is small.

The Spearman rank correlation coefficient for the two rankings is 0.78. Such a correlation is statistically significant to the 0.01 confidence level, implying only a 1 per cent chance that the relationship identified is spurious.

However, the strong correlation between the two rankings does not imply that a pattern of investment allocation which attaches importance to the generation of forward linkages will lead to a regionally concentrated pattern of growth. It is possible that each of the high growth inducing industries is concentrated in a different region.

To test for this eventuality, the seventeen industries examined were divided into two groups: those above the median in forward linkage generation and those below. Next, the location quotients of the high forward linkage grouping were calculated for each of nine regions into which Greece was divided. Location quotients close to unity in most regions would have implied a fair amount of dispersion of high forward linkage industries.

Table 3

Dispersion of high forward linkage industries[a/]

Region	Location quotient
Athens	1.346
Sterea Hellas	1.084
Epirus	0.349
Thessaly	0.574
Macedonia	0.704
Thrace	0.236
Peloponesos	0.815
Crete	0.332
Islands	0.599

Source: National Statistical Service, Greece (1965) Recensement des Etablissements Industriels et Commerciaux.

a/ The industries included were those ranking above the median in the ratio of intermediate deliveries to total output in the ranking W of table 7. Because of the emphasis of the paper on industrial production in the strict sense, mining was dropped from the list. Thus the industries included were: non-ferrous metals, petroleum and products, chemicals, paper and products, iron and steel, textiles, rubber, printing and publishing. For details of the industries by ISIC, see tables 1 and 6.

The results are shown in table 3 above. They lend strong support to the hypothesis that high forward linkage industries tend to be concentrated, particularly in the Athens metropolitan area and in Sterea Hellas, the surrounding region.

This conclusion raised the question whether concentration of high forward linkage industries in metropolitan areas is a phenomenon unique to Greece or characteristic of other countries as well. A limited test was undertaken, comparing the location quotients of industries in the Athens metropolitan area with the location quotients of the same set of industries in three urban centres of Italy: Milan, Turin and Rome.

Industry rankings were made by location quotient for each of the four urban centres, and the coefficient of concordance between the rankings was computed. The results (shown in table 4) strongly support the hypothesis that urban centres tend to attract relatively large proportions of the same industries. The coefficient of concordance between the industry rankings was 0.619, significant at the 0.01 confidence level.

A further test was then undertaken, relating the rankings of industry location quotients in the four urban centres with the industry ranking according to degree of forward linkage potential, derived earlier. A comparison of the rankings again shows the strong tendency of industries with high forward linkage potential to concentrate near urban centres. The coefficient of concordance for the rankings was 0.53, significant to the 0.01 confidence level.

Probable location of induced investment

It can be presumed that the foci of growth in the form of industries with high forward linkage potential tend to be concentrated, and, in the case of Greece, to cluster in and near the Athens metropolitan area. The extent to which expansion in these industries leads to a pattern of concentrated growth can be determined by the locational tendencies of activities stimulated by this expansion.

Thus, what must be investigated is the locational tendencies of a group of interrelated activities which are successive stages in the manufacture of an end product. The optimum location of these activities is also interdependent. The location of a steel plant, for example, cannot be determined without information on the location of pig iron production, one of its main inputs, or

Table [illegible]

[illegible] coefficients and their rankings [illegible]

[illegible]	Coefficients				Rankings				
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Textiles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wood and wood products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chemicals	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Printing and publishing	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Petroleum and coal products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Paper and products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other industries	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: For Greek data, see table 2; for Italian data: Insituto Centrale di Statistica, Istat, [illegible] Progetto Generale dell' Industria del Commercio, October 1961, Volume I, Imprese, Unita Locali, Addetti, Rome.

without knowledge of the location of the market for steel products. The pig iron plant location, on the other hand, would depend on the location of the steel plant which constitutes its market and on the location of iron ore, its input.

If the problem were to determine the location of an iron and steel complex to be built from the ground up, the location of the pig iron and steel plants would have to be considered jointly. An industrial complex study would have to be undertaken, supported by a cost-benefit analysis of alternative locations for the two plants. Another question must also be answered: whether the distribution of activities generated by expansion in the forward linkage iron and steel complex would tend to be similar or to diverge from the distribution of the latter.

The locational pattern of activities induced by forward linkage industries would be determined by three sets of factors: transport costs of inputs, transport costs of output, and external economies or diseconomies resulting from the spatial juxtaposition of the induced activities with the inducing ones.

Input costs consist of costs of materials and labour. The former include costs of raw materials and intermediate inputs, as well as costs of capital goods employed in production.

If an induced activity locates in the proximity of an inducing one, it would obviously minimize the costs of some of its material inputs, namely those procured from the inducing industry. The extent to which the induced activity B would minimize its material input costs by locating near the inducing one A would depend basically on the share of B's input supplied by A. The higher the share, the larger the probability that B would locate close to A. The probability that the induced activity B would minimize its material input costs by locating in the vicinity of A is high, particularly if expansion in A (which is associated with lower cost for its output) generates external economies.

No similar tendency can be identified <u>a priori</u> with respect to labour costs. In Greek urban areas, where industries with high forward linkage potential tend to concentrate, average wage rates are higher than in the rest of the country. This might appear to create an advantage for induced activities with a high labour component of total cost to locate away from urban concentrations.

Closer examination, however, shows this advantage to be non-existent. In Greece, as in other less developed countries, higher wage rates in the urban centres reflect a higher skill composition of the labour force. In addition, unskilled labour differentials appear to be insignificant.[36] In the case of Athens, Ward has observed that a large pool of unskilled, low wage, immigrant labour exists in slum suburbs, which reduces the advantages that outlying areas might offer to industries employing large amounts of unskilled labour.[37]

The pattern of demand in Greece is also concentrated with Athens accounting for more than 20 per cent of the total population, close to 60 per cent of the national income and 61.4 per cent of expenditures on final goods.[38] Thus, industries oriented towards demand would also tend to cluster, though perhaps less so than input oriented industries.

The tendency of demand oriented industries to locate around Athens is reinforced by the structure of the transportation system. Because of the absence of direct routes linking outlying areas goods shipped from one part of Greece to the other often have to be shipped through Athens.

To measure the economies and diseconomies resulting from the juxtaposition of induced and inducing activities is a difficult if not impossible task. There are many apparent benefits for industry locating in a metropolitan area. Banking facilities and contacts may reduce the cost of borrowing; sanitation, legal, and research facilities are more abundant and less expensive. On the other hand, spatial juxtaposition is liable to lead to external diseconomies in the form of water and air pollution, traffic congestion, or social problems. To the extent that the local government attempts to remedy the situation, taxes in urban centres may be higher.

With respect to the relative significance of these factors in the location decisions of Greek industries, this discussion will rest with the conclusio reached in the Coutsoumaris study that, on balance, agglomeration economies generate considerable attraction of industry to the Athens metropolitan area.[39]

36/ S. Schiavo-Campo, op. cit.

37/ J. Ward, op. cit., pp.48-51.

38/ G. F. Coutsoumaris, op. cit., p.35.

39/ Ibid.

From all available indications, it can be concluded that activities in need of expansion in the high forward linkage industries would tend to cluster in the Athens metropolitan area. It may appear hazardous to generalise this conclusion, yet the primacy of one metropolitan area, usually the capital or a major port, which generates the bulk of total final demand and possesses a sizable pool of skilled labour, is characteristic of many less developed countries. Mexico City, Caracas and Manila are only a few of many such examples. The transport system can in many cases be described as a giant wheel with spokes originating from the capital, but with no interconnecting links. On the materials input side, projects induced through forward linkages are likely to minimise costs by locating near the stimulating industry. Thus, if the foci of induced investment - industries with high forward linkage potential - are concentrated in metropolitan centres, the activities they induce would tend to cluster in their neighbourhood.

Regional distribution and income

The implication of this investigation so far is that, given the present geographic distribution of Greek industrial activities, an investment pattern which emphasises expansion of industries with high potential yield of external economies through forward linkages will lead to a regionally concentrated pattern of growth. The extent to which such a pattern would raise or lower income differentials between regions depends on the proportion of high forward linkage industries located in low income areas. If this proportion is low, other things being equal, investment that emphasises expansion in the high forward linkage industries in order to exploit potential external economies will lead to rising income differentials between regions.

Table 1 shows the relationship between high linkage industries located in each of Greece's nine regions and the *per capita* income. There is a close correlation between regional *per capita* income and location quotient of industries with strong forward linkage potential. Low income regions have a small number of industries with high forward linkage potential, while high income regions have a relatively large share. The coefficient of correlation between regional *per capita* income and location quotient of industries with high forward linkage potential was 0.7, statistically significant at the 0.1 confidence level.

It is of interest to note that the location quotient of industries with high forward linkage potential was also high in certain areas

Table 5

High forward linkage and per capita income

Region	Annual per capita income in dollars	Location quotient of high linkage industries[a/]
Athens	812[b/]	1.346
Sterea Hellas	273	1.084
Epirus	145	0.349
Thessaly	234	0.574
Macedonia	271	0.704
Thrace	236	0.236
Peloponnesos	217	0.815
Crete	217	0.332
Islands	191	0.599

Source: Chase Manhattan Bank, "Purchasing Power Survey: Technical Note"; and National Statistical Service, Greece (1963) Recensement des Etablissements Industriels et Commerciaux. Per capita income for 1962 was calculated on the basis of national income data for 1961 and by using regional income information included in income tax collection, consumer good expenditures and other similar estimates.

a/ Industries ranking above the median in ratio of intermediate deliveries to total output. For information on the industries included, see table 3.

b/ Per capita income is for the Attiki prefecture, of which Athens is the major city. As a result, the income estimate tends to understate per capita income in the Athens metropolitan area.

or, conversely, whether such industries are attracted to high income areas. However, no a priori assumptions can be made about the direction of causality. To the extent that industries with high forward linkage potential are demand rather than input oriented, they would exhibit a tendency to be located in high income regions. On the other hand, their establishment in one region will undoubtedly boost the prospects for this region's growth and thus become one of the factors responsible for regional income differentials.

No matter what the line of causation, the main conclusion stands. Since low income regions have a relatively low portion of industries with high forward linkage potential, a pattern of expansion which emphasizes the inducement of investment through forward linkage is likely to lead to rising income differentials between regions.

Conclusions

This analysis has several important implications for regional development policies in developing countries. First, when developing countries formulate plans for investment allocation, they must consider the effect expansion in one industry will have in inducing investment in related activities. It has been argued that the strongest inducement comes from expansion in industries with high forward linkages; that is, industries such as chemicals, non-ferrous metals, iron and steel, paper - whose output is largely directed to intermediate demand. These industries are by and large the same in countries employing similar levels of technology.

This argument obviously does not mean that investment in industries with high forward linkage potential must be preferred at all times. Investment allocation must be based primarily on comparative cost and feasibility analysis. But among equally feasible projects, preference should be given to those generating the largest possible external economies through forward linkages.

It has also been demonstrated that, in a developing economy such as Greece, industries with high forward linkage potential and the activities stimulated by their expansion tend to cluster. This phenomenon is likely to be encountered in other developing countries. The reasons for clustering in Greece - large-scale relative to market size, dependence on imported inputs, dependence on skilled labour available in metropolitan centres, external economies resulting from spatial juxtaposition - are also likely to be present elsewhere.

Concentration thus appears to be the pattern of geographical distribution that maximizes the private profitability of industrial activities and complexes. A government is justified in interfering with this tendency to agglomerate only if it can show first, that there is a substantial divergence between private and social profitability and, second, that the latter will be maximized through decentralization. The attainment of maximum social profit will call for decentralization only if any of the following conditions prevail: (a) regions with low industrial activity actually possess locational advantages for the establishment of industries not yet exploited; (b) large external diseconomies result from industrial agglomeration.

In the absence of these conditions, tampering with the tendency of industry to agglomerate can only lead to decentralization for decentralization's sake, a policy with no justification from the standpoint of economic efficiency.

Since industries with a high forward linkage potential and their related activities tend to cluster in relatively high income regions expansion which emphasizes the forward linkage inducement will tend to exaggerate regional income disparities. In the absence of clear-cut divergence of social from private profitability, an attempt to locate a large portion of these industries in the low-income regions may diminish regional income differentials, but at considerable cost - the cost of a suboptimal geographic distribution of industry which would tend to lower the rate of income growth for the country as a whole.

Furthermore, an attempt to infuse growth in the low income regions by stressing investment in industries that are intensive - mostly industries with low linkages - is costly as well. The cost in this case is in the foregoing of external economies which would have induced a higher rate of growth for the country as a whole.

Development of underdeveloped regions in less developed economies may follow any of the following alternatives: (a) emphasis may be placed, where possible, on the expansion of those few high forward linkage industries which can be optimally located in underdeveloped regions; (b) attempts should be made to channel investment induced by expansion of the high forward linkage industries in high income areas to underdeveloped regions; industries in which economies of scale are not important, which are intensive in the use of unskilled labour and are oriented towards local demand, would most likely be optimally located in the underdeveloped areas; (c) a strong effort should be exerted where possible in the identification and development of the natural resources

of less developed regions. The development of a new resource can often lead to the establishment of resource oriented industries which will infuse growth in an underdeveloped region through either forward or residentiary linkages. In Greece, for example, the exploitation of bauxite ores for aluminium production was undertaken close to the raw material source and shifted the base of the aluminium industry from Athens to an underdeveloped area of central Greece.

Table 4

Greek regional industrial employment

Industry	Crete	Thessaly	Epirus	Thrace	Sterea Hellas	Ionians	Thessalia	Attica	Peloponnesos	Total
Apparel[a]	1,[illegible]	[illegible]	647	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Transport equipment	646	[illegible]	121	[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Leather and products	1,[illegible]	1,[illegible]	[illegible]	[illegible]	2,466	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Processed foods	6,132	[illegible]	1,969	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grain mill products	327	1,217	602	639	1,866	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rubber and products	50	[illegible]	1[illegible]	[illegible]	167	47	[illegible]	[illegible]	[illegible]	[illegible]
Textiles	685	[illegible]	296	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Machinery	452	1,441	156	[illegible]	1,422	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Iron and steel	–	–	–	–	1,344	–	–	[illegible]	–	[illegible]
Non-metallic minerals	797	[illegible]	[illegible]	694	4,1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lumber and wood products	[illegible]	[illegible]	[illegible]	1,504	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chemicals	[illegible]	[illegible]	[illegible]	16	1,436	246	[illegible]	[illegible]	[illegible]	[illegible]
Printing and publishing	[illegible]	[illegible]	136	[illegible]	194	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mining	[illegible]	[illegible]	[illegible]	[illegible]	4,284	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Petroleum and coal products	–	[illegible]	–	9	[illegible]	–	[illegible]	[illegible]	[illegible]	[illegible]
Non-ferrous metals	–	–	–	–	[illegible]	–	–	[illegible]	–	[illegible]
Paper and products	11	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	15,[illegible]	[illegible]	[illegible]	[illegible]	36,844	24,631	[illegible]	[illegible]	41,[illegible]	[illegible]

Source: National Statistical Service, Greece (1963) Recensement des Etablissement Industriels et Commerciaux.

a/ For ISIC designation, see table 1.

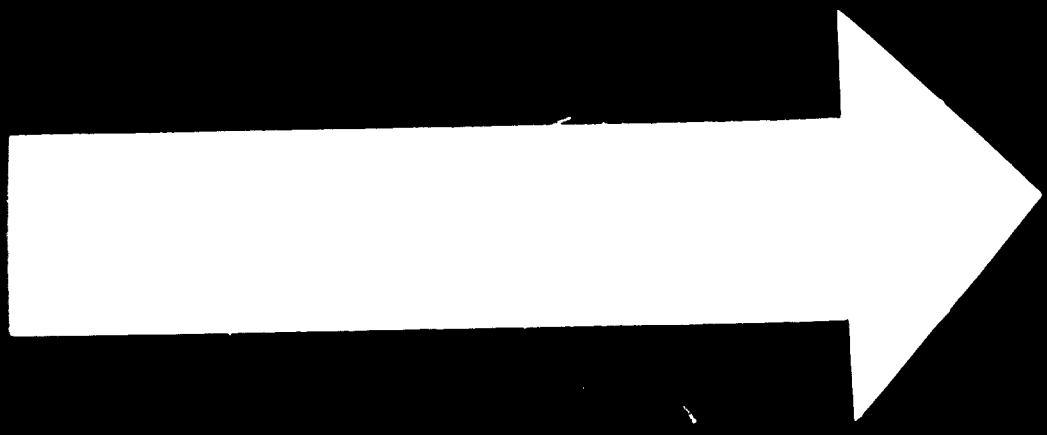
Table 7

Industrial employment in three Italian metropolitan centres

Industries	Italian Industrial Classification Code	Milan	Torino	Rome	Italy Total
Processed foods[1/]	3.01, 3.02 (except 3.01A)	30,048	11,315	9,742	321,023
Grain mill products	3.01A	2,854	1,415	2,919	111,945
Textiles	3.03-3.05	84,964	45,032	4,270	592,131
Apparel	3.06	41,550	17,009	11,794	349,977
Leather and products	3.07-3.08	22,635	8,427	4,475	226,722
Lumber and wood products	3.09-3.10	40,086	14,983	11,416	378,246
Iron, steel and non-ferrous metals	3.11, 3.12A 3.12E, 3.15	114,996	45,191	5,073	371,908
Machinery	3.13-3.14	189,843	78,389	13,482	578,196
Transport equipment	3.16	30,903	87,870	1,233	234,861
Non-metallic minerals	3.17	20,869	7,753	10,796	311,546
Chemicals	3.18, 3.21	86,375	14,096	12,953	254,869
Petroleum and coal products	3.19	3,167	226	608	23,984
Rubber and products	3.20	20,230	13,603	1,923	49,822
Paper and products	3.22	13,590	6,282	2,610	81,799
Printing and publishing	3.23	31,203	9,291	17,155	111,757
Other industries	3.24-3.24	33,211	11,395	6,927	117,569
		776,824	372,366	117,376	4,116,355

Source: See Italian data, table 4b.

1/ For ISIC designation of industries, see table 1.



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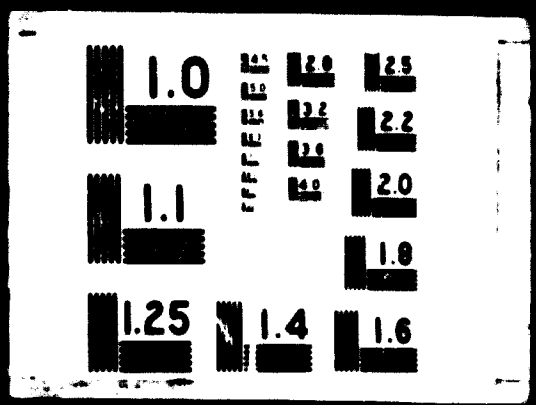

2. RELEVANCE OF INTERMEDIATE INDUSTRIES AND INDUSTRIAL SERVICES FOR CORRECT LOCATION PLANNING

by E. S. Tosco[1]

Auxiliary industries and industrial services

Technological specialization is a feature of modern manufacturing industries in developed countries. Other things being equal, specialization reduces investments in machinery and plant, enables fuller use of plant and equipment and minimizes the required proportion of skilled manpower. In short, it steps up productivity.

Many of the interindustry relations derived from technological specialization exert an influence on industrial location independent of transport cost considerations. Both need and convenience require manufacturing industries to be located near auxiliary industries and industrial services. These requirements, felt to a greater or lesser degree by different industries, constitute the interindustry relations factor which, together with transport costs, infrastructure and site requirements, labour supply and public industrial policy, make up the ensemble of industrial location factors.

Interindustry relations that are important location factors include:

- Specialist units for maintenance and servicing of machinery and equipment, and related facilities;
- Subcontractors and specialized processing units;
- Intermediate industries or local depots supplying standard and catalogued products;
- Various technical and commercial services for industry.

Maintenance units, subcontractors and specialized processing units are auxiliary industries and should be distinguished from industrial services such as local commercial depots, for example. Broadly speaking, industrial services

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1/ "Italconsult", Rome.

may also be taken to mean all those interindustry relations (of intermediate supply and demand) that have a direct influence on industrial location.

Specialist units for repair and maintenance provide services to keep the means of production of the industries they serve in good working condition. In particular, such units are concerned with the repair and maintenance of tools and gauges, processing installations, vehicles and buildings. They should be distinguished from general repair shops, which provide for the repair of machinery. Maintenance units vary according to the kinds of tools and machinery with which they deal,[2] in the composition of the highly skilled manpower they use and in the machinery with which they are equipped. Specialization of the maintenance units is therefore one of the conditions guaranteeing the efficiency and low cost of the services they provide.

The specialization of these maintenance units is reflected in the range of their customers. The majority of the units work for specific sectors and only a few, such as building maintenance units, provide services for a number of industries.

Specialist units for maintenance require, in turn, the services of supplementary specialized units which supply them with made-to-order parts and apparatus such as welding units and heat treatment equipment. Maintenance operations also call for the existence of local spare parts depots.

Maintenance services are generally required by all enterprises because their internal services normally operate only in the intervals between overhauls.[3] Outside service supplied by the specialist deals with non-routine maintenance and periodic overhauls.

Such services are normally not self-supplied in large plants and the periodic overhaul of machinery and installations is subject to considerable

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2/ The needs of specialization for certain types of machinery are such that the makers themselves supply the repair and maintenance services through their own workshops in the various centres.

3/ The internal service of most enterprises is limited to normal checking and adjustment of machinery and equipment and replacement of quick-change parts. Obviously there are exceptions; some types of industries, for example, are self-contained as far as maintenance of certain specific processing installations is concerned. However, even these industries have recourse to specialist units for the maintenance of machinery, means of transport and the like.

seasonal variations.[4] In a number of large plants engaged in certain industrial sectors, however, maintenance and overhaul are effected exclusively by internal units, as a result of exogenous elements which are analysed later in this study.

Maintenance units must be located near customer plants so that workmen and technical staff can reach them within a short time and materials can be delivered quickly. Frequent contacts between customer units and maintenance units are also necessary, because in the intervals between overhauls, a number of operations have to be arranged, such as the preparation of materials.

The radius of economic utilization of the maintenance units is therefore limited. It varies according to a number of factors, including the speed of transport and communications in a given area. Generally speaking this radius may be up to 50 km (for certain types of units, up to 100 km).

Subcontractors and specialized processing units produce materials or components or supply processes for the articles produced by the customer firms. These processes are made-to-order according to required specifications. In general, the subcontract and specialized processing units supply enterprises within a single sector.

For this type of auxiliary industry, specialization results in lower costs. In many cases, if the processes were effected by the customer units - even those of large size - they would seldom be able to achieve the cost levels attained by the specialist units, which receive orders from a large number of customers and can utilize the most productive machinery and equipment. In other cases, subcontractors are called in even when the customer units possess suitable machinery because full utilization of the necessary machinery is not possible. There are other techno-economic reasons which make it advantageous for a given enterprise to carry out auxiliary processes within its own factory but to entrust them instead to specialist firms.[5]

4/ The periods differ according to the type of servicing (major, intermediate or minor overhaul) and according to the type of machinery. In Europe the periodic overhaul of general service systems and specific processing installations generally takes place when the factories are closed for holidays.

5/ See European Economic Community (1966) Study for the Promotion of an Industrial Development Pole in Southern Italy, 2 vols., Economic and Financial Series, Study No.5, Brussels.

In many industries production schedules and product quality depend heavily on subcontractors and specialized processing units. This requires a constant qualitative check on production and on the regularity of deliveries. Frequent contact, sometimes daily, is necessary between customer firms and the auxiliary industries.

The radius of economic utilization of subcontractors and specialized processing firms is also limited. Depending on the characteristics of the transport and communications system, the maximum for such a radius may be 100 km, a distance permitting frequent contacts and a shuttle service. For certain processes that have fixed time limits, the maximum distance could be extended to 200 km.

Similar location requirements apply to plants in a multiplant firm when each unit turns out a part of the same product or products. Analogous to the case of subcontractors is so-called domestic out-working. This generally consists of hand assembly of components or work with small machines. Frequently the reason for out-working is the need to find labour, especially female, or the advantage of paying lower wages.

Among the factory inputs are standard and catalogued products produced by intermediate industries. These materials and products, used on a large scale in industry, generally comply with national or international standards (standard products) or are decided by the individual firms producing them (catalogued products). The use of such products does not necessitate contacts with the manufacturers as does that of made-to-order products. Thus, there is normally no need to be near industries which manufacture for the national or international market, nor is proximity necessitated by transport cost considerations. Many of these products are quoted at nation-wide prices and for the remainder the incidence of transport on total production costs is not significant for the majority of customer industries. However, firms in industrial centres do benefit from local depots supplying standard and catalogued products because they stock together the whole range of such products in sufficient quantities to meet the widely-varying demands quickly. These local depots may be the commercial branches of the producing firms or wholesale commercial distributors.

The advantages of local depots are many: customer factories can hold lower internal stocks, mistakes in supplies can be corrected almost immediately, and production stoppages or imbalances can be avoided when infrequently used products are needed urgently.

Raw materials, too, have a homogenous market similar to standard and catalogued products and raw material depots in industrial centres offer parallel advantages.

Auxiliary industries and industrial services locate in large industrial concentrations because the economic size for their operation implies support by numerous customers. Equivalent demand conditions may occur in smaller agglomerations of industries of a given sector or subsector (specialized concentrations) such as certain textile districts, shoe industry districts and electronic industry districts. In either case the availability of auxiliary industries and industrial services is an aspect of the economies of concentration, that is the external economies occurring in industrial concentrations.

In appendix 3 the role of interindustry relations is examined in the formation of external economies, taking account of the other integration factors. As explained in this appendix these economies may be grouped under two headings: general external economies, deriving from the purely quantitative agglomeration of industrial activities, and sectoral external economies, which derive from the agglomeration of industries with homogenous inputs.

General external economies refer not only to the advantage of infrastructure and site (standard requirements) and of labour supply (including skilled labour, but limited to skills that are widely used), but also to maintenance units common to the majority of manufacturing industries, to those depots of standard and catalogued products for which there is extensive demand and to industrial services of a general nature.

Sectoral external economies refer not only to specialized infrastructures, special site requirements in some cases, and skilled labour supply, but also to the whole system of interindustry relations which an industry in a given sector requires (sectoral services).

Sectoral external economies and in particular sectoral services are the basic attraction which large industrial concentrations offer to manufacturing industries with a high degree of technological specialization.[6/]

6/ In large industrial concentrations there are numerous other advantages that could be included, apart from the external economies mentioned above, such as easier sales and after-sales services for a large proportion of the customers. Even in the case of industries that sell to the domestic and international market, location in a large concentration means they have a considerable number of customers in the immediate region - obviously a great advantage. It should be noted, however, that among these advantages, the reduction of transport costs in delivery is, as a rule, of very little importance.

Finally, it should be noted that the large concentrations in developed economies are complex economic spaces made up of industrial centres whose radii of utilization of sectoral services often overlap, thereby covering entire regions and spreading to parts of adjacent regions.

The need for auxiliary industries and industrial services

The need for auxiliary industries and industrial services varies according to the field of activity of the processing industry. In general, needs are greatest in the manufacturing industries where technological specialization prevails, and least in the basic industries, due to emphasis on technological integration. Such needs vary, however, within the manufacturing industries themselves, affecting the question of location which is also influenced by other location factors.

It is important therefore to know the extent to which different industries require auxiliary industries and industrial services, and to determine in which industries this factor tends to predominate in the choice of location.

Industries may be grouped as shown below, bearing in mind that the predominance of one factor does not signify that the other factors are not taken into consideration.

Industries group	Predominant factor
Market-oriented industries	Transport costs
Material-oriented industries	Transport costs (and special site requirements)
Sectoral services-oriented industries	Interindustry relations
Other industries	None

The market-oriented industries are those in which each plant produces for a regional or local market[1/] because of high transport cost in relation to the value of the product (many standard food products and drinks, various wooden products, construction materials and bulky containers).

In this group the need for services from auxiliary industries is generally limited to those provided by maintenance units; the need for local depots of

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1/ The size of the market served by these industries varies according to the products, the distribution of the customers, the ease of the transport system, the commercial organization of the firms and so on.

materials and products used in their processes is reduced. Location is thus not influenced by the availability of such services, but by the market. These industries make use of the services available and may even provide services to others.

Activities characterized by a service element which must be near their customers may be placed within the market-oriented group. They are mainly small-scale activities operating for the local market and with limited need for industrial services (small mechanical workshops repairing all manner of machinery, vehicles and domestic equipment; shoe repair units, tailoring, dressmaking, small furniture works etc.). This group is known as scattered pattern or geographically protected industries.

Among the market-oriented industries one may also include the auxiliary industries themselves (specialist units for maintenance, subcontractors, specialized processing units) in relation to the sectors which they specifically serve.

Material-oriented industries are those which produce for national and international markets and whose transport costs for bulky raw materials are an important component of total production cost. Such industries locate near domestic supplies of raw materials (extractive materials or agricultural produce), or near ports if they rely on imported raw materials. In the latter case the location factor, "special requirements of infrastructure and site", may become decisive (for example, in the case of a refinery, deep-water berths are required for the tankers).[8/]

Basic industries belong to the material-oriented group (steelmaking, heavy chemicals, petrochemicals, mineral oil refining etc.), as do a limited number of other industries (some metalliferrous products, paper mills, certain food industries such as vegetable oil mills, grain mills and sugar factories).[9/]

In general, material-oriented industries are technologically integrated complexes with continuous processes requiring only certain specialist units for maintenance, but not subcontractors.

8/ For some industries in this group, special site requirements also depend on the processes used.

9/ Industries such as the aluminium industry which, although influenced by the supply of raw materials, are energy-oriented, may be included among the basic industries.

However, a zone chosen because of lower transport costs and special site requirements need not be rejected for lack of such auxiliary industries. If they do not exist, they can be provided within the plants. The additional cost is irrelevant in relation to the total cost of production. For example, some petrochemical complexes that have sprung up in virgin zones are self-contained; others, located near industrial centres, limit their internal maintenance facilities to equipment required for emergency repairs and routine maintenance.

A few material-oriented industries such as food production may find it advantageous to be near not only specialist maintenance units but also other auxiliary industries (containers etc.) and certain technical services such as laboratories as well as local depots of materials used in their processes. Technical services exist in zones where there is already a certain agglomeration of such industries, as in some vegetable oil refining and food canning districts but the advantages of location relative to transport costs of raw materials remain predominant in these market-oriented industries. This explains the presence in a number of zones of the kind of factory which can operate economically without the support of auxiliary services.

Sectoral services-oriented industries are factory industries for which the predominant location factor is interindustry relations. They are industries with processes that involve technological specialization. Their output is generally destined for the national or international market. The most important industries in this group are the metalworking industry (general, electromechanical, electronic and precision engineering), the textile industry (wool, cotton, other natural fibres, synthetic fibres), the hosiery industry and the shoe industry.

In order to be competitive, these industries need specialist units for maintenance, subcontractors and special-process units, local depots of standard and catalogued products. Consequently, they must locate in areas where there is already an agglomeration of industry of the same sector.

The phrase "agglomeration of industry of the same sector" does not necessarily signify a geographic pattern. On the contrary, in some small countries with a long industrial tradition, such as England, there are no concentrations of metalworking and other industries. For example, in England there are a number of scattered metalworking centres whose over-all influence dominates the country.

Once the interindustry relations factor has been examined, much importance is often given by metalworking industries to the labour supply factor (skilled workers and/or workers with special characteristics) and to site requirements. This leads to a preference for locating in industrial centres and even justifies locating on the fringes of such centres if the industries concerned are still within the radius of utilization of their sectoral services.[10]

In general, metalworking industries should be close to toolshops, foundries, forges, auxiliary industries providing machining and presswork facilities and maintenance units as well as to the depots supplying their standard and catalogued products.[11] There are, however, some light engineering and electronics industries in which assembly and simple repetitive work prevail. These industries have less need for auxiliary industries and are sensitive to labour supply, especially female labour. Such industries

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[10] Generally the incidence of the additional transport costs on materials and for delivery between such centres or areas is negligible.

[11] In detail, the auxiliary industries for metalworking industries consist of various types of toolshops which repair, modify or construct specific tools used for metal-cutting, metal-forming and assembly; maintenance and overhaul units for general service systems, specific processing installations, constructions, electrical machinery, electrical parts of various machines, metal-cutting machinery, metal-forming machinery, store equipment and transport equipment. Various supplementary units see to the supply of specific materials and processes required by the toolshops and maintenance units (welding, stamping and forging, heat treatment etc.). The numerous types of metal-working auxiliary industries are flanked by subcontractors and "specialized processing firms", e.g. foundries and forges, which supply the client with made-to-order castings, hot-stamped items, hot-forged items, for production, normally in series; units which provide heat treatment, cutting and forming processes, which fabricate gears, nuts and bolts, special heat-hardened elements and thermoplastic items, extrusions, sintered products, microcastings etc. Most of the various auxiliary industries are at the service of all sectors of metalworking industries, but there are some which are specific to particular sectors. The trade depots supplying standard and catalogued products stock numerous types of intermediate units. Some of the intermediate industries are themselves metalworking (producers of standard nuts and bolts, hardware, metal tapes, springs, radiators, hydraulic cylinders, bearings, steel ropes, flexible piping, roller chain, I.C. engines, electric motors, compressors, electrical and electronic material for industrial use etc.), and some belong to other sectors of industry (industries making fabrics, vegetable stuffing and felt, artificial leather etc., plywood and semi-finished wood items, tires, inner tubes and cushions, various rubber articles, belts, linings, welded articles, insulating materials, various chemical products such as paints, resins etc., normal and plate glass products etc.).

frequently locate in small towns which may be distant from the large concentrations where metalworking industries tend to set up.[12]

Textile industries, depending on the sector involved, locate in areas served by various types of specialized maintenance units - including specialized machinery suppliers - as well as by various auxiliary industries such as dyeing and finishing specialists, plus certain suppliers' and buyers' services.[13] Areas where hosiery industries locate offer similar auxiliary industries and services.

The centres in which the shoe industry tends to locate offer units specialized in the maintenance of shoe-making machinery, units for closing uppers and the like, as well as depots supplying materials and various commercial services to the sector.

The group termed other industries may be considered to consist of all those industries with a wide market for which there is no clearly preponderant location factor. This group contains a wide range of factories producing consumer and intermediate goods such as certain food industries and wood products industries not included in the preceding groups, tobacco, clothing, leather goods, rubber and plastic products, paint and varnish, detergents, pharmaceuticals, and various light chemicals.

The industries in this group need few auxiliary industries apart from those concerned with maintenance. A paint factory, for example, may consider locating near a unit producing printed metal cans; a medium-size detergent unit near a paper carton producing unit and so forth. As a rule, the importance of transport costs for raw materials and other materials is not high in this group.

12/ When an analysis of the metalworking sectors is made in greater depth, various types of industries having particular location aspects appear. The same would also be true in other groups of industry. For example, as shipbuilding must be located on the coast, it may have to organize itself in some respects as a self-contained unit, if certain auxiliary industries are not available in the area. With both shipbuilding and heavy structural steel work, the high volume of iron and steel inputs means that the transport costs of such materials account for a considerable proportion of total production costs. This is not generally the case in most metalworking industries.

13/ The spinning and weaving of synthetic fibres have less need of auxiliary industries than has the traditional textiles sector.

Notwithstanding these and other conditions which might lead to the assumption that they enjoy considerable autonomy of location (greater spatial flexibility), industries in this group generally tend to set up in existing large concentrations. This is because the requirements of the various location factors are better satisfied here, thanks to the advantages called general external economies. Among these advantages is the presence of a large proportion of customers in the immediate region (facilitating sales and customer services). This aspect is closely considered by industries in this group when choosing a factory location, especially by those types of industry in which plants are normally not large.

On the other hand, industries within this group which require a large quantity of general or female labour may find the advantages offered by the large concentrations out-weighed by those offered by areas with a supply of this type of labour.

In conclusion, it may be stated that the availability of auxiliary industries and industrial services within a reasonable radius constitutes a location factor for all industries. It becomes the predominant factor only in certain sectors in which it is a fundamental condition for efficiency and competitiveness.

These sectors have, however, great importance in the general framework of industry and condition the level and rhythm of development. In developed economies, sectoral services-oriented industries contribute about half the total product and employment of the manufacturing industries. Metalworking industries alone can contribute up to 40 per cent of the total and also have one of the highest rates of industrial growth.

In developing regions and countries, these sectors, especially those engaged in metalworking, constitute a determinant for future industrial development.

Auxiliary industries and industrial services in the location and development of industries in the Mezzogiorno

The lack of auxiliary industries and industrial services as an obstacle

The southern region of Italy - known as the Mezzogiorno - is characterized by the following points: a relatively low *per capita* income (about half that of the developed regions of northern Italy and of the European Economic Community (EEC) average); a considerable part of its labour force still engaged

in agriculture; an insufficient level of industrial activity, many sectors of which have limited competitivity; and a low availability of skilled manpower. With the creation of the EEC, the Mezzogiorno was faced with the problem of increased competition from regions which are among the most highly industrialized in the world and which, within the new framework, exert an increasing attraction for industrial investments.

Most of the industries in the Mezzogiorno are typically market-oriented and are located in the main towns. In per capita terms their performance is only 40 to 60 per cent of the level of corresponding industries in northern Italy. This may be considered adequate if comparison is made between the per capita product or per capita income in the Mezzogiorno and that in the North (indeed, market-oriented industries operate for a demand which is a function of the regional product and income).

Among the material-oriented industries, basic industries have expanded considerably in the Mezzogiorno, especially during the last ten years. Important steel plants have been built, and the petrochemical industry has reached a per capita product of more than 80 per cent of that in the North. The creation of large industrial complexes (basic industries) in the Mezzogiorno, favoured by the regional development policy, has been made possible by the discovery of natural resources (methane etc.) and by the erection of new port facilities for the importation of raw materials (oil, coal, iron ore, etc.). The agricultural processing industries (vegetable oil refineries, grain mills, canneries, etc.) in the southern region have reached a higher level than those in the North.

However, all the material-oriented industries taken together make but a limited contribution towards the product and employment aggregates of the Mezzogiorno (the same is true of developed economies).

The industrial gap between the southern and the northern regions of Italy becomes even more apparent when considering the industries which in this study are called sectoral services-oriented industries and other industries. On average, these two groups reach a per capita output of barely 10 per cent of that of corresponding industries in the North. In the former group, this level is achieved by metalworking industries (excluding small mechanical repair shops), traditional textiles and synthetic fibres. In the latter group, the manufacturing industries which use materials supplied by the petrochemical industry also achieve about 10 per cent, while others reach a maximum of

70 per cent. Notwithstanding the completion of certain new establishments of considerable size - some of which owe their existence to public holdings - the flow of investments into these sectors in the Mezzogiorno is insufficient to bridge the gap.

In brief, the Mezzogiorno (and other similar regions on the periphery of the EEC, such as southwest France) is characterized by geographically protected industries (local market-oriented industries and material-oriented industries) and a lack of attraction to other industries.

In order to ascertain the reason for this lack of investment flow into the Mezzogiorno it is necessary to refer briefly to the ways in which the industries in question expand, i.e. industries which at present are located mainly in the large concentrations of the more developed regions.

One element which tends to favour the present geographical pattern and results in these industries remaining in the large concentrations (quite apart from conditions regarding industrial location in the Mezzogiorno and other regions), is that only one third of the investments of these industries is spent on building new plants. Two thirds of the investments are used to expand existing plants, thus avoiding the problems involved in establishing new factories and making possible economies of scale. Even in cases where it is not feasible to enlarge the existing plant, there are many advantages[14/] in building a new plant as near as possible to the old one.

It is not always possible to increase production by such solutions (for example, because there are not sufficient building sites nearby or owing to local labour shortages).[15/] It is only in such cases - estimated by the EEC to amount to less than one fifth of all investments - that location in peripheral regions such as the Mezzogiorno may be considered.

In practice, preference is given to locate new plants on the fringes of existing industrial concentrations, in nearby regions and in depressed regions (regions with an industrial tradition but undergoing a structural crisis) where

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14/ Possibility of using the same suppliers; ease of moving materials between the two establishments; facility of management and supervision; less staff and training problems such as transfer of key workers.

15/ In some areas industrial activity may grow faster than the population of the city centre, and so on.

industrialists can not only find space and labour (skilled, or with special characteristics) but also count on auxiliary industries and industrial services.16/

On the fringes of industrial concentrations, a new plant is still within the economic radius of utilization of the sectoral services of one or more centres of industry. In depressed areas such sectoral services may be readily available for the relocated metalworking industries.

Although enterprises in some industries move mainly because of local labour shortages and/or because they need more manufacturing space (during periods of general economic expansion), these are not the main location factors for many important sectors such as metalworking industries. For the latter the prime factor is interindustry relations (availability of auxiliary industries and industrial services) which peripheral regions are unable to supply.17/

Comparative analyses of the location pattern in the large industrial concentrations of the EEC area (and its zone of influence) and comparative studies of the conditions and operating costs of industries show that the lack of auxiliary industries and industrial services (which for the moment cannot be overcome) is the main reason why the Mezzogiorno is not attractive to industries seeking a new location.18/

16/ For certain industries, one of the additional advantages to be gained from location in such areas is that of remaining close to a large part of their clientele.

17/ The results of surveys made in recent years in some European countries (the United Kingdom, France etc.) on the reasons underlying plant location point to the labour factor as being the most frequent cause for relocation. When firms have to make a choice between alternative locations all offering the required sectoral services (although with greater or lesser facility), it is obvious that in this context labour supply may be the determining factor. In some European countries such as the Federal Republic of Germany and the United Kingdom the geographical field of choice covers most of the country (though perhaps discontinuously) because of the number and distribution of existing industrial centres and the radius of utilization of their services. There is some truth, therefore, in the statement of some economists that the trend in industrial development is towards a growing share of "footloose" industries (metalworking industries and, in general, the manufacturing industries) but this "footlooseness" is not directed towards the peripheral regions.

18/ For the EEC study a number of major firms were asked about the main factors affecting the location of their new plants. The most frequent replies to this question were: labour and site requirements. However, in reply to the specific question why they had not considered setting up in virgin regions such as the Mezzogiorno, almost all the metalworking firms pointed to the lack of auxiliary industries and industrial services essential to them; to this they added the problems of selecting and training local workers.

The EEC-Italconsult study[19] shows that in the most important industrial areas of the Mezzogiorno, the infrastructures and site requirements comply with European standards. In these areas there are the undoubted advantages of good supplies of general and female labour. The study acknowledges the organizational difficulties in selecting and training local workers in the Mezzogiorno but notes that, at times of relatively full employment, these problems and costs must be faced when locating large plants, even when these are sited on the fringes of the large concentrations and in adjacent regions.[20] Workers in the Mezzogiorno learn quickly and well and, if the job is done by firms experienced in setting up new establishments, the time required for training, construction and start-up can be kept within acceptable limits.[21] Supported by numerous statistical data, the study states that the increase in transport costs for most of the manufacturing industries (non-material oriented and having wide markets) in the Mezzogiorno amounts on the average to less than 1 per cent of the total cost of production.

It is in the field of interindustry relations that conditions in the Mezzogiorno appear to be decidedly negative. While large industrial concentrations offer efficient networks of auxiliary industries and industrial services, these are missing or inadequate, even in the most important areas of the Mezzogiorno where there is a certain agglomeration of industry. This deficiency causes serious production difficulties, increases production costs and cancels out the effects of incentives.

The fact that metalworking industrie in the Mezzogiorno have, in many cases, to look to toolshops in the North (more than 800 km away), makes delivery delays more frequent. Delays in the delivery of new or in the repair of

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19/ European Economic Community (1966) op. cit.

20/ For metalworking industries setting up in the Mezzogiorno, the additional costs of selecting and training local workers plus those incurred during the start-up period (over and above what these would be for setting up similar establishments in the North, but not right in the firm's "home district") amount to 1 or 2 per cent of the total value of the investments. In practice, these increased capital costs are more than offset by capital grants to new industries setting up in the Mezzogiorno.

21/ See also "The problems of the development of metalworking industries in Southern Italy and experiences thereon of interest to developing countries" by V. Valletta, Chairman of S.A. Fiat, Turin, Italy.

old specific tools make it necessary to use alternative emergency tooling if production is not to be halted, even though this may involve a longer production cycle. Alternatively, it may be necessary to stop production of the component involved, while continuing to produce other parts for stock, or to assemble an incomplete finished product (which also increases stocks). In the first case, labour costs increase, while in the other two cases - apart from overtime payments in order to restore the balance of production - increased financial charges are incurred by producing for stock and not for sale. Establishments which carry out the repair of their own specific tools also incur higher costs because they have to equip themselves with machines and skilled labour which are considerably underemployed because the calls for their services are intermittent and variable.

The need to look to the North for machinery and equipment maintenance services owing to the lack of such units in the South likewise leads to delays, stoppages and production upsets with damaging consequences of the kind described above. Firms which carry out their own overhaul and maintenance work likewise have to face higher costs.[22/]

Excluding craft units, there are not sufficient foundry and forge services in the Mezzogiorno. Supplies must be drawn either from the North or from local self-contained metalworking plants which also turn out supplies on a discontinous basis for other establishments. This results in delays and losses, which can be partially avoided by carrying heavier inventories of such materials. On the other hand, it is not an economic proposition to equip an establishment with its own forge and foundry. The same applies to processing and treatment services.

Higher production costs arise as a general rule from the insufficiency or complete lack of subcontractors, which leads to additional investments in machinery that cannot be fully employed. In the Mezzogiorno it is also necessary to carry larger stocks than in similar establishments in the North, in order to make up for the insufficiency or complete lack of local depots carrying standard and catalogued products.

22/ It should be noted that when establishments attend to their own repairs of specific equipment and to the maintenance of all the machinery, the additional problem arises of the lack of supplementary units to supply the necessary materials.

From inquiries made for the EEC study, it appears that on the average the inadequacy of the auxiliary industries and industrial services in the Mezzogiorno results, either directly or indirectly, in increased costs of production amounting to 10 per cent or more (depending on the various metalworking activities, the size and production organization of the plants). To this must be added the problems and the difficulties which assail the managers and technicians, even though these are not quantifiable factors. If account is then taken of the fact that there are no great differences between North and South, as regards the other cost elements taken as a whole,[23] and that the various incentives offered by the industrial promotion policy reflect on operating costs to the extent of 2 to 5 per cent (lower depreciation costs, lower interest charges, etc.), it is not surprising that there is no great flow of investments to the Mezzogiorno.

It is only in certain types of metalworking activities, where interindustry requirements are relatively negligible and the need for unskilled or female labour is high, that there is a net advantage after taking the effect of incentives into account. This explains the location in the Mezzogiorno of a number of structural steelwork plants, light metalworking industries and electronic factories, where assembly is all-important.

The main reason for the lack of auxiliary industries in the Mezzogiorno is the absence of intermediate demand locally. There are few metalworking industries; the incipient agglomerations of industrial areas are formed by heterogeneous industries, in terms of inputs. It should also be stated that in the one industrial area of the Mezzogiorno (Naples) where metalworking activities have reached a certain level of importance, many essential types of auxiliary units are missing.

To remedy the present situation the metalworking industries of the region, especially the larger plants, formed an organization to make good, as far as possible, these missing services. Such an organization requires considerable additional investments, which must be amortized over time, and an additional pool of skilled workers. While the shortage of services persists, machinery and special equipment have to be renewed continuously. The difficulties have been accentuated by certain policy measures (preferential supplies to the

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23/ For detailed statistical analysis, see the EEC (1966) op. cit. and particularly the projects which contain comparative analyses of the operating costs of similar projects in the North (Milan area).

government etc.). These measures, however, permit the industries in question to operate with a certain degree of profitability, notwithstanding the lack of auxiliary industries and industrial services.

As far as the textile industry is concerned, there are no great obstacles to the location of synthetic fibre plants in the Mezzogiorno, because the synthetic fibre sector has less need of auxiliary industries than the traditional textiles sector. The advantages of a good labour supply and the effect of incentives have indeed led to the setting up of some important establishments. The fact that there are still not as many industries of this kind in the Mezzogiorno as in the North probably reflects a tendency to continue to locate in traditional areas even though the main reasons for doing so are no longer valid. On the other hand, the development of the hosiery industry in the Mezzogiorno is slowed down by the lack of suitable industrial services, despite the female labour supply situation.

Finally, although it is not mainly the lack of industrial services which stops more industries in the "other industries" group setting up in the Mezzogiorno, the interindustry relations factor has an indirect effect on many of these. In fact, a number of the industries in this group produce intermediate items, especially for the metalworking industry and, as almost all their national clientele are in the North, such industries are not anxious to locate in the Mezzogiorno (even though transport costs on delivery do not play an important role in the total production costs).

It may be concluded that the lack of auxiliary industries and industrial services is the main reason (either alone or together with other reasons) why most industries in the Mezzogiorno are local market-oriented or material-oriented, and these, as such, cannot ensure a high level of employment and industrial output in the economy.

Experience with the industrialization policy for the Mezzogiorno - a pilot study for the EEC

During the last decade, the Mezzogiorno has been the object of an intensive industrial development policy. The instruments of this policy are those used in other European countries: public expenditure on infrastructure, the creation of industrial estates in industrial areas, grants and other incentives

to new industries, direct investment in industry by public holding companies [IRI, etc.].[1/]

The goals of this policy include the provision of a modern and efficient general infrastructure, a necessary premise for the industrial and economic development of the area. The present transport system provides an adequate link between the main industrial areas of the southern region and the large centres of industry and consumption in northern Italy and in the EEC countries. The bare port installations may be considered key items for the basic industry complexes. The industrial estates not only offer suitable manufacturing sites, but also solutions to urgent problems of town planning and regional physical planning. Various measures deal with the problem of the lack of local manpower. The direct participation of the Government through public share holdings helped to increase activity in important sectors (steel complexes, petrochemical and metalworking industries, etc.). Above all, for the first time in the history of the Mezzogiorno there has been a modification of the traditional economic and social structure.

Although good results have been obtained in market-oriented and material-oriented industries located in the Mezzogiorno, those in other industrial sectors leave much to be desired. It has been possible to get the industrialization process under way, but it suffers from sectoral imbalance, which restricts industrial development. The EEC study - made with the collaboration of the Committee of Ministers and of the Cassa del Mezzogiorno - aims at identifying the limitations of the policy adopted and includes suggestions for new guidelines and measures. The results of this study are worth summarizing here insofar as the limitations concern the field of interindustry relations.

The areas of industrial development were selected with the objective of progressively establishing industrial concentrations in the Mezzogiorno which, with their growing economic efficiency and the multiplier effects deriving from the interrelations of their enterprises, could make accelerated industrial

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1/ Tax relief, contributions from sinking funds, financial aid, state share participation, capital grants, etc. for new industries setting up in the South. Among the various incentives offered, the Mezzogiorno can supply a guaranteed percentage of the central Government's requirements from industry. Considerable funds are allocated for the creation of infrastructure in the areas of industrial development, including the industrial estates. Funds are also allocated for the industrialization nuclei to foster smaller industrial agglomerations.

development possible. However, the industrial development areas, inspired by the British experience of development areas, did not prove to be sufficiently attractive for sectoral services-oriented industries, especially the important and dynamic metalworking industry and industries directly or indirectly connected thereto. The problem was a vicious circle. It is interesting to note that in the United Kingdom, the Scottish Highlands have attracted practically no industries as a result of the development areas policy. Like the Mezzogiorno, the Scottish Highlands are undeveloped industrially; in other parts of the United Kingdom where the policy has proved successful, the development areas corresponded to old industrial districts. Although for various reasons (unemployment etc.) these other areas were in a depressed state, industrial bases (auxiliary industries, industrial services etc.) already existed and hence new plants could be established without difficulty.[25]

The industrial areas policy in the Mezzogiorno followed well-known theories on regional economies, in that steps were taken to promote the establishment of a leading firm (usually a steel complex, a petrochemical complex etc.) as a nucleus which would induce industrial investments. The EEC study shows that such a complex (apart from its direct economic and social effects on the zone) has limited multiplier effects. The initial establishment in certain cases of just one part of a whole steel or petrochemical complex followed by the completion of the whole operational unit cannot be considered a true case of induced investments.[26] The creation of a complex may, at the most, give rise to a few plant and construction maintenance units. Industries which use products from the petrochemical complexes as material inputs are, in view of the high value of such materials, not material-oriented in general. It may be thought that the existence of a steel complex would generate the

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[25] W. F. Luttrell (1962) Factory Location and Industrial Movement, Vol.1, National Institute of Economic and Social Research, London, p.346.

[6] Sometimes only some of the cycles of a complex may be set up (e.g. a hot-roll mill for a steel complex or a chemical complex producing only intermediate synthesized products). Then later, if the required conditions arise (market growth etc.), the complex can be completed (e.g. with the inclusion of a cold-roll mill or the production of basic products such as resins). This step-by-step implementation of the various integrated cycles cannot lead to the original unit being regarded as a "prime mover". In reality, it is the beginning of a chain which, if supplemented (perhaps without being completed), has well defined limits. Finally, it should be remembered that it is irrelevant, as far as this case is concerned, whether the units of the complex belong to the same firm or to different firms.

establishment of metalworking industries; however, transport costs of iron and steel are no longer determining factors for the location of metalworking industries.[27] Similarly, the possibility of a large metalworking plant acting as leading industry in the way indicated must also be excluded.[28]

In other words, without the creation of an industrial environment any incentives remain ineffective. While present conditions persist, it will be difficult for the areas of Mezzogiorno to expand more rapidly and to become modern industrial centres.

The EEC study proposes a sectorally differentiated policy with preferential use of incentives. Support should be given mainly to industries which can move to the Mezzogiorno only with considerable difficulty (i.e. precisely those industries characteristic of developed economies). The various branches of the metalworking sector should be given priority as they present the best possibilities for development. Industrial development policy should aim at geographical concentration during the initial period, so as to favour the rapid formation of industrial agglomerations and thus the creation of general external economies.

Another general guideline is the creation of a sound production structure for the development poles and nuclei, taking account of interindustry relations and specialization criteria that favour the emergence of sectoral external economies.

The implementation of this new policy requires the selective utilization of existing incentives and the creation of additional ones. To develop the sectoral services-oriented industries and break the vicious circle of the shortage of auxiliary industries and industrial services in the Mezzogiorno, it is concluded that a new instrument is required. The development of branches of the metalworking industry, in particular, would be affected but other sectors such as textiles and shoe manufacturing could likewise benefit.

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[27] The mere presence of a new steel complex does not automatically lead to the establishment of a whole range of new industries, but often to the creation of specific production lines, such as that of concrete from blast-furnace slag.

[28] Such considerations can be satisfied only by the creation of a really huge plant, e.g. a factory producing (not just assembling) 1,000 to 2,000 cars a day. This would allow numerous auxiliary industries and subcontractors to set up in the area, but it is a rare case.

The policy action of this new agency would consist in the determination, direct promotion and simultaneous creation of an ensemble of main establishments belonging to one homogeneous sector or subsector, along with the essential auxiliary units, all located in a given area. The new main establishments must be present in sufficient number (and size) to sustain, with their demand for inputs, new auxiliary units of an economic size and to justify the installation of local depots of standard and catalogued products. In principle it is not necessary for the intermediate industries producing these materials to be near the industries which use them.[29]

The fact that the main industries belong to a given homogeneous sector or subsector makes it easier to achieve a satisfactory level of inputs from essential auxiliary industries and to serve the specific requirements of customers. The homogeneity of demand extends to other inputs, thus facilitating the creation of local depots of standard and catalogued products and other industrial services. It also helps the formation of a skilled manpower pool. Later on, with the expansion of the original activities, the homogeneity of demand increases the possibility of investments in the area by intermediate mechanical industries and other sectors (light chemicals, rubber etc.) which make such standard and catalogued products and materials.

Within the sector or subsector chosen for area specialization, the new main establishments must be selected by means of suitable criteria (relatively low skilled labour requirements etc.) to make the product lines showing the greatest growth trends, always providing that these establishments can compete with similar establishments in the North. Individual feasibility projects are drawn up for the main establishments and for the auxiliary units.

29/ To reduce the difficulties of promotion, the number of main units (taking account of the size necessary to operate competitively in Europe) has been kept down to that required to sustain the auxiliary units. The latter are limited to the most essential ones. For example, the following auxiliary units are essential for large and medium general metalworking plants: toolshops, specialist maintenance units, foundries, forges, heat-treatment units, metal-cutting and metal-pressing units. The absence of units specializing in extrusions, sintering and microcasting should not create operating problems, as the user industries can turn to suppliers in the North or in other regions. Furthermore, the auxiliary units are conceived as being as small as possible and as having the lowest degree of specialization found in similar units operating competitively in the large concentrations.

In reporting to the Committee of Ministers and the Cassa, the promotional agency would submit projects to be carried out by expanding firms in Italy, the other EEC countries and abroad. The agency would offer adequate assurances regarding the implementation of the whole ensemble of projects, and especially of the auxiliary industries (use of direct public investment, etc.).[30]

The final composition of the ensemble, influenced by the free choice of the private firms participating in the programme, may turn out to be different from the ensemble originally planned. However, it must have an equivalent (or higher) level of inputs from the auxiliary units envisaged in the original plan.

The promotional agency must also ensure that industrial sites are available to the firms taking part in the programme, as well as any additional technical and social infrastructure (housing for workers etc.), together with such facilities for training local labour, etc., as may prove necessary.

It is important to emphasize that by setting up an ensemble it is possible to create operating conditions in part of a virgin region similar to those which can be found at present only in the large concentrations of highly developed regions. These conditions may favour not only the main establishments of the ensemble but, especially, others which may come in later (the present major obstacles having been eliminated and the incentives exploited) in a self-generating development process. This is a new conception of an industrial growth pole, and as such must be promoted by new methods.[31]

30/ For the main establishments, promotional work would be directed towards that part of investment in new plants which for various reasons must be outside the home district, and which at the present time relocate on the fringes of the large concentrations or in nearby regions. As regards promotion of the auxiliary units, the fact of their having an assured market through the creation of main establishments on the same spot is a great help.

31/ The following aspects distinguish this new concept of an industrial growth pole:

- The creation, in a given area, of an industrial environment typical of that which exists in highly industrialized areas, right from the very outset, by means of an ensemble of interrelated projects.
- The distinction between interindustrial relations which require the geographic proximity of the industries involved (relations with auxiliary industries) and relations which are technically and economically feasible with considerable distances intervening between customer and supplier (relations with basic industries and with intermediate industries supplying standard and catalogued products).

The EEC study presents, as a guideline, a complete programme for the promotion of an interrelated ensemble of projects which could constitute the embryo of a large industrial centre in the Bari-Taranto pole. This could serve to test the new policy instruments. The ensemble of projects comprises eight modern main establishments, the size and technical characteristics of which are in keeping with European standards. The plants belong to the general metalworking sector and the total investments are in the order of US$80 million (value addsd in production $40 million; 5,900 employees). In addition, there are twenty-three auxiliary units requiring a total investment of $47 million (value added in production $16 million; 2,300 employees).32/

The programme, which has already been approved by the Italian Government, entered the promotion phase in the second half of 1966; this phase was planned to last for one year, followed by the final design, construction and erection phases (over two years).

Similar studies for the selection, determination, promotion and creation of an interrelated group of main establishments, auxiliary units and industrial services are presently being undertaken by Italconsult in the Uelva-Cadiz-Seville pole (Spain) and in the San Nicolas pole, along the Buenos Aires-Rosario axis (Argentina). Similar studies may be undertaken in two other countries.

(31/ cont'd)

- The consideration of the specific sectoral nature of many auxiliary industries.
- The assurance that the pole has the minimum initial dimensions capable of guaranteeing its feasibility.

32/ The eight main units cover the following product lines: heavy structural steelwork; stoves, baths, central-heating radiators, pots and pans, all in sheet steel; centrifugal pumps and oil burners; agricultural machinery; metal-working machine tools; excavators, mechanical shovels and self-propelled cranes; large cranes and transporters; lift trucks. The 23 auxiliary units comprise: a malleable iron and steel foundry with pattern shops; a cast iron foundry with pattern shops; a non-ferrous foundry with pattern shops; a forge producing stampings and forgings; a machining unit for large and medium items; a machining unit for medium items; 3 machining units for small items; 2 gear-making units; 2 press shops, one for large and medium items and one for small items; 2 heat treatment units; a galvanizing unit; a unit producing nuts and bolts; a toolshop for large and specific tools for machine shops; 2 similar toolshops for small tools, gauges etc.; a toolshop for specific medium and small press dies; 2 units for the maintenance and overhaul of machinery and equipment (general services systems and specific processing installations), organized in sections, according to main types of machinery and equipment involved.

Auxiliary industries, other intermediate industries and industrial services in industrial location programmes of developing countries

The shortage of intermediate supply as one of the main obstacles

In order to be geographically protected and have a ready market, market-oriented industries generally predominate in the limited manufacturing activity of developing countries.

In larger and medium-sized countries with a certain degree of development, in addition to various material-oriented industries (including the basic industries) almost all manufacturing sectors are present, even though they may make only modest contributions in terms of output and employment to the national economies since their production is restricted to the less complex products.

Except for material-oriented industries, a large part of industrial activity in the developing countries is located in one or a few centres, generally large cities, where economic activity is concentrated and where there are the best infrastructural facilities.[33/] In the larger developing countries, this has given rise to sizable industrial agglomerations, despite the low *per capita* level of industrial output. In many developing countries the geographical pattern of industry thus causes serious town-planning problems and considerable regional disequilibria.

The existence in the larger and medium-sized developing countries of relatively diversified manufacturing activities and sizable industrial agglomerations does not derive from a modern, rapidly growing industry. The former, where they do not enjoy a natural, geographical protection, exist and operate in most cases thanks to tariff barriers. These enable firms to reap large profits even if they produce at high cost owing to their inadequate size, often obsolete machinery and equipment, and outmoded techniques and organization. But this situation implies that their output must be limited to the restricted demand of the domestic market, even in the case of industries which in developed countries are geared to production for wide markets.

This situation is not to be attributed solely to tariff protection (which is justifiable and necessary, up to a point, for a country's industrial development), or to entrepreneurs who consider investment opportunities in an easy

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33/ Typically, market-oriented industries (except those which are strictly local) are also less scattered geographically, other things being equal, than they are in developed countries.

domestic market the only safe ones (there are numerous local entrepreneurs with a modern outlook and subsidiaries of foreign firms which in their home countries own factories which compete actively on the international market).

In those industries which in developed economies are termed sectoral services-oriented, entrepreneurs in developing countries find themselves up against problems which are in many respects similar to those in the Mezzogiorno. In these countries, such problems extend to the whole of intermediate supply, where other unfavourable conditions must be added such as lack of skilled manpower. A new plant by itself cannot bring about the creation of the auxiliary industries and industrial services which it requires. It has to be set up as self-contained or adapt itself to the inadequate conditions of existing supply. As in the Mezzogiorno, the unfavourable production structures are perpetuated by a vicious circle. Under such operating conditions, production costs are necessarily high and therefore investment opportunities remain limited to industries catering for the protected domestic market.

In the developing countries these problems affect mainly the metalworking industries. The textile industries and other sectoral services-oriented industries often manage to offset the disadvantages by the advantages of low-cost manpower, at least as far as certain low-quality products are concerned. It is therefore worthwhile to examine the effects of the shortage of intermediate supply on metalworking firms in larger and medium-sized developing countries (in the smaller countries, such activities are confined practically to general repair workshops).

In many medium-sized developing countries the production lines of the metalworking sector are still limited (on the average, over three quarters of the domestic demand for mechanical products has to be met by imports), covering activities such as assembly of durable consumer goods and production of simple articles for the domestic market. These industries are forced to turn to non-specialist workshops for maintenance needs or to carry out the maintenance themselves. The same applies to all processes which in developed countries are dealt with by specialized processing firms and subcontractors. In contrast to the Mezzogiorno, industries in developing countries have the possibility of turning to specialized units in large modern centres in the more industrialized regions of their country, however distant. In addition there is a lack of adequate local depots of standard and catalogued products, the majority of which have to be imported, resulting in considerable transport costs and longer

periods of delivery. In other words, whereas in the Mezzogiorno it is not absolutely necessary for some types of auxiliary industries to be located near the metalworking industries, in developing countries the basic problem is their total absence within the country; the problem of local depots becomes, in practice, that of the lack of firms inside the country to manufacture these standard and catalogued products.

Even in larger metalworking plants, adequately equipped and organized, the operating conditions described above lead to much higher costs compared with plants of equivalent output operating in industrial centres in developed countries. The comparatively low unit cost of local manpower compensates for the higher unit cost of key workers and technical staff, but the total cost of direct and indirect manpower is still higher (additional and underutilized workmen), an increase in depreciation rates additional and underutilized machinery and equipment in a self-contained organization increases depreciation costs, the inadequate auxiliary services obtainable within the area of location also raise costs. Transport costs for imported materials and intermediate products and the financial burden of the larger stocks of materials that have to be kept in the plant must also be taken into account. To these higher costs must be added those caused by delays and imbalances in factory programmes as a consequence of the inadequate supply structure, leading to further increases in manpower costs and financial charges.

On the basis of feasibility studies for metalworking industries carried out in developing countries it can be claimed that even given an economic size, adequate organization etc. the burden of adverse external conditions implies increased total production costs of 20 per cent and more, according to the type of industry.

In larger developing countries where the metalworking industries cater for about 50 per cent of the domestic demand for mechanical products (durable goods and, to a lesser extent, capital goods), production conditions are similar. Metalworking industries, including those which operate in industrial centres, have to face serious problems from the shortage of intermediate supplies and, in particular, of auxiliary processing. Not all the necessary auxiliary industries are available. The intermediate supplies offered by the existing auxiliary industries are generally insufficient to meet the demand. Their degree of specialization is low and this is one of the reasons why the cost of their services is high. The proportion of standard and catalogued

products imported remains high. Moreover, the existence of various factories manufacturing standard and catalogued products for domestic demand only, protected against foreign competition, does not help to reduce the costs of such supplies. Often the low quality of such intermediate products contributes towards the low quality of the final products. The ensuing excess production costs in the metalworking industries, as compared with similar industries in developed countries, represent about the same percentage as for medium-sized developing countries.

These increments to normal production costs indicate that, even if the general problems of capital shortage, finance, manpower training, etc., were solved, and if entrepreneurs were prepared to accept the risks and the cost of setting up engineering plants with adequate organization, capacity, equipment and technical know-how, external conditions in developing countries would still prevent the majority of these industries from competing internationally.

It is not unrealistic to suppose that these general problems will be overcome. Already in a number of countries more organic and efficient industrial development policies have been introduced and international collaboration between developed and developing countries is being strengthened. Even without taking these macro-economic aspects into consideration, it must be acknowledged that when sound industrial projects are presented, their financing is not very difficult. The higher cost of training basic manpower, key workers and key personnel may be compensated by the lower cost of general labour, while the know-how and organization may be assured by a joint venture or some other form of collaboration with large foreign concerns to establish major new plants. Thus these problems may be solved as far as the promotion of important individual projects is concerned. This does not apply, however, to the problem of intermediate supplies, which is a question of external structure and proves in the final analysis to be the real limiting factor.

Certain requirements of the "other industries" group from auxiliary industries and industrial services cannot readily be met in developing countries.[34/] Supplies of other materials and intermediate products are also more difficult to obtain and more expensive. In addition, the group often lacks sufficient domestic demand to sustain plants of internationally competitive size (low

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34/ The requirements in this group are lower than for metalworking and other sectoral services-oriented industries, though still relatively important.

yield per capita for those industries in this group which produce consumer goods, and scanty industrial activity, especially in the metalworking customer sectors, for those which turn out intermediate products). It must be borne in mind that export-oriented plants in this group of industries are not very common in the developed countries; the support is generally necessary of a considerable volume of sales on the domestic market.

An important aspect of the effect of intermediate industries on the level and composition of manufacturing activities in developing countries is their favourable impact on the geographical pattern of industry in these countries. The presence of auxiliary industries and industrial services in certain centres or agglomerations, even in inadequate strength, together with the general external economies available there is mainly responsible for the tendency of industrial investments to be concentrated in only a few areas.

The role of the auxiliary industries, other intermediate industries and various industrial services becomes even more important when the future industrial growth of developing countries is considered.

Without underrating the unexploited opportunities of local market demand in some developing countries, mention should be made of the hampering effect of a protected domestic market on industrial initiative in developing countries with a certain level of industrial development. After the boom in the first stage of development occurring in such surroundings, and despite the take-off invariably proclaimed, industrial growth and that of the economy slows down and incentives seem to lose their effect. This situation is often accompanied by a worsening in the balance of payments.

To speed up industrial development, industrial effort must be aimed at wider markets with rapidly expanding demands. Taken as a whole, however, market-oriented industries are able to expand only in line with a country's general economic growth. The same applies to many material-oriented industries.[35]

35/ Among the basic industries, petrochemicals have a high rate of growth in demand in the international market. However, it has earlier been remarked that in certain countries, if the possibilities exist, the creation or expansion of these industries (although constituting a sizable contribution for the zones where they will be operating) does not lead to more than a limited contribution towards employment and production at national level. It should also be remembered that in general basic industries (iron and steel complexes, heavy chemicals etc.) produce above all for an internal market and hence depend on the country's industrial growth. Furthermore, in view of the considerable proportion of exports that often becomes necessary to sustain the size of such complexes, it must be borne in mind that the international market for these products is very difficult of access.

Metalworking and related industries are most likely to have large markets and good expansion prospects.

Producing for export as well as the domestic market means achieving competitive conditions in the industrial sectors involved, which again depends, among other factors, on adequate intermediate supplies.[36] These are difficult but unavoidable problems for all developing countries. (The experience of industrialized countries shows that many of their industries depend to a considerable extent on exports.)

Even with the enlargement of the internal market through association with other neighbouring countries, e.g. forming a common market, these problems of competitiveness persist. In the ideal case all member countries should benefit from such an economic integration, in that the industries of less-developed countries reach a level of competitiveness comparable to that of the relatively more advanced countries in the association. In fact, however, only the stronger industrial centres benefit if unbalanced development takes place among member countries, and regional imbalances within each community become more pronounced. Intergovernmental agreements on industrial location are difficult to reach and, at least on a medium-term basis, tend not to ensure the maximum exploitation of the available economic resources and the maximum increase in production and income.

Nevertheless, if a common market is conceived solely as a wider internal market, where demand is not supplemented by exports (such a concept occurs, in fact, when no profound change is made in the production structure and hence in intermediate supplies required to achieve competitiveness), all that has been done is to set up a new economic space with restricted marketing opportunities. Here, too, after an easy boom during the initial stage in which various plants may be established in new activities, the pace is sure to slow down and conditions and problems of development similar to those described for the larger developing countries are then encountered.

36/ It is obvious that in every country, given the limited economic and human resources and the economic size of plants, industrial policy should limit this effort towards participation in the international market to a number of sectors or subsectors. In other words, insofar as the objectives of a high degree of self-sufficiency are sterile, the aim of promoting all the industries in the most dynamic sectors and with wide markets is unrealistic. Hence the affirmation of the need for specialization.

Possibilities and limits of applying the experience of the Mezzogiorno

The importance of intermediate industries and industrial services to the industrial growth of developing countries indicates the need to make use in these countries of the technological experience of industrially more advanced countries. The recent industrialization policies of developed countries for their underdeveloped regions (technological specialization in the factory industries, technological integration in the basic industries, etc.) offer valuable guidance.

The question is whether developing countries can apply the technologies of developed countries and in what circumstances they should do so. The foregoing analysis implies an affirmative answer in principle to this question in most cases, contrasting with the conclusion reached by other studies that developing countries should use a less capital-intensive technology in view of the relatively lower unit cost of labour (unskilled labour). These conclusions depend in fact on the theoretical assumptions made regarding efficiency and competitiveness.[37]

Precisely because of the shortage of skilled manpower and the need to utilize unskilled labour, recourse must be had to some degree of automation in manufacturing operations in developing countries. In developed countries, on the other hand, automation has occurred not only as the outcome of technological progress, but also under the pressure of high labour costs.[38]

37/ It is logical that in choosing which industries to promote in developing countries, those requiring the most difficult technologies or a high proportion of skilled manpower should be excluded. However, the question here is to establish whether the same or different technologies should be applied in developing and developed countries, industry by industry.

38/ Automation of industries in developing countries should be selective and should be carried out in co-operation with foreign firms. Net saving on skilled manpower can be calculated; the larger requirements for certain types of skilled workers (e.g. to set up machines) or supervisory personnel, will be more than compensated by the decrease in the number of skilled workers in charge of hand-operated machines. Automation in metalworking industries and other manufacturing industries cannot cover all operations, so that large numbers of semi-skilled workers will still be needed. The question of automation in certain operations, i.e. the reduction of the number of skilled workers, has been taken up in the designs of the factories proposed in the EEC-Italconsult study for the promotion of the Bari-Taranto industrial pole in the Mezzogiorno.

To sum up, in the major industries whose products have to compete on the international market the same techniques as those used in developed countries are necessary. Economic factors such as limited market outlets dictate that these techniques should correspond, in terms of machinery, equipment, organization and the like, not to those of the larger factories in developed countries, but to those of smaller factories which, however, compete on the world market (for example, for certain machining processes, numerically controlled machines can be used instead of transfer-line machines).

The technologies should also be the same for materials and intermediate products as those in developed countries. A certain variation may be allowed in terms of size and degree of specialization, provided that there is no adverse effect on the cost of such supplies.

The experience of some developing countries, including mainland China tells against the production by old techniques of the materials used in the basic industrial complexes. The application of traditional techniques should therefore be restricted to industries that produce exclusively for local markets.

Accepting the need to apply the technologies of the developed countries, at least in key industries, it follows that European experience in location and industrial development policy should be drawn on by the developing countries. The application of the European experience should be limited, however, to underdeveloped regions (similar to the Mezzogiorno), thus excluding economically depressed regions. Account should also be taken in developing countries of the different degree of economic and industrial development achieved, the economic system, the density and distribution of population and so on.

Despite their relatively high <u>per capita</u> product and income, European peripheral areas such as the Mezzogiorno have various aspects in common with developing countries: limited contribution of industry to economic activity, predominance of local market industries, scarcity of skilled manpower, and a manufacturing production network short of intermediate supplies. The degree of industrial expansion achieved in some developing countries has not, however, brought about any profound changes in the adequacy of intermediate supplies. Major industrial agglomerations in the larger developing countries call for different measures of implementation from those to be applied in other countries with incipient industrial centres. The experience of the Mezzogiorno can be applied not only to developing countries with a market economy, but

also to countries with planned economies, because competitiveness and efficiency criteria in using resources tend in practice to be similar despite the differences in economic systems. Clearly, different systems call for different policy instruments.

As for differences in density and distribution of population,[39] the majority of developing countries have to face a growth of urban centres more rapid than the growth of employment possibilities in industry. This presents a severe challenge to industrial location policy.

In the interests of brevity, attention must necessarily focus on industries that depend heavily for their location on the interindustry factor, in other words, the sectoral services-oriented industries. Recent experience in this field is of industrial poles, in accordance with the EEC-Italconsult concept previously presented. The following section outlines the application of this concept in developing countries.

Poles of industrial growth and location planning in developing countries

The most interesting application to developing countries of the determination and promotion of industrial growth poles according to the EEC-Italconsult concept consists of a pole based on a given sector or subsector of metalworking industries, together with its auxiliary industries and industrial services. This gives rise to conditions of operation and of interindustry relations that foster the progressive installation in the area of various manufacturing industries turning out intermediate and final goods. This application has the advantage of focusing on one of the main targets of industrialization of these countries, the metalworking industries, followed by the expansion of other manuturing industries with sufficiently large markets, with direct and indirect effects on important basic industries (steel, chemicals and petrochemicals).[40]

In establishing industrial poles in developing countries account must be taken of the various situations and problems described in the two foregoing sections. A distinction must be made therefore when designing the pole between

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39/ Differences in population density and distribution affect policy profoundly with regard to the utilization of resources and the time-scale of industrial, as compared to agricultural, development.

40/ For a discussion in concrete terms of the possibility of creating poles based on this concept in developing countries, see V. Valletta, cp. cit.

countries where the engineering industry is still at an initial stage and those where agglomerations of metalworking industries already exist on a reasonable scale, even though with considerable structural deficiencies. A network of auxiliary industries and industrial services must be created (which need not be done in underdeveloped peripheral regions of Europe) and other intermediate industries producing standard and catalogued products have also to be established. The creation of industrial poles must form part of the spatial co-ordination of industrial and urban growth and indeed of all economic activities, whose twin objectives are to achieve an equilibrium of production and income in the various regions of a country, and an acceptable distribution of industrial activity among developing countries which form a common market.

In countries where engineering production is at an initial stage, industrial policy should be directed towards the determination and direct promotion, in an adequately equipped area, of an integrated ensemble - however small - of main metalworking projects together with auxiliary units and the most necessary services. In substance, it would mean setting up a nucleus to become the prime modern industrial centre in the country, offering a modern industrial environment from the very outset and therefore constituting a pole of attraction for subsequent investments in metalworking industries and related activities.

The product lines of the new main industries in the ensemble would have to offer good market prospects and also would have been successfully manufactured by smaller enterprises in developed countries[41/] and would require a limited amount of skilled manpower. Examples are certain types of light metal structural work, agricultural implements, metal containers, pots and pans, taps and faucets, and various products in which assembly plays an important part, such as refrigerators, deep freezers, air conditioners, lifts, elevators, and industrial vehicles with special coachwork and fittings. Should some of these industries, characteristic of an initial stage in engineering activity, already exist in the countries in question, the ensemble of projects in the pole should be devised to allow for the rationalization and expansion of existing factories

41/ A different criterion was followed in selecting industries for the Bari-Taranto pole in the Mezzogiorno. As this area is situated in one of the largest markets in the world (the European Common Market), there were no problems of demand. Eliminating the product lines which imply large-size factories reduced the number of main units, and hence the promotion difficulties. At the same time the selected activities permit large-batch production, with resultant advantages.

in addition to the creation of new production lines for relatively simple machining and presswork processes and assembly.

If possible, it is advantageous to include in this ensemble, as an exception to the general criteria of selection, one or two units to make mechanically more advanced product lines (such as centrifugal pumps, special agricultural machinery). These would have a certain educational function in the training of skilled workers and so on.

The ensemble of pole projects, including the existing industries, should be large enough to justify economically the creation of the most essential auxiliary units, for example, a toolshop for medium and small specific tools with sections for machining and presswork and a repair and maintenance unit with a number of sections (according to types of machinery and equipment). These auxiliary units should offer more efficient services than those provided by general repair workshops operating in such developing countries.

The fact that the auxiliary industries barely reached minimum economic size and have a low degree of specialization, leads to 10 to 15 per cent higher costs in the processes they perform than is the case with average industries in large industrial concentrations; but this represents less than 1 per cent of the total costs of production to the customer industries. It is important to ensure that such essential auxiliary industries are available in the pole area from the outset.

It is unlikely that when the initial nucleus of the pole is set up demand will justify the promotion of even the most essential of the intermediate industries making standard and catalogued products. It may be feasible to create units in some industries producing simple products of widespread use (e.g. a nut-and-bolt unit, a hardware unit). In the absence of intermediate industries for standard and catalogued products, the setting up of local depots for imported counterparts should be encouraged. The selection of a production ensemble with homogeneous inputs contributes towards this end, since it creates, despite the small number of factories forming the initial nucleus, a greater over-all level of demand for such products and materials.

The creation of the initial nucleus of the pole involves selection and direct promotion of the ensemble of units, measures to ensure the requisite infrastructure (industrial estates, dwellings for workers, etc.) and train local manpower, and so on. The examination of such measures, though they are connected with the creation of a pole, is outside the scope of the present study.

Once the initial nucleus of the pole has been established and favourable operating conditions have developed in the area, investment opportunities arise for the creation of new larger industries producing more complex mechanical products.

The growth of such activities in the pole should help to increase the demand for inputs and permit expansion of the original auxiliary industries, creation of new types of auxiliary industries and greater specialization in auxiliary supplies. The increase in the intermediate demand for standard and catalogued products creates favourable conditions for the improvement of depots and leads in some cases to setting up industries to manufacture these products (springs, valves, rubber materials, paints, and so on).

This natural growth of the pole should be sustained by a clearly defined industrial policy which, inter alia, is capable of direct promotion of major industrial projects, the absence of which threatens to create a bottleneck in its future growth.

In view of the development of the intermediate industries, industrial policy must give priority to a national system of standards[42/] based on that of industrialized countries. Measures must be taken to promote co-operation between new factories making mechanically similar products to adopt standard components such as valves and joints in the design of their components.

Rapid growth of the pole will be fostered if industrial policy has a clear sectoral orientation to the metalworking and other related industries. This contributes to the homogeneity of auxiliary demand and of other intermediate products, and facilities the training of skilled manpower for specific tasks. It also imparts that step-by-step character which is essential balanced development (progressive extension of activities from general engineering to more complex ones such as precision engineering) and permits territorial specialization in the creation of new poles, in accordance with regional policy requirements.

In developing countries where metalworking industries with diversified product lines already exist, the prime objective in creating a pole is to rationalize and modernize the production structure of the existing industries. Therefore the pole area coincides with the country's main industrial centre or industrial agglomeration.

42/ Standard sizes of materials for the metalworking sector.

On the basis of the industrial development policy targets (new product lines and more complex products in existing lines, for the local market and for export) the sectoral orientation of the pole is fixed in terms of specific metalworking sectors or subsectors.[43]

The principal enterprises in the area in the chosen sector or subsectors should be studied from the point of view of modernizing them or expanding their size, and a selection made of new main plants to be promoted. At the same time, it is necessary to decide the types and sizes of the auxiliary and other essential intermediate units which will be required for the new production structure and its degree of technological specialization. The new auxiliary industries should show a trend towards relatively advanced specialization right from the beginning and cover, with appropriate types of units, the whole range of sectoral services. In the case of standard and catalogued products the aim should be to fill the major gaps in production as far as possible. The possibility should also be considered of improving and extending the supply of materials from existing basic industries.

The inputs of the major existing plants and the new ones should together be high enough to sustain the activity of the auxiliary industries and to justify the creation of other intermediate industries. To complete the network of intermediate supplies, project selection should favour product lines with a high demand for inputs of the materials and services provided by the auxiliary and other intermediate industries which have hitherto been lacking or inadequate. Existing workshops, if enlarged and modernized, could become service enterprises.

It is a far more complex operation to promote the establishment of a pole in an existing agglomeration of moderate size than to create the first nucleus in a newly established pole. This is due to the volume of investigations, studies and design called for, and to the inertia of the production organization of existing enterprises. If the gradual incorporation of these enterprises into the new network is envisaged, there must be a corresponding increase in the number of new plants to be created, in order to ensure an over-all level of intermediate demand large enough to operate the modern new auxiliary industries and services.

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[43] The existence of a metalworking plant with poor prospects does not in itself justify the inclusion in the pole of the subsector in which it operates.

When the objectives set for the pole's pattern of production have been reached, in terms of complementarity, rationalization and modernization, the metalworking and related sectors encounter new conditions of operation and competition which result in the quantitative and qualitative expansion characteristic of the great concentrations in highly industrialized countries. Moreover, the increased external economies in the pole area foster the development of other industrial sectors. Both before these objectives are reached and in the ensuing phase of expansion, a whole series of industrial policy measures, such as industrial financing, technological research, manpower training, are called for.

The improvement of the network of intermediate, especially auxiliary, supplies is not only essential for the competitiveness of the industries concerned but also - other things being equal - reduces the call for skilled manpower. With equal output, an ensemble of main plants and its auxiliary units (with a normal degree of technological specialization) makes possible a fuller utilization of manpower and requires (in the engineering sectors referred to) 10 per cent less skilled workers than a corresponding group of predominantly self-contained plants with similar total output. The indirect benefit which technological specialization yields by making plants competitive must also be added. The achievement of access to wider markets permits the creation of larger plants which can economically use more productive specific tools, machinery and equipment. From studies made it appears that, depending on product line, large industries employ about 10 per cent fewer skilled workers than plants of medium size.[44/]

The creation of poles in developing countries implies considerable efforts both in implementing the programme properly and with reference to general industrial policy measures. Especially concerning the simultaneous carrying out of an ensemble of projects, the inherent difficulties are undoubtedly greater in market-economy countries than in planned economy countries, where the government provides the necessary direct investments. In market-economy countries, the government acts as promoter (selection of the ensemble, drawing up of feasibility projects, etc.), while private entrepreneurs cater for industrial investments. The government takes on direct promotion, contacting private

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44/ "Large" and "medium" sizes in terms of the levels of output, employment and investments must be read in the European context, for the various product lines.

entrepreneurs, a procedure which requires considerable time to get operations under way (gathering a sufficient number of investors). The designed ensemble must be adjusted according to the final choices of the private entrepreneurs. Difficulties occur when changes in the structure of an existing industrial agglomeration are required and the government has to face pressure groups which defend existing, inefficient small industries.

Government action in market-economy countries does not necessarily stop short with direct promotion, the granting of incentives and the provision of infrastructures. By means of licensing and selective granting of incentives, the government influences the composition and location of investments in the pole area. The government may have recourse to direct investment in projects for major factories and auxiliary units projected if they do not gain the interest of private operators, thereby speeding up the completion of the ensemble. It may also carry out joint ventures with domestic firms and foreign corporations interested in the major projects. The fact that the pole area will possess operating conditions similar to those in industrial centres in industrialized countries, the offer of suitable incentives, the availability of general manpower (which becomes progressively scarcer in developed economies), the advantages in the domestic market and possibly in certain groups of countries (forming a common market), all these benefits can induce foreign industrial firms to settle into a developing country.

The creation of a new pole of industrial growth can contribute towards solving the problems of congested urban areas, which plague many developing countries. Establishing the initial nucleus of a new pole and the autonomous way in which an ensemble of projects works both allow considerable flexibility in spatial location. In principle, all areas with a certain size of urban population that can readily provide the necessary infrastructures (water and electricity supply, adequate transport system, etc.) may be considered as potential areas to locate a pole. Solutions which are effective in terms of physical planning can be set in the framework of the objectives of regional economic policy.

When a pole is created within an existing industrial agglomeration in a congested area, the problem of urbanization can likewise be solved while remaining within the radius of techno-economic utilization of the auxiliary industries and industrial services (roughly 100 km, given certain transport and communications facilities). It is therefore possible to create satellite towns in whose industrial estates the main activities of the new metalworking

and auxiliary industries are located. Other industries making standard and catalogued products for the intermediate demand of the metalworking sector (and, later on, other industrial sectors), most of which make limited use of auxiliary industries, may be located in satellite centres within a 100 to 200 km radius.

Licensing, incentives, the building of industrial estates and dwellings for workers act on the new industrial investment flows and consequently on the population flows from rural areas, changing the spatial organization, with indirect effects on the congested areas by attracting existing industries to move. (Use of various auxiliary industries is obviously easier at a distance of 20 to 30 km than near the limit of 100 km mentioned above, where the previously existing industries are sited.) Planning of spatial organization is not a simple matter. Not only problems of urbanization have to be solved; account must also be taken of the specific requirements of sites for various types of enterprise and of the spatial implications of many technical restrictions imposed by interindustry relations.45/

The creation of industrial growth poles can assume an important role in regional policy of medium-sized and larger developing countries. In general, however, during the first stage of a country's development the limited human and economic resources make it necessary to concentrate spatially all industrialization efforts, instead of aiming at balanced regional industrialization. Judging by the experience of European underdeveloped peripheral regions, there should be no wishful thinking that spatial equilibrium of production and income can be automatically brought about in future. The conflict between sectoral and regional approaches in developing countries has to be faced.

This conflict can be settled only by a policy of geographical specialization of industry. In determining and creating a first pole or in restructuring the pole of an existing agglomeration, its specialization must be fixed in terms of given subsectors of the metalworking sector. These limitations of the pole's fundamental production structure encourage a swifter formation of external economies, thereby shortening the period before the pole acquires autonomous expansion characteristics. When the promotional effort and the implementation

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45/ An instance is given in the EEC study cited of the distribution of the various main and auxiliary industries in two centres forming a single pole, bearing in mind these relations and other factors.

of projects have ended and experience of this type of operation has been acquired, the next step is to create new poles based on other subsectors or sectors.

The inclusion of spatial planning in policies of industrial development is not a new idea, but the poles of industrial growth, as defined in the present study, do represent a new instrument to attain such objectives, while conforming to criteria of techno-economic efficiency. The way poles work and their specialization in product lines make it possible to distribute geographically the sectoral programmes of metalworking and other industries.

A country which has already reached a suitable stage of economic growth could consider the establishment of two or more poles in different regions under its national development plant. Among these poles, in accordance with appropriate criteria (degree of development, special resources, geographical position of the areas involved, etc.) the programmes to expand metalworking must be distributed in homogeneous ensembles. Intermediate industries manufacturing standard or catalogued products may be distributed among these poles, provided a system of local depots and an efficient national transport system exist. In particular, the large group of intermediate non-metalworking industries can locate in a number of subsidiary nuclei of the poles or in autonomous nuclei, thereby spreading the industrialization process geographically. Similar possibilities can also be offered for the location of industries producing consumer goods for broad markets, which are not strictly sectoral services-oriented.

Market-oriented industries must generally be located in the major centres of population and consumption (centres which in practice coincide with the area of the poles). Any new basic industries provided for in the national development plan, especially complexes, can contribute to industrial activity and employment in zones beyond the areas directly influenced by the poles.[46/] These must be zones, however, where adequate sites and the necessary facilities for raw material supplies exist. Lastly, there are the possibilities offered by the creation of specialize concentrations of sectoral services-oriented industries, such as textiles, hosiery or shoe manufacturing, which can be located in appropriate zones not taken up by other industrial activities.

46/ New non-basic material-oriented industries may be set up in a number of other zones, for example, factories processing agricultural produce are located close to poles of agricultural growth.

In short, even if a process of dispersed industrialization, which is so favoured by sociologists, is impracticable, it should be possible through the creation of growth poles and nuclei to extend the field of industrialization considerably in a geographical sense, at the same time introducing advanced techniques and competitive criteria.

What has been said about harmonizing sectoral and regional approaches to industrial location can be applied, with due alteration of details, to the allocation of industrial investments among the member countries in a common market, especially among the small countries that are relatively less developed industrially.

Provided the minimum need of a common transport system in the common market area has been met, there is no reason to rule out the setting up of growth poles in small member countries. The establishment of auxiliary industries and industrial services, the supplementary measures taken to train the labour force and the creation of specific items of infrastructure eliminate the main differences between small and larger member countries in terms of their ability to attract enterprises in a given sector or subsector to favoured areas.

Implementing a common industrial policy on balanced development among member countries of a common market leads to difficulties in the location of all those industries that are not local market-oriented. The creation of growth poles with large external economies and a specialized production structure can provide a logical basis for intergovernmental agreements on industrial location. One criticism among member countries of current industrial location policies is that any decision not based on economic choice (principles of comparative advantages) and not implemented by economic policy instruments (licensing, differentiated incentives, etc.), reduces industrial efficiency and hence the economic development of the common market as a whole. With the creation of growth poles the differences in comparative advantages in respect of many industries in the sectoral services-oriented group and many classified in this paper as "other industries" can be drastically reduced in practice.

The necessary specialization of the poles according to metalworking subsectors cannot occur to the same degree in a common market of several countries comprising numerous industrial centres as would be possible in a single country. Specialization can and must be effected by taking into account the degree of development already achieved in the various countries. Only the poles in

larger countries where a metalworking tradition already exists can specialize in precision metalworking or certain general metalworking activities or make complex electromechanical products. Widespread differentiation can also be achieved within a given subsector by designing two poles (in different countries of the common market) with different product lines. Within a single major industry (e.g. agricultural machinery or machine tools) such differentiation between poles may be contrived through product specialization. In this connexion, it must be remembered that restricting the number of models manufactured in new (or already existing) plants has, like technical standardization, the same effect on economic efficiency as increasing the size of plants. This type of factory specialization can be envisaged owing to the larger demand in the common market and the export possibilities which are created if such industrialization is carried through with the objective of becoming competitive.

In the formulation of intergovernmental agreements on industrial location, it is advantageous to seek some form of specialization for intermediate industries (standard and catalogued products) and for industries producing consumer goods for large markets (although in principle these industries can be located in different poles). Where standard and catalogued products are manufactured for a common market, it is important to establish a unified system of standards for these products and to quote the same delivered prices at all the poles in the common market for the most important products (especially materials for the metalworking sector) as is done in industrialized countries.

Finally, the creation of poles can contribute little or nothing to the problem of the distribution of material-oriented industries among various member countries with domestic resources of the same raw materials and similar site facilities. Nevertheless, it is reasonable that the basic ones among these industries should be allocated to the larger countries, where inputs to industry are higher.

3. REGIONAL LOCATION AND EFFICIENCY OF INDUSTRIAL COMPLEXES IN RELATION TO THE PROVISION OF INFRASTRUCTURE

by J. A. Shubin[1]

This study analyses industry-infrastructure relationships and the provision of transport and power within the context of the development of an industrial structure designed for accelerated growth.

Industries in a given geographic situation determine infrastructure requirements, but infrastructure, too, determines the kind of regional industries and industrial structure that are economically feasible. The introduction of an industrial structure appropriately designed for underdeveloped regions results in high utilization of plant and infrastructure (transport and power) capacity.

An industrial structure of high productivity is designed (as outlined in this study) on the basis of a rationalization of industrial production, design of specialized production centres, and the application of analysis and appropriate location procedure to obtain a rational industry-location pattern (a projected regional division of labour).

Effective planning for industrialization and for an economic provision of infrastructure is based on a region's projected industry-location pattern and its pre-designed transport and power systems. Such planning results in rational long-range programming of infrastructure; it can erect a pre-designed infrastructure system in logical stages with well prepared schedules that provide adequate services to industries at comparatively low investment. It also erects plant capacity in a constellation of related industrial centres to obtain high utilization of infrastructure and economies of scale.

In developing countries, the typically small markets for specific goods impede the establishment of modern industry for the output of goods for domestic consumption. Continual advances in industrial technology, moreover,

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enlarge the output capacity of economic-size plants. Notwithstanding these impediments, practical approaches for industrial development are available; industrial plants can be introduced in developing countries on an economic basis.

The successful economic growth of smaller countries requires that they be economically integrated into larger common market regions. Economic integration makes possible an efficient use of resources through regional division of labour.

The procedure for locating economic activities to obtain geographic specialization of production (regional division of labour) and the approach for designing the structural organization of industry and infrastructure require analytic methods appropriate to the conditions of developing countries. If they are to design the structure of industries for developing areas, planners must look to the economic and the relevant technological attributes of industry and infrastructure, and to the interrelations among industries and economic areas.[2/]

An analysis of the industrial structure and the production technology of industrialized countries points to alternative structural arrangements and organizational adaptations appropriate to underdeveloped areas; and it indicates the structural designs of industry and the development approaches fruitful in achieving accelerated industrialization.

A realistic approach to economic growth demands a long-range over-all analysis. Planners must design and project a region's sector mix and its structural pattern for the development of industries if they are to programme integrated economic development and fully exploit the growth-and-productivity potential inherent in regional division of labour.

Viable industrial programming for accelerated expansion and the economic provision of infrastructure can be obtained on the basis of a predetermined geographic specialization of industry, the rationalization of production, design of specialized production centres, design of infrastructure systems, and related approaches as outlined below.

2/ The planner derives his approaches from the "demonstration effects" of industrialized countries. The planner must not only look to historical stages and processes of economic growth, but to the nature of the evolving industrial system and technology and to insights into available structural potentialities and procedural schemes.

Regional location and efficiency of industrial complexes

The ideal location for an industry is determined on the basis of the lowest long-term cost of production and distribution of goods. The selection of a location for an industrial enterprise must take into account the future size of the market, the future cost of input factors and transportation, and the advantages of proximity to complementary industries.

Location analysis and procedure

By appraising the comparative advantages of alternative locations on the basis of an industry's future cost (the relevant cost) of production and distribution of goods, planners can determine the net impact of the different location determinants (the location pulls). The long-range approach for locating industries and industrial complexes in a developing country differs from that of locating industrial plants in an advanced country.3/

Many of the external pulls (availability of suppliers, specific markets for goods, and so on) that influence the location of a plant or an industrial complex in an advanced country become, in a developing country, internal interrelationships among the industries involved in the over-all location procedure for determining a region's pattern of geographic specialization of industries. Long-range planning for developing regions deals with relatively dynamic development and industrial programming which essentially creates its own economic environment. When a planner simultaneously locates industries on the basis of mutual comparative advantage, he creates a specific economic environment for production. If they are to locate industries for geographic specialization and high productivity, planners must, at the outset, locate industries and project infrastructure two decades or more ahead.

3/ The location and the erection of an industrial plant in an advanced country involves a comparatively small capacity increment to total industrial capacity of the economy. Even though a new industrial facility is large, its location in an advanced economy essentially involves a small capacity adjustment and increment to an existing industrial structure and environment and pattern of geographic specialization of production. Plants that are poorly located, or locations that have become obsolete because of technological or economic change, would operate under high costs. Producers in high-cost locations are eliminated in the long-run by the competitive process, while rival producers in favourable locations typically expand capacity, thereby contributing to the emergence of geographic specialization of industry.

By employing appropriate economic analysis, planners can attain a highly productive location pattern for industry and economic activity. An analytic approach may be able to avoid the emergence of excessive geographic concentration of industry, while attaining specialized production centres or districts of appropriate size.

Planners can project a region's future sector mix and geographic specialization of industry through an analytic location procedure that takes into account geography and resource distribution, projected population, projected industrial technology and stipulated goals for economic growth.

The procedure for obtaining an efficient geographic specialization of industries calls for: (a) a resource survey and an evaluation of the potentialities of modern transportation and power supply; (b) the designing of specialized production centres and industrial complexes on the basis of technological interrelationships and in conjunction with the geographic situation of resources; and (c) sequential locating of plants and industrial complexes on the basis of long-term comparative advantage, computed in terms of future costs for the relevant time horizon.

The analytic procedure for locating economic activities involves a chain-reaction path and feed-back interrelationships among vertical stages of production and among geographic areas. In determining and projecting the locational pattern of economic activities, planners, therefore, employ a sequential procedure (with systematic back-tracking) for successively locating industries and economic activities on the basis of a resource survey and industrial analysis.

Through regional analysis planners identify areas of resource adequacy and high growth potential as well as areas of low economic potential, such as arid zones and inaccessible rugged terrains. Resource surveys and industry studies can produce and project a future industrial geography (a predetermined industry-location pattern) that consists of a distribution of industries based on resource availability and areas of high growth potential. Because most large regions include areas of low productive potential, an industry-location pattern would generally consist of a "spatially unbalanced" pattern for regional development.

A long-range projection of a predetermined location pattern for industry [illegible] is, in many ways, vital to the attainment of effective economic development. It provides, for instance, the means

for designing a rational regional infrastructure system and for programming the provision of infrastructure on an economic basis.

Planners begin by locating resource-based industries and extractive industries (crop production, mining, fisheries). On the basis of the distribution of fuel resources, they provisionally plot the pattern of the future interconnected power system; the lower cost of electricity gives planners greater locational flexibility for situating a range of industries. Planners outline an emerging spatial pattern for economic activity by delineating the areas for agricultural processing industries, basic chemicals, and other early-stage production. They can then tentatively project the transport routes that will make up the future transportation system.

The location pattern of resource-based industries and specialized agricultural areas (the "independent" locations) predetermine the location of many intermediate-stage and late-stage industries. Planners take into account the fact that industries and areas engaged in resource-based production become important markets (on the basis of derived demand) and are thus relevant to the location of certain market-oriented industries.

In allocating industries on a regional basis, planners determine whether an industry-divisional unit or an industrial complex is essentially material-oriented, fuel-oriented, labour-oriented or market-oriented in its location. Then, to locate plants and industrial complexes for economic production for the long run, planners take into account accessibility to the market area or the consuming industries concurrently being located, the location of material sources, the extent of weight loss of materials during processing, projected transport costs, special requirements in terms of power and water inputs, and the projected location of industrial districts consisting of complementary enterprises.

In a given geographic situation and resource endowment, the best location for a plant or an industrial complex engaged in one or more stages of a series of production stages depends on the locational situation of the preceding or the subsequent stage; on the advantages of locating separately or of locating near projected complementary enterprises so as to reap the economies offered by a specialized production centre.

The locational situations of late-stage industries, service industries, and locales of construction activity identify the consuming industries and

areas that call for such inputs as semi-processed agricultural products, building materials and semi-fabricated metal products; therefore, they indicate which supply sources (which early-stage industry location options) are advantageously situated for access to larger markets and for economical distribution.

Resource-based industries

Many agricultural processing industries must necessarily be situated near the source of their raw materials. The influence of raw materials on location decisions depends not only on the future cost of transportation, but also on the bulkiness and the perishability of the raw materials and on the extent to which production processing brings about weight loss during conversion of the materials into a finished state. Weight-losing materials attract processing plants to the source of the raw material.

For certain resource-based industries only a limited number of locations are available. This rigidity stems from the fact that raw materials are situated only at certain places, for example, copper and nitrate deposits. There are, however, alternative location choices for material-oriented industries that process these widely distributed raw materials. Moreover, the continual development of new sources and new kinds of materials, and improvements in transport technology provide alternative location arrangements for industry in developing countries.

There are many opportunities for designing industrial complexes and specialized production centres consisting of more or less techno-economically related enterprises. The kind and the extent of division of labour that can be developed depends not only on a region's resource endowments, but also on ingenuity in exploiting the potentialities of new production technology and new transport and power technology.

The topography of a region, the locational configuration of its agriculture and other resource-based industries, and the situation of projected industrial areas determine the general routes of transportation and identify the sources of, and markets for, power.

By projecting the future outputs of agricultural areas and the future transport routes and cross-roads, planners identify centres where processing mills and plants can be located for high productivity. Major transportation centres (main-route junctions) in rural areas frequently provide the "growth points" suitable for processing industries, schools and experimental stations,

equipment repair shops and marketing centres. Extractive and resource-based industries (distilleries, pulp mills, lumber mills, ore reduction mills, etc. should, wherever possible, be developed in the vicinity of, and spatially integrated with, agricultural-processing industries so as to promote the joint development of infrastructure and the emergence of industrial areas.

The environs of major transport junctions containing the forementioned economic activities and facilities may be projected as evolving into larger towns favourable for locating industries oriented to the agricultural sector such as the production of farm machinery and implements, local meat packing, tanneries and fertilizer plants.

Thus, the delineation of the specialized production of richer areas and the projection of power supply and transport routes identify major transport centres and bulk-breaking points, which offer favourable situations for locating those material-oriented processing and manufacturing industries that exploit the resources of the general area, and those market-oriented industries drawn to the general area because of economical production and distribution.

Market-oriented industries

Among the industries that seek a location readily accessible to their major markets are those which produce bulky or perishable goods and involve high transportation costs for shipment to market. Market-oriented industries also include those establishments that require market accessibility for effective technical servicing of, and communication with, consumers and those that require a connexion with market developments and consumers' behaviour to ascertain style trends.

Modern industry is basically engaged in specialized production. Many industries are engaged in the assembly of standardized final products such as appliances, business machines, communication equipment and agricultural machinery. Assembly plants are typically market-oriented; they locate more or less centrally with respect to their over-all market. Producers of parts and sub-assembly units also locate centrally for economical distribution to assembly plants and other industrial buyers of their products.

Producers design end products which can incorporate standard interchangeable sub-assembly units (motors and compressors, transmission devices, control devices) and other "common" components, all of which are decidedly more economical to buy from specialized manufacturers than to produce.

The industrial system nurtures different types of industrial complexes.[4/] For example, an industrial complex (a multiple-plant unit) may consist of two or more stages in a series of successive stages of production from raw materials to the final product; it may consist of a cluster of plants putting out two or more products from a single raw material (that is, engaged in the output of a material-related product line); it may consist of a multiple-plant unit that employs processes for the joint output of two or more related products (that is, engaged in the output of a process-related product line); or, it may consist of more or less integrated establishments engaged in activities (the preceding, the following, or the allied activities) related to a major activity (for example, publishing).

The rationalization of industrial complexes and regional location

The geographic specialization of industry on the basis of the highest available productivity decrees the rationalization of industrial complexes and of each homogeneous industrial sector, for example, the light-engineering sector or the electrical-engineering sector. A rationalization programme employs selective analysis and a number of related industrialization approaches that assure accelerated industrial development.

The active responsibilities of a rationalization programme are to:

(a) Design plants and industrial complexes to obtain the production adaptability necessary for developing countries;

(b) Design and locate industrial complexes to obtain the available economies from vertical integration;

(c) Formulate approaches for setting up minimum economic-size plants and industrial complexes required by developing countries;

(d) Employ a broad product-design approach that permits industrial sectors to maximize the adoption and the output of common components, such as standard interchangeable sub-assembly units, parts, and materials;

4/ An industrial complex is an interrelated multiple-plant unit (embodying production, marketing, or other activities) located at a given site for the output of goods or services. When an industrial complex operates on the basis of current technology and organization, the physical separation of a single activity or facility from the site increases its cost of operation, whereas, the expansion of a complex to a given level of output sometimes makes it economical to add a related activity or facility. Because of the size of local markets and transport costs, sub-optimal industrial complexes can be profitable, multiple-plant units.

(e) Organize and set up plants and industrial complexes on the basis of process-related product lines to obtain a large volume of work for output by mass-production facilities;

(f) Group techno-economically related plants and complexes to make up specialized production centres or districts that obtain high productivity and intensive use of infrastructure;

(g) Design the type of industrial structures that promote mutual locating of industrial complexes and the setting up of specialized production centres for regional division of labour;

(h) Design a projected industrial structure that enables the programming of integrated industrialization - the programming of related projects that erect vertical segments of capacity and techno-economically related facilities and concurrently provide complementary infrastructure to assure economic integration.

The above industrialization approaches are elaborated upon in the pages following.

For developing countries, an adaptable plant or industrial complex has particular value because of its ability to turn out a comparatively wide range of products and because of the low investment requirement for conversion of the plant to another line of output or for expansion of plant capacity.

Process engineers can readily design plants and industrial complexes for ease of adjusting or converting processes to meet changes in the products as well as for ease of inaugurating multiple-shift production to meet peak output requirements. Engineers attain production adaptability through the use of a process-layout arrangement for plant machinery, wherein the constituent departments or plants consist of a given type of processing equipment, as exemplified by press shops, machine shops and welding shops. Plants organized on the basis of a process layout and judicious use of general-purpose machines are highly adaptable to the introduction of new or redesigned products and to expansion. The pre-planning of and provision for production convertibility prior to the erection of a plant lowers the capital outlay that would be required for plant change-over to an output of technically-related products.

A vertically-integrated industrial complex is generally a multiple-plant industrial division consisting of sequentially-related plants at a given site. Detached mills and facilities situated at a distance from the complex proper can be likewise more or less integrated with the "works" division as ancillary plants or auxiliary facilities. The processes or services of the detached facilities would be technically designed specifically to meet the production requirements of the industrial complex.

The economies of vertical integration derive from the reduction in overall inventory stocks required, utilization of more specialized facilities, and the elimination of some beginning or terminal operations and equipment, such as those that involve furnace heating, inspection, packaging and crating, handling and storage.

In order to reduce investment in plant and to obtain steadier utilization of plant capacity, an industrial complex may be designed for partial or "tapered" integration, wherein the capacity of the earlier-stage plants is limited to meet the output requirements of the normal level of business. The additional output required to meet peak-production periods is covered by purchases from subcontractors who supply fabricated items and components for further processing or assembly by the later-stage plants equipped with the required peak-production output capacity.

An industrial enterprise integrates either forward or backward (acquires sequential plants) when the return on investment for earlier-stage or for later-stage plants is higher than the return on its alternative investment opportunities. As a vertical complex grows in output capacity (scale), and as technological innovations introduce capital-savings production methods or improved materials which are more economical to process, producers typically find it economical to erect an earlier-stage plant to produce components and materials that have become cheaper to make than to buy from suppliers.

The number of vertical complexes that emerge or that can be designed from the entire cycle of production stages in a given line of output (for example, in metal fabrication, textile, or food industries) depends on the volume of similar goods or related production that planners can group for a product coverage, the location of the major market(s), the geographic situation of resources, and the ingenuity of industrial planning and engineering. Planners, in their long-range design and projection of regional development, can frequently locate highly-integrated industries by identifying and securing favourable geographic situations where the required materials and other inputs (fuel, power, or water) are in close proximity and there is also advantageous accessibility to the major markets for the goods produced.

The optimum size and the minimum economic-size plant or industrial complex differ among industries because of differences in plant divisibility, capital intensiveness, length of the production cycle and the sources of economies of

scale. The economic-size production unit increases over time due to the emergence of high-speed machines and processes, improved materials that process faster and more intricate products which require a longer production cycle.5/

The capacity balance among comparatively indivisible production and service equipment and facilities is obtained more readily in the higher range of rated capacity.6/ Because of the high productivity and comparative indivisibility of facilities in certain fields of industry, such as transportation and power supply, increases in scale (in output capacity) can be made only in relatively large increments.

An efficient smaller plant or complex (a smaller-volume minimum economic-size unit) can be economically obtained by specifying a product line consisting of economy model products, designing products for output on less capital-intensive facilities, organizing plants on the basis of a process-layout pattern wherever possible, and carrying out subcontract work on the high-capacity underutilized facilities. The aggregation of techno-economically related plants and complexes into specialized production centres promotes the joint use of high-capacity, capital-intensive facilities, auxiliary plants and local infrastructure.

5/ An optimum size production unit is one that obtains the lowest unit cost of output in a given state of technology. A minimum economic size facility or multiple-plant unit is that scale beyond which long-run unit cost begins to decline slowly over a wide range of output (especially in the field of manufacturing). The scale of the minimum economic size unit depends on the output volume of the largest (in output rate) high-productivity, capital-intensive equipment or integrated processing unit; the scale of the minimum economic size industrial complex depends on the capacity of the largest (in output rate) economic size constituent plant. Analysts identify the minimum economic size divisional unit of an industry as that output volume which fully employs (at rated capacity) the high-productivity constituent indivisible equipment or facility, which may be a high-speed machine, an integrated fabrication line or assembly line, or an expensive auxiliary plant.

6/ Rated capacity (the effective output capability) is the output attainable when a plant or an entire industry operates on the basis of the standard or customary length of week and number of shifts (e.g. single shift, 48-hour week) with an allowance for normal delays - i.e., shutdowns resulting from machine failure and equipment repair or renewal, job set ups and changeovers, processing difficulties, absenteeism, and the like. Rated capacity is computed from past performance, trial runs, or engineering data. Managers would tend to adopt a multiple-shift production intensity when investment in plant is high and unit cost (as well as the initial investment outlay) can be lowered through multiple-shift operation.

Planners select and organize industries along structural lines suitable for industrialization in developing countries and regions. Planners ascertain a region's existing composition or industrial potential and study the products or output targets selected for production. They group products for process relatedness, material relatedness, market relatedness, and infrastructure requirements. Assembled final products are further broken down into common components and sub-assembly units.

Industrial planners, then, promote the maximum adoption of common components (standard interchangeable sub-assemblies, parts and supply items) that are selected or designed to go into the fabrication and assembly of similar as well as different kinds of products. For economical and accelerated industrialization, developing regions can adopt a scientific, broad-based product-design approach (essentially, a broad approach for the selection of sub-assembly units and parts) which permits large-scale output by specialized plants of standard sub-assemblies and parts designed for absorption into the assembly of a wide range of final products.

In this approach, products (including sub-assemblies and parts) that require the same or similar production technology are grouped to make up a process-related product line for joint output (usually output on an intermittent basis) by a given plant or industrial complex. The process-related product line approach for designing and setting up plants or complexes is employed where the projected output volume (the projected market) of a single product or item is not sufficient for the erection of a minimum economic size production unit.

Where resources and other location requirements are favourable or, at least, permissive, planners will specify plants and industrial complexes on the basis of process-related product lines so as to obtain ("carve out") a larger volume of the same or similar production requirement for low-cost output by a minimum economic-size production unit. Diverse items of small volume requirements are grouped to make up broader process-related product lines for economic output by more adaptable (less specialized) facilities.

Analysts may break down a product line slated for large volume output into two (or more) narrower process-related product lines for efficient output by more specialized industrial complexes or plants. Large optimum-size industrial complexes sometimes may be split up, without any appreciable sacrifice of

productivity, into two or more divisions of a minimum economic size so as to obtain a wider locational dispersal of industries and build up specialized industrial districts in different areas. In the long-term process of progressive division of labour, more specialized plants and industrial complexes will continually gestate and spawn in the industrial environment.

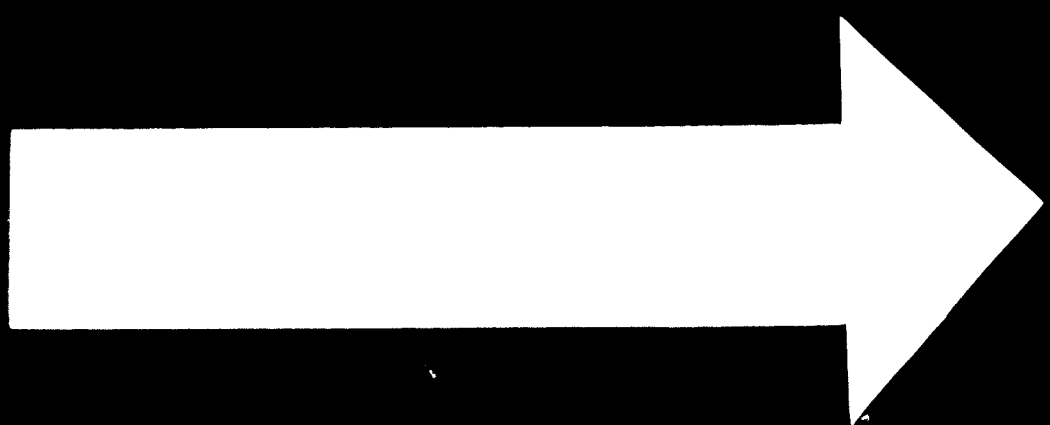
Depending on the particular dispersal of consumer industries and consumer market areas, market-oriented complexes will locate in areas of relatively high-income potential; such areas may include urban areas, major transport centres, areas of intensive agriculture, richly endowed lake areas, larger valleys and basins and harbour areas. Planners should set up or promote, in selected growth areas, one or more appropriately specialized production centres or districts consisting of a well situated cluster of industrial plants or complexes that employ more or less the same or similar production technology, materials and infrastructure. These centres would include material-oriented plants and complexes, market-oriented complexes and single plants, auxiliary facilities and infrastructure facilities.

In striving for an economically "ideal" geographic specialization of industries, planners, in their long-term analytic procedure, project the kind of specialized production centre that is best suited to each area and region in the long run, including the economic exploitation of a continental or subcontinental infrastructure system (particularly the economic use of continental transport and power systems). The entire infrastructure includes road transport, railways, air transport, power supply, water supply, and waste disposal facilities.

Basically, the emerging industry-location pattern is perspective or "indicative" physical planning. It serves as a basis for preparing economically viable five-year or "short-term" plans consisting of projects for erecting vertical segments of capacity and techno-economically related facilities, including companion infrastructure. (A later section deals with relevant economic planning and programming aspects, particularly with respect to the provision of infrastructure.)

The efficiency of geographically-specialized industrial complexes

Through regional analysis and the sequential and mutual locating of industrial plants and economic activities, planners develop a projected geographic-specialization-of-industry location pattern for planning and programming



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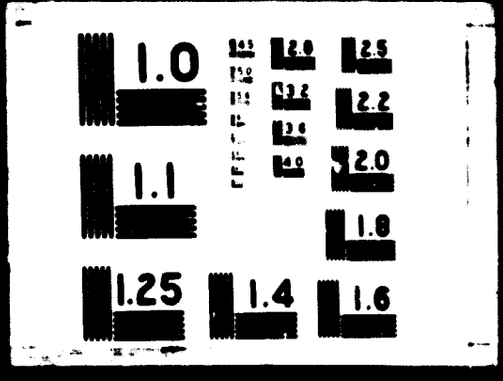

regional industrialization, infrastructure development and accelerated economic growth. Compared to dispersed and isolated enterprises, geographically specialized industries and industrial complexes require smaller investment for their development, are more adaptable, and operate at substantially higher productivity.

More precisely, economic development along the lines of a predetermined geographic specialization of industries achieves productivity gains and advantages in a number of ways. It specifies the types of skills required for each projected specialized production centre or industrial district and, thereby, provides time for the provision of a pool of skilled labour in advance of long-term requirements; it obtains lower transportation costs; it calls for a smaller investment in inventory stocks (a more optimal stock-sales ratio); it promotes more stable levels of production and use of plant capacity; it promotes industry-wide adoption of mass production methods of output; it requires a smaller capital outlay for the erection of plant capacity or for the revision and modernization of plant; it promotes the emergence of industrial research and a flow of technological innovations; it promotes the emergence of service and ancillary plants and a supply of components to producers; it specifies appropriate special-purpose (more efficient) types of infrastructure, providing ample time for engineering and erection of infrastructure synchronized for emergence with the establishment of industries in a given area, and attains more intensive long-term utilization of infrastructure. These advantages of economic development along the lines of a projected geographic specialization of production are amplified below.

A production centre comprised of enterprises specializing in techno-economically similar lines of business (whether in extractive, manufacturing or service lines of industries) creates a labour pool of skilled and technical labour. Geographically specialized industries may augment the supply of skilled labour by an early inauguration of trade and technical schools. By predetermining the location of industries well in advance of their erection, planners obtain time in which to establish technical schools for the provision of the required skilled and professional personnel, so that the "labour bottleneck" need not emerge to retard industrial development or adversely influence location decisions. The provision of the required skills in advance of demand creates a desired "labour pull" on industries, drawing them to economically valid locations. The general availability of better schooled labour in

existing urban areas would, however, tend to attract and accelerate the establishment of certain labour-intensive industries. Such labour-oriented industries are those in which labour costs make up a signifcant share of the unit cost of output, and business volume tends to fluctuate, so that the ease of selecting and recruiting effective workers from a large local supply facilitates the maintenance of a relatively efficient work force. Furthermore, industries requiring skilled personnel tend to be drawn to urban areas where such manpower is usually concentrated.

A predetermined geographic specialization of industries results in a more economical pattern of transportation; it eliminates needless movement of cargo and minimizes the cross hauling of cargo and the multiplicity of shipments. The location of establishments, industrial complexes, and specialized production centres on the basis of a long-range transport design and long-term transportation costs achieves the economical shipping of finished goods and economical inbound movement of raw materials that a modern transport technology can provide.

The design and timely programming for the provision of transport (as in the case of power and other infrastructure) for a constellation of related specialized industrial districts promotes an intensive use of such infrastructure and low cost transport services.1/ The localization of industries in specialized production centres results in lower industry-wide stock-sales ratios. This quantitive shrinkage in inventory stocks, with resulting lower investment in inventories, is appreciable in the many industries that produce high-value goods, wherein investment in stock tends to exceed investment in plant and equipment. The localization of industries requires lower finished stock levels because quicker delivery and shorter distribution channels absorb less stock.

Rationalized plants and industrial complexes in well situated industrial districts have markedly low stock-sales ratios owing to the greater integration of plants and wider absorption of interchangeable sub-assemblies and components in the assembly of final products. Industrial rationalization shrinks inventory stocks by designing plants adaptable to changes in the

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1/ The analysis and the approach for attaining this economic arrangement is allocated to a later section.

product mix, by shortening distribution channels and by obtaining more efficient material-handling and transport arrangements. Industrial rationalization also obtains economies by promoting the adoption of improved inventory control systems and "hand-to-mouth" purchasing practices.

Producers situated in a specialized production district can more effectively adapt facilities and operations to changes in products, product mix, and production requirements because of a wider range of equipment types and sizes available for current and standby operations. Producers can also attain a more stable volume of output in the face of seasonal influences and shifts in market demand owing to the greater availability of market information and more effective forecasting, and to the greater opportunity for purchases from local subcontractors to meet peak sales requirements or for engaging in subcontracting work during the slack season. Producers, moreover, experience fewer production interruptions because of a more reliable supply of materials, utilities, repairs and facilities.

The geographic concentration of producers in similar lines of business readily and economically promotes the emergence of industrial research. The concentrated location pattern is more conducive to the assembly of a community of technicians, engineers and scientists and to the establishment of industry-wide and publicly aided research activity for the generation of a flow of technological innovations specifically geared to the needs of the industry.

A concentration of more or less specialized production in an economically favourable location reaps productivity gains from lower priced inputs of productive factors in terms of goods and services (that is, from external economies), as well as from the broader adoption of mass production technology by economic-size establishments (that is, from internal economies). Specialized ancillary plants emerge to supply sub-assemblies and parts to producers of different though technically-related products. A large market, comprised of techno-economically related producers in the general area, promotes the emergence of specialized enterprises that offer such services as equipment repair, motor trucking, warehousing, plant construction, waste disposal, engineering, technical education and other local infrastructure services.

Producers locating in an economically compatible centre of specialization obtain lower operating costs (lower break-even points) owing to the availability of skilled labour and specialized suppliers and to the procurement of

lower priced materials and utilities. Lower production costs permit lower prices and, generally, a larger volume of sales for many lines of goods which, in turn and in the long run, promotes wider use of mass-production (high-speed) machinery with its lower fixed costs and lower labour cost per unit of output.

Thus, when a plant or an industrial complex, designed for the output of a process-related product line, is located in a specialized industrial district, it obtains a low break-even point from external economies (including savings from purchases of low-priced sub-assemblies and components) and from internal economies, though in some cases internal economies may be somewhat limited in the initial years of business. As indicated earlier, through the joint output of related goods, enterprises obtain internal economies because of a relatively high utilization of capacity. Since a rationalized minimum economic-size enterprise, when situated in a specialized production centre, enjoys a lower break-even point, it will be an economically viable enterprise even though it may be somewhat underutilized.8/

Infrastructure provision for regional industrial complexes

Infrastructure provides industry with the basic services necessary to the production process. These "economic overhead" services include transportation, power and water supply, and communication. Social infrastructure consists of education, health facilities and the various public services that contribute to economic growth and a general increase in productivity.

The provision of such infrastructure as highways, railways, terminals and power facilities absorbs large amounts of capital. The capital intensiveness and capital "lumpiness" of infrastructure derives from the geographic dispersal of the demand and market for their services and the physical extensiveness of their facilities.

8/ A rationalization programme (as outlined earlier) standardizes materials and sub-assemblies and maximizes their interchangeability for assembly or fabrication into various final products. It organizes industrial complexes of minimum economic size on the basis of process-related product lines designed for appropriate adaptability and integration and for intensive use of infrastructure and other productivity gains; it sets up specialized production centres consisting of techno-economically related industrial complexes and plants; and it locates these centres for economical production and distribution and for complementary interrelationship with neighbouring production districts, namely on the basis of a spectrum of industrial technology.

The programming of geographically scattered development projects often means that newly erected plants are provided with high-cost, underutilized infrastructure services, or are handicapped by interruptions stemming from bottlenecks in transportation and power. Poorly planned and indiscriminate infrastructure erection results not only in underutilized capacity, but in long-term economic dislocations; plants are pulled to areas and sites by the short-term availability to transport or power, rather than being rationally located on the basis of the best available resource and market situations. A development approach which permits heavy absorption of investment in underutilized infrastructure, moreover, retards the rate of economic growth because it represents misdirected development and a waste of resources.

Because of the general indivisible nature of infrastructure and the fact that facilities are often built ahead of demand, underutilization (excess capacity) is considered to be unavoidable. This means that for a period of years large investments for economic development contribute little to the supply of goods and services.

Balanced programming seeks to avoid excess capacity above that which is inherent in the indivisibility of the facilities. Capital lumpiness and underutilization can be somewhat reduced by tailoring and staging the construction of highways, thermal power plants, and coastal shipping to fit the current requirements of industry and development. Such balanced programming attempts to provide sufficient infrastructure services to prevent the emergence of production bottlenecks as new industrial facilities go into operation.

Planners must try to provide adequate infrastructure so that industry can function without shortages in power, transportation and communication. Shortages result in curtailment of production, underutilization of plant capacity, and excess accumulation and hoarding of raw material stocks. Planners must, however, avoid the erection of technically "over-specified" facilities and of excess capacity (underutilized facilities) in infrastructure with the consequent high service charges.

Planners must provide developing countries with technically and economically efficient and useful types of infrastructure for long-term needs and rational economic development. That is, they must avoid the incidence of premature obsolescence in capital-intensive facilities (both in design and economic utility). The infrastructure must meet the needs of long-term economic development and provide a useful service for a long span of years.

Transport and power supply are integral parts of industrial and economic activity. Effective industrial planning depends on a continual survey of resources and their evaluation for commercial exploitation on the basis of richness and accessibility in terms of projected transport and power technology. A transport study must derive from studies of resources and plans for agricultural development and industrialization. Economic objectives and development plans must be translated into transportation requirements if an efficient long-term transport system is to be designed and developed.

The projected cost of transport services influences the location of industries and the kinds of industrial complexes that can be established. An economical transport system and an interconnected power system enlarge the scope of markets and open up "growth areas" for locating specialized production centres. Because of the larger number of available location options, industrial complexes can be more advantageously situated for cheaper inputs and efficient production.

It is essentially by projecting a geographic specialization of economic activities that planners specify the long-term rational direction of development and the economically-valid industries for each area. A continuing study for the projection and refinement of a location pattern for industries obtains an efficient distribution of specialized production activities. A location study essentially allocates and situates related industrial activities and land uses to areas and districts where these specific economic activities would be advantageously sited; and where the required plants can be organized and arranged for efficient use of land as well as for efficient production.

Predetermined regional location of industry serves as a means for identifying, acquiring and reserving scarce, well situated industrial land for vital long-term economic development. It thereby determines the best use for scarce industrial land and provides the time necessary for research and thorough planning of the economic aspects that facilitate town planning. In the short run, industrial land may be effectively employed for agriculture, storage areas, public markets, open-air cinemas, rather than for permanent structures.

By projecting the kind and the size of industries suited to each economic area (by projecting economic potential), planners determine the infrastructure specification for each area in terms of transportation, power, water, waste

disposal, communication, technical education, medical facilities and the like. A projected location of mining, iron and steel, and basic chemicals industries, for instance, indicates where heavy transport services and power would be required.

A location-projection survey shortens the gestation time for erecting and establishing industries and infrastructure because it permits advance long-term decision making and, thus, provides ample time for thorough economic and engineering studies and for selection and acquisition of industrial sites.

The planning of transportation, communication, power and water supply systems is fundamentally based on a projected economic and industrial geography of a developing region. The projection, however, undergoes adaptation and refinement to accommodate technological innovations and the availability of more complete resource data.

A projected economic geography enables planners to determine the routes and kinds of transport services required, areas of water surplus and areas of water demand, areas of cheap fuel and power surplus, and the pattern and stages for the evolution of an interconnected power grid. Planners, for instance, will estimate the types, volume and seasonality in the flow of cargo so that they can evolve a rational transport system.

It is on the basis of over-all analysis and the emerging transport technology that the planner projects economic development and designates the transport media that are economically suitable for the various types of cargo and branches of industry. The cost and performance of the various transport services differ among areas because of differences in the type and volume of goods to be moved and differences in geographic location of industries.

The development of a transport system takes into account the trend in transport technology, comparative transport capabilities and costs for different transport media, the impact of the different media on production and distribution costs, and the net long-term effect on economic development of the various transport media. The selection of a media will be based on comparative costs, not only in terms of the transportation service, but of the total long-run cost (the future cost) of production and distribution for industries projected for development. The projected freight cargo to be moved, therefore, would be allocated among different transport media so as to attain minimum long-term investment in both transport and industry and to accelerate economic growth.

Planners develop a transport system on the basis of topography, geographic configuration of economic areas, and a projected flow of goods from industries and areas planned for development. Planners select general routes for surface and water transport and stipulate terminal and key intermediate points. (The development of a cargo air transport system and air transport-based industries is outlined in a later section.)

Transportation analysts select the type of carriers (type of transport services) on the basis of development strategy, adaptability and long-term costs for moving designated types of freight in the projected economy. The specification of transport services involves the stipulation and allocation of transport media among freight and passenger services, for long-haul and short-haul trips, for bulk and small package goods movement, for high-value and low-value cargo and so on.[9]

A detailed study of projected economic development and of transport requirements provides the specifications for specific routes - initially the routes for those areas selected for earlier development. The construction of transportation is programmed for effective synchronization with the progress of plant construction and projects for agricultural development.

In the projection of transport, planners should take into account relevant technological trends and industrial potentialities. They should particularly note the progress in miniaturization of both consumer and producer goods. Light-engineering and electrical industries, for instance, devote a large share of their capacity to the output of goods of high value relative to their bulk (small high-value products). This means that a substantial share of the manufactured products of the immediate future will be goods of high unit value relative to their bulk.[10] Meanwhile, the continual long-term drop in the cost of air cargo shipping means that air transport will

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9/ In general, long hauls in heavy traffic would be allocated to railways and water carriers; road transport finds its best use for moving high-value goods and perishables over short hauls; and air transport is economical for high-value products relative to their bulk.

10/ Miniaturized sub-assembly units and components go into the assembly of business machines, automobile control devices, air conditioners, television sets and radios, and a growing group of other products. Air-shipped sub-assembly units and components that also go into the final assembly of many products include transmissions, clutches, gears, crankshafts, axles, instruments, pumps and control devices, generators, motors, rubber and plastic parts and the like.

expand secularly. A decision for the future introduction of air transport services for a given industry in developing regions should take into account the important savings in inventory that would take place, the over-all reduction in inventory carrying charges and the advantage of speed in transport of materials.

Industries operating on the basis of air transport can, therefore, obtain substantial economies in terms of steadier production, short distribution channels, speed in adjusting to changes in market demand and low over-all inventory levels. Such economies, and the possibilities of establishing efficient industrial complexes of minimum economic size, create the economic conditions for a measure of industrial development on the basis of air transport in the years ahead.[11]

The investment required for the provision of air cargo transport services would be comparatively low because of the general excess capacity in airline facilities in developing countries. Moreover, cargo aircraft might be acquired singly as needed.[12] The comparative absence of capital lumpiness in air cargo transport facilities would enable a gradual expansion in air freight carrying capacity.

Interrelationships in the programming of infrastructure and industry

Perspective planning projects the future industrial geography of a developing country by outlining its constituent economic areas, location pattern for industries and a flow of economic activities. Such planning provides a large backlog of viable industrial and agricultural projects that make it possible for planners to prepare and maintain an up-to-date, long-range development plan for years ahead. Since perspective planning provides a wide range of viable projects for the erection of industries and infrastructure, it offers alternative directions and approaches for economic growth.

11/ Most fundamental is the fact that air transport might become a major means for overcoming the obstacle of small markets. A continental constellation of interrelated industrial complexes and specialized production districts might emerge to produce and distribute to an enormous market and thereby obtain a balanced flow of freight and intensive utilization of air transport facilities that will make for low shipping costs and lower priced inputs.

12/ Aircraft builders would likely find it economical to tailor their aircraft designs for developing countries. For instance, slower planes would be appropriate because of the substantial differential between air speed and surface speed.

In determining the most effective strategy for economic growth, planners analyse the perspective projection (a projection of the geographic specialization of industry two decades or more ahead) to ascertain and evaluate alternative directions and approaches for developing the earlier stage of economic growth and the ultimate growth of the economy as a whole.

Although there are many intricate aspects to the problem, the selection of an economically valid growth strategy is crucial to success. Stated in simple terms, planners employ the perspective plan as a basis for following through alternative paths for economic development (alternative approaches and sequences for developing industry branches, infrastructure, agriculture, etc.) and for appraising the results of each in terms of such criteria as the rate of growth, attainment of technological proficiency, investment absorption and ease of maintaining economic balance, that is, avoiding imbalances in capacity, in the balance of payments and in inflationary forces.

Once a valid growth strategy is determined, planners implement the strategy by preparing an economic plan for programming the establishment of specified industries and infrastructure in selected areas in conformity with the predetermined industry-location pattern.

With perspective planning, planners are able to prepare and implement a succession of comparatively long-range plans (six to ten years) for developing industries, infrastructure, agriculture, education and other cultural improvements. Such "planning in depth" is particularly vital for programming infrastructure and industry for concurrent completion and for attaining the adaptability in programming essential for minimizing the emergence of imbalances during the process of growth.

On the basis of a projected industrial geography, planning and programming can accelerate regional development by initially exploiting the economic potential of the most promising areas and growth points. These would include major urban areas as well as accessible selected regions favourably endowed with rich mineral deposits such as copper, bauxite, and potash; timber resources for lumber and pulp industries; and rich sources of fuel (coal, oil, sites for hydroelectric power). Industrial programming would initially concentrate on those capital-intensive industrial projects that promote the emergence of scale economies and step up economic expansion.

Planners introduce geographically specialized industries and integrate an emerging economy by programming a succession of techno-economically related

vertical segments of capacity - in line with the predetermined industry-location pattern within the limits of available investment funds and short-term supply of skilled and professional labour.[13]

The programming of a new industry usually involves the erection of vertically related plants and industrial complexes at pre-located industrial districts. This vertical segment of capacity will generally consist of early, intermediate and final-stage plant capacity and the supporting specialized local infrastructure. The constituent plants and industrial complexes would be mutually supporting in that they would be supplying establishments and consuming establishments.

Planners programme the expansion of an existing line of production by enlarging output capacity all along the line of a vertical segment of productive facilities and the specialized local infrastructure facilities. This may involve the erection of a duplicate early-stage plant and an enlargement of a final-stage industrial complex. It may, however, call for the erection of a more specialized final-stage industrial complex (or plant) and the conversion of an existing industrial complex (or plant) to a narrower line of production. Programming, in this instance, splits a line of production and allocates a narrower line of work to more specialized establishments.

The development plan will typically include the programming of a number of groups of techno-economically related single establishments pre-planned for location in appropriate specialized production centres. In the earlier stage of economic development, many of these establishments are designed to put out products substituting for imported goods. Since the foregoing plants were largely selected on the basis of their material relatedness, the specified early-stage plants would be erected with a ready market for their output.

A long-range approach to economic growth enables planners to prepare plans and programmes that take into account detailed infrastructure needs (depots, terminals, warehousing, special handling facilities) of industries pre-located at various growth districts and areas. Such an approach enables planners to avoid or, at least, to minimize the waste of resources stemming from economic

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13/ It is obvious that short-term planning for economic growth in developing countries involves many obstacles - political instability, trade imbalances, inflation, shortage of capital and skilled labour, etc. This paper limits its coverage to the outlined long-range location-and-development approach and its contribution to facilitating long-term economic development on a more rational basis.

imbalances that consist of shortages in capacity (or output) in certain industries and infrastructure along with excess (underutilized) capacity in other industry branches and infrastructure.

The attainment of integrated industrial development necessitates advanced programming of transport and power facilities in order to assure the provision of the infrastructure services required for industries scheduled for early emergence. Long-range planning in depth on the basis of a predetermined industry-location pattern enables planners to identify the transport and power infrastructure requiring long gestation.

Long-range programming can then specify the needed transport routes and facilities and the time schedule for their erection. Such programming erects those sections of the pre-planned transport system required for synchronized emergence with particular industries.

Planners may specify a transitional scheme for the provision of transport services. A near-term scheme for the provision of transport for a given route may stipulate motor trucking or a narrow gauge railway which is later to be replaced by a standard gauge railway line. The dismantled narrow gauge railway may be installed for local infrastructure of isolated industrial districts.

Planners will not long delay the improvement or the linking up of transport services between neighbouring economic areas. The programming of complementary industrial enterprises at neighbouring economic areas results in a more intensive use of linking transport services. Transport utilization is augmented by an early programming and construction of industrial establishments at major cross-roads and along the main route between economic areas.

The long-range development plan takes into account the cost of power. A study for long-term power supply analyses the long-range development plan and formulates the most rational scheme for acquiring an economical long-term power supply, while satisfying near-term power requirements with a minimum of underutilized capacity. The long-term supply (and cost) of power will depend on the feasibility of designing suitable stages for evolving an interconnected power system. The near-term supply (and cost) of power would depend on the relative cost of fuel sources, availability of hydroelectric power sites, and the types of power stations that can be economically erected to meet the near-term demand as indicated by the development plan.

In the short run, certain isolated production centres can be supplied by a local power station. Small power stations may be equipped with a transportable turbine which can later be installed in another area. As the demand for power increases, the spreading power network supplies electricity to formerly isolated production centres.

Planners essentially achieve industrial development at low investment in plant and infrastructure by programming industrial capacity for the emergence of a number of integrated industrial districts. By expanding (filling in) capacity in a constellation of related production centres in line with a predetermined geographic specialization of industry, planners obtain intensive use of power and transport facilities, lower stock-sales ratios and create other economies of scale.

Appendix 1

INTERINDUSTRY RELATIONS IN THE HISTORICAL EVOLUTION OF INDUSTRIAL LOCATION FACTORS 1/

Before the industrial revolution, transport costs were the predominant factor for the location of industry. Industries, including the production of iron and steel (whose furnaces used wood for fuel), were generally scattered in small centres of production set in plains or valleys where transport was easy and there were pockets of non-agricultural labour (fertile areas with agricultural production) or in regions with a rapidly growing population offering ample supplies of low-cost labour.

With the industrial revolution there was a changeover from a scattered iron and steel industry based on wood to one using coal for fuel and reduction. Because of the cost of transporting coal and the large quantities involved, the steel industry - which now needed heavy investments - settled at sites in the coal basins which in Europe stretch from the Saar-Ruhr area across to England. These areas possessed the additional advantage of river transportation facilities. In their turn, industries using iron and steel tended to settle in these areas, influenced by their cost of transport. Similar trends appeared in the glass and ceramics industries and in other industries requiring considerable quantities of fuel. In this way, what were to become the greatest industrial centres in Europe grew up.

The emergence centres for iron and steel making and metalworking created concentrations of population, and hence manpower resources and local markets, which attracted manufacturing industries. These economic concentrations justified and led to the creation of vast infrastructural works. Thus, new industrial location factors were added to transport costs, arising from the spatial concentration of industry and the economies of concentration or rather the external economies offered to firms by the existence of good infrastructure, labour supply and so on.

The nineteenth century and the present century saw the expansion of these great concentrations. Their power to attract industrial investment continues, although there are now profound changes in the role of location factors, which have begun to manifest themselves - at first slowly, then more rapidly - during the last fifty years.

1/ The text of this appendix has been taken in part from EEC (1966) op. cit. suitably condensed and modified for the purpose of the present study.

New sources and forms of energy are used and there are vast improvements in transport systems. Markets have broadened and competition grows. Given the need for greater productivity and innovation, technological specialization becomes ever more important in the manufacturing industries, forming the basis for modern mass-production methods. This specialization, once peculiar to the textile industry, has spread to metalworking and numerous other manufacturing industries. In basic and other continuous-process industries (steel, heavy chemicals and so on), these objectives are attained by technological integration.

Technological specialization in manufacturing industries leads inevitably to reliance on auxiliary industries and various industrial services. These must be located near the manufacturing industries, either because their facilities must be immediately available or because frequent contact with them is necessary. Because of their size, the auxiliary industries and industrial services require many customers in order to operate economically. Hence they are to be found only in the large industrial concentrations.[2/]

Though transport costs no longer have a decisive effect on production costs in most manufacturing industries[3/] and a suitable energy supply is also available in other areas, new investments continue to be directed towards the existing concentrations, despite the fact that new conditions favour greater mobility.

Interindustry relations have become the predominant location factor for manufacturing industries with widespread markets. Availability of labour and more spacious sites are the most frequent reasons why expanding enterprises decide to move. But because of the interindustry relations, such movements generally occur within or around the borders of industrial concentrations, that is within the radius of utilization of the auxiliary industries and industrial services.

Originally, the industrial agglomeration process in the concentrations was essentially quantitative, but it has since become mainly qualitative.

2/ With some industries which developed in traditional centres, such as textiles, auxiliary industries and related services grew up organically in these specialized agglomerations.

3/ With auxiliary industries and services, the importance of proximity lies not in the transport costs involved, but in the immediacy of such services and personal contacts.

The external economies which once stemmed from the mere fact of agglomeration now derive from the specific interindustry relations found in the great concentrations, where the units belong to the same and complementary sectors.

Transport costs are still the predominant location factor for a few industries, mainly those using bulky raw materials, such as the basic industries, or selling bulky products to local markets (food products, soft drinks and some construction materials). As supplies of the raw materials (coal and iron ore) which gave rise to the concentration of industry in Western Europe become insufficient or less economic and new materials (oil, etc.) which need to be imported have been introduced, the expansion of basic industries is moving to the coasts to reduce transport costs, or to those parts of Europe where deposits of the new materials (methane etc.) have been discovered.

Large steel works, petrochemical complexes and refineries spring up in the peripheral parts of Europe, which previously were left out of the industrialization process and could count only on small industries serving the local market.

Unfortunately, since the common location factors which once grouped manufacturing and basic industries no longer exist, these complexes do not give rise to new industrial centres, despite the presence of infrastructures and the regional development policy incentives introduced during the last decades. These regional policies were devised when belief declined in the principle that a free economy would be spatially self-balancing and mark the introduction of macro-economic criteria of industrial location in the European countries.

The profound historical changes described above in the relative importance of the various location factors have not, however, greatly changed the industrial face of Europe. By and large, industry remains located in a central block. Over the course of time, the large concentrations have extended into the adjoining regions while the peripheral parts of Europe have continued to have a low density of industry and an agricultural economy. In view of the different rhythms of expansion which characterize these two types of economic structure, the gap between the developed regions and the peripheral regions has become more pronounced.

Without doubt, one of the major causes of the present lack of development in the underdeveloped regions is the inadequacy of interindustry relations, particularly the lack of an efficient network of auxiliary industries and industrial services.

Appendix 2

INTERINDUSTRY RELATIONS IN THE CLASSIFICATION OF INDUSTRIAL LOCATION FACTORS

An ad hoc classification of industrial location factors has been made in this paper for the sake of clarity of presentation and to highlight the autonomous role of interindustry relations. The following five main headings are utilized:

1. Infrastructure and site requirements

This refers to the general technical infrastructure (transport, communications, water supplies, etc.) and the social infrastructure (housing, schools, amenities, etc.) in the district where industry is to be located, and to facilities at the site on which the plant is to be built (availability of building plots, connexions to water and power supplies etc., access to transport systems).

In this respect two sub-headings may be considered:

(a) Standard requirements: normal infrastructure and site requirements needed by most industries,

(b) Special requirements: those relating to infrastructure and sites for certain heavy industrial plants and to industries using particular processes, etc. (water access and deep-water berths for overseas shipments; quantity or quality of water or electricity or gas supply; size of plot, nature of the ground, etc.).

2. Transport costs

These include not only transport but also communications costs, of raw materials from the source to factory and of products from the factory to the markets.

3. Labour supply

This covers the availability of labour (workers and other personnel) and rates of remuneration. Labour supply may be referred to, depending on its characteristics, under three sub-headings:

(a) General labour;

(b) Skilled labour;

(c) Labour with special characteristics (female labour etc.)

4. Interindustry relations

Interindustry relations refer to linkages that cause one industry to be located near to another, but not because of transport or other direct costs. Such industrial linkages making for proximity affect the following groups:

(a) Specialist units for maintenance and servicing machinery and equipment, including supplementary units and local spare parts depots. Many such repair and maintenance units work specifically for a given sector of industry; others, concerned with the maintenance of general service plant and construction systems, operate across industry as a whole.

(b) Sub-contractors and specialized processing units, comprising workshops turning out made-to-order products or performing special processes specifically requested by industry. Most of these industries work for a particular industrial sector.

(c) Other intermediate industries or local depots supplying standard and catalogued products. Intermediate industries which produce material used on a large scale industrially. This sub-heading excludes basic industries, which do not normally have to be close to the factories they supply; when exceptions occur, they are due to the effect of 2. (transport costs).

(d) Various technical and commercial services, which may be grouped according to whether they serve industry in general or given sectors.

5. Public industrial policy

This item refers to instruments and measures of industrial policy which influence the location of industry (controls, incentives, etc.). They tend to introduce macro-economic criteria of industrial location in the market economies.

In the classification adopted, interindustry relations as location factors are limited to those shown in heading 4. Many other interindustry relations appear in input-output matrices (linkages with basic industries and aspects of vertical integration of production in steel and petrochemical complexes) but they are excluded as location factors. In the few cases nowadays where manufacturing industries locate near basic industries, the main reason is generally transport costs, no longer technological reasons.

Steel and petrochemical complexes and other basic industries are generally material-oriented, so that transport costs mainly determine their location.

only a part of the processing cycle of these complexes may set up at the main location, the rest of the cycle being undertaken elsewhere by the same firm or even in nearby establishments of other firms. These are cases of technically complex integration of a single operational unit, although the location of the remainder of the cycle could be considered as resulting from the interindustry relations factor. It has been thought preferable, however, to treat steel and petrochemical complexes as an operational unit, whether this is the actual or potential situation. Agro-industrial complexes, on the other hand, are generally processing industries located near raw materials of agricultural origin; in other words, transport costs are the main consideration in their location.

To summarize, interindustry relations have been defined independently from other factors, to avoid duplication and confusion in the classification. Only auxiliary industries and industrial services satisfy this criterion. The customer industries tend to locate in their proximity, not because of transport costs but because the services and personal contacts need to be immediately available. In other words, the distance factor has a marked influence here, but not in the traditional terms of transport costs.

The classification might have been drawn up to include interindustry relations under a wider heading called the "distance factor", other than transport costs. This heading would also have covered, for instance, the commercial advantages of being near to customers or a considerable number of them, and also the requirements of internal organization of multi-plant firms and so on. It could be objected, however, that the latter point is one of the general aspects of the problem of centralized versus decentralized management. The case of plants operating as auxiliaries of other plants of such firms is covered by sub-heading (a) and (b) of this heading.

The classification does not include under separate headings the following factors affecting the location of single industrial plant: the availability of natural resources, the availability of capital and economies of scale.

As natural resources, the classification refers to processing industries other than mines, whose location is determined by the deposits. The availability of natural resources is covered by the factor Transport costs (2) for raw materials only by the factor Infrastructures and site requirements (1), for water supply, climate, etc. Availability of capital is not considered a factor bearing on the location of individual plants, in view of the existence of

national and international sources of finance and the mobility of this production factor, especially when sound projects are involved.

Economies of scale are undoubtedly an element to be considered when deciding whether to expand the production of an existing establishment or to set up another plant, duplicating the range of products or suitably dividing the processes between the new plant and the existing one. Hitherto, considerations of the economies of scale have worked against the relocation of enterprises. Should it be decided to set up a new factory, its location will be decided after examining the various cost factors in relation to site needs and ease of operation.

Finally, it should be noted that the classification facilitates reference to the external economies gained by firms located in industrial agglomerations. This subject is dealt with briefly in appendix 3.

Appendix 3

INTERINDUSTRY RELATIONS AND EXTERNAL ECONOMIES

Interindustry relations form part of the external economies which in any given location may benefit the operations of firms already there or which settle there. External economies generally refer to the existence of suitable infrastructures, interindustry relations, and organized labour market and other conditions.

These external economies, are available to industries in industrial concentrations or agglomerations, by their very nature, but not to those in rural zones. External economies are therefore identified with the so-called economies of concentration.

The need has been felt in the present study not only to define them in terms of the various location factors, but also to distinguish between general external economies which derive from the purely quantitative fact of agglomeration, and other external economies which result from the presence of industries belonging to the same sector or industries with a relative homogeneity of inputs. The convention has been adopted of calling this class of external economies sectoral external economies.

The distinction makes analysis easier and is based on observable reality. In underdeveloped regions of Europe and in many developing countries one may encounter, in incipient industrial areas, agglomerations of heterogeneous industries which can offer in consequence some general external economies, but only to a limited extent. In the great concentrations of the highly industrialized regions of central western Europe and other economically developed countries, it is possible to add to the general external economies the more important sectoral ones.

General sectoral economies include infrastructure and standard facilities; supplies of general and the types of skilled labour used by many different industries (electricians, certain types of mechanics, etc.); a few types of maintenance units used by the majority of industries (maintenance units for general service systems of plants, for constructions, for vehicles etc.); local depots supplying the materials most widely used in industry; and other technical and commercial services which operate for industry in general (see table).

Sectoral external economies include infrastructure and site facilities which satisfy special requirements; skilled labour and labour with special characteristics; sub-contractors and specialized processing units; special units for maintenance; local depots supplying standard and catalogued products and various technical and commercial services which are required specifically by the industries of the sector considered. Interindustry relations thus belong mainly to this class of external economies, and for many industries and sectors with a high degree of technological specialization (metalworking, textiles, etc.), they represent the most important element.

General external economies may vary in quality and level according to the characteristics of an agglomeration of industries. On the other hand, an agglomeration which contains numerous industries belonging to the same sector may not offer all the external economies described above, especially as fas as auxiliary industries are concerned. The presence of industries belonging to the same sector constitutes a necessary but not a sufficient condition for the operation of such auxiliary industries and services. Because of inertia, industrial agglomerations of considerable size already exist in some industrial areas, in underdevelcped parts of Europe and in the larger developing countries. Such agglomerations contain numerous industries belonging to the same sector but cannot attract the auxiliary industries and specific services they require.

The great industrial concentrations in the developed countries, however, offer every class of external economies; for certain sectors such economies are available in specialized isolated agglomerations such as textile and shoe manufacturing districts. Since they are the geographic locations of a great number of industries, and consequently the seats of great centres of population too, such concentrations also offer additional advantages to many industries producing for intermediate demand (standard and catalogued products) and for consumers. Although these are industries which produce for wide markets (national or international), and delivery costs are not usually a significant part of total product cost, the fact that many of their customers are in the immediate region facilitates the commercial organization of sales and customer service. This is one of the general external economies proper to the great concentrations. Furthermore, it is precisely in the great concentrations that the continuous training of a body of managers and technicians occurs, and where the fastest transmission of technical and administrative know-how takes place.

Table

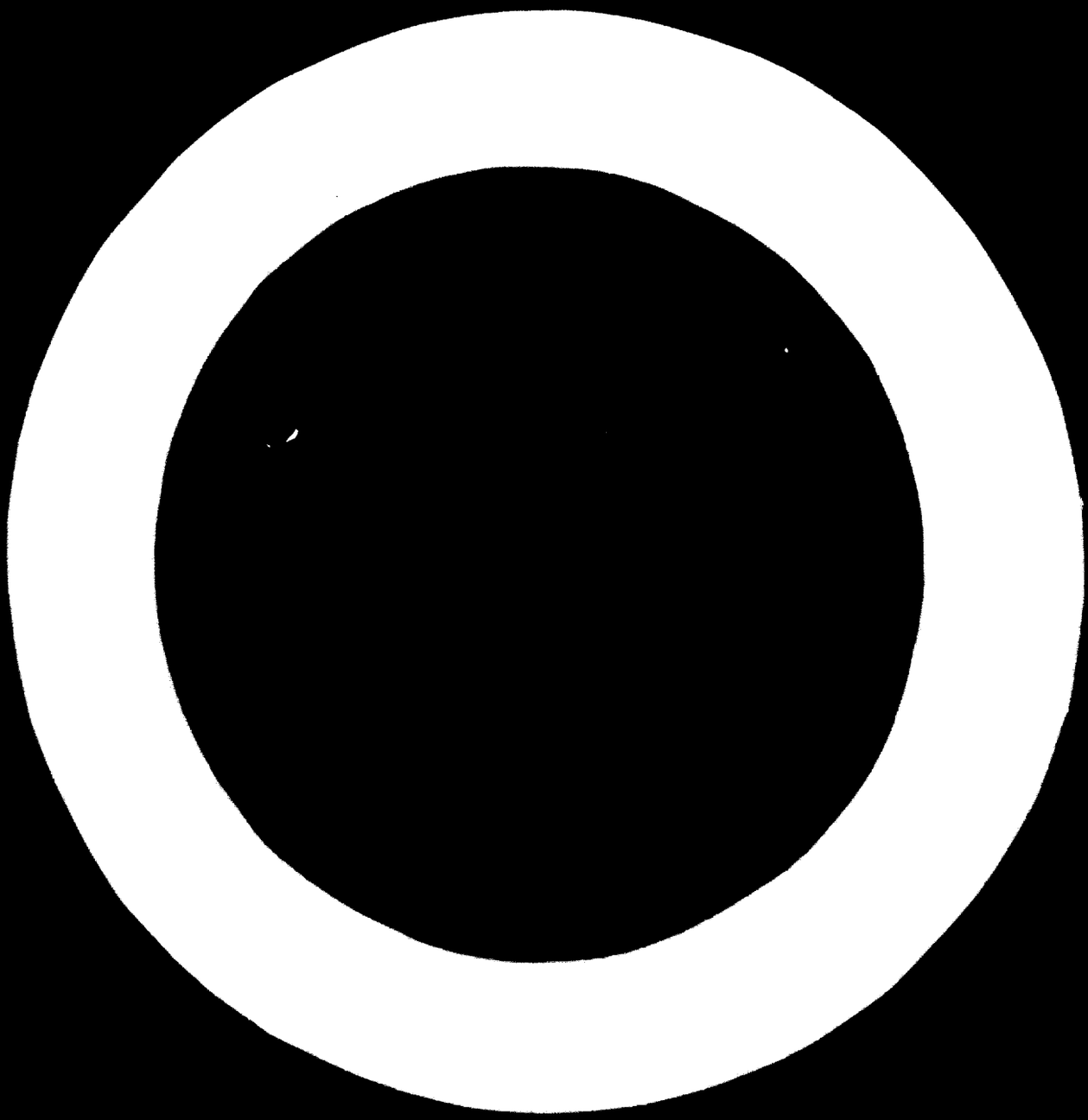
Industrial location factors and external economies

Industrial location factors	External economies	
	General (general agglomeration of industries)	Sectoral (agglomeration of industries of same sector)
1. Infrastructure and site requirements		
(a) Standard requirements	E	-
(b) Special requirements	-	E
2. Transport costs		
3. Labour supply		
(a) General	E	-
(b) Skilled	e	E
(c) With special characteristics	e	E
4. Interindustry relations		
(a) Special units for maintaining and servicing machinery and equipment	e	E
(b) Sub-contractors and specialized processing units	-	E
(c) Other intermediate industries or local depots supplying standard and catalogued products	e	E
(d) Various technical and commercial services	e	E
5. Public industrial policy	-	-

Note: The symbol E indicates the existence of facilities corresponding to the indicated location factors. The symbol e indicates the possibility of facilities restricted to a few aspects.

PART III METHODS OF INDUSTRIAL LOCATION PLANNING

1. Techniques of industrial location programming - A selective survey, by I. Kršsić
2. The use of indicative planning to pass from over-all plans to location of individual projects, by P. David
3. Territorial division of labour and distribution of productive forces, by S. A. Nikolajev
4. Data requirements for industrial location, by V. Cerniansky and V. Nikulas
5. Methods of achieving consistency between national and regional location plans, by D. Schejbal and O. Žurek
6. Cartographic methods applied to regional planning, by E. Alaev and S. Jack



1. TECHNIQUES OF INDUSTRIAL LOCATION PROGRAMMING - A SELECTIVE SURVEY

by I. Krešić[1]

Current research and development in locational programming have been intensive, including efforts to widen the application of scientific methods. These methodological innovations are too numerous to summarize in a single paper, if limited, as this paper is, to the techniques of industrial location programming. Locational methods important for research and practical purposes are considered here and priority has been given to methods verified by practice. Considerable attention has been devoted to the problems and methods of programming individual and group locations not emphasized in the literature of the major languages. Only the most important techniques of programming individual and group locations have been mentioned. Titles of original papers referred to are given in the list of references.

ECONOMIC THOUGHT ON THE PROBLEM OF LOCATION

Survey of the development of the theory and methods of location

During the intensive economic development of the nineteenth century the Ruhr Valley became the world's biggest industrial centre. The Industrial Revolution spread throughout the rest of politically and economically disunited Germany and by the end of the century the industrialization of the country had become intensive. Accelerated industrialization created many problems brought on by aspirations of increased productivity and profitability, and severe competitiveness. Realization of these aspirations depended, among other things, upon the location of industrial activities.

For obvious reasons, the nucleus of the industrial location theory appeared at this time. In 1882 Launhardt published in Berlin his tentative

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1/ Institute of Economics, Zagreb, Yugoslavia.

method of determining optimal location.[2] Thirty odd years later Weber constructed the "locational triangle" method for the same purpose and in almost the same way.[3] He wanted to determine the methodological approach and the optimal location for industries according to their needs. Since then, the approach to the formulation of the locational problem has been simplified. According to Launhardt locational optimality depends upon a single locational factor - transport costs. As in Weber's locational triangle, the apices of the triangle indicate the location of raw material, fuel and consumption of product (market). The task is then to find the place of production within such a triangle, that is, where transport costs will be lowest.

In these investigations Weber went much further than his predecessor. He was the first to formulate the original industrial location theory. According to him, the determination of an optimal location depends upon three factors: transport costs, labour and agglomerative-deglomerative factors. Weber widened considerably the instruments applied by the methodology of determining optimal location, but all of his methods (locational triangle, isodapane system and Waringnon model) have been reduced to a technique of determining the individual industrial location with the minimal transport costs. Other factors have been only of corrective importance. It is not clear what their locational influence can be upon the methods mentioned above.

All attempts to apply these early methods have shown how imperfect, impractical and rather naïve they are. Weber's numerous followers had as little success in trying to perfect these methods as he did.

Among other theorists Palander of Sweden contributed greatly towards perfecting Weber's technique.[4] Although he showed a great deal of ambition in trying to find practical solutions to the location problem, his work was of limited practical value. In his methodological approach Palander improved Weber's isodapane method by applying it to the determination of industrial location. However, to stray from his examples in applying this method requires a deep knowledge of the schematic intricacies of this complicated locational technique.

2/ W. Launhardt (1882) "Die Bestimmung des zweckmässigsten Standortes einer gewerblichen Anlage", Zeitschrift des Vereins deutscher Ingenieure 26(3), Berlin.

3/ A. Weber (1909) Über den Standort der Industrien, Tübingen, Federal Republic of Germany.

4/ T. Palander (1935) Beiträge zur Standortstheorie, Uppsala, Sweden.

The first locational theory has, within the past fifty years, developed into a number of theories of different approach, subject, or extent. Simultaneous with the development of the theories, contributions have been made towards perfecting relative locational methods. Although it makes little sense and is very difficult to separate the analysis of development within various methodologies from the creation of the theory, a number of theorists have made interesting contributions towards perfecting the technique of determining location (A. Lösch, E. Hoover, Hanukov, S. Florence, H. Hotelling, A. Smithies, G. Ackley and others).5/

Lösch has stressed the importance of the Weber-Palander method of isodapane for locational research, with a number of contributions of his own.6/

Hoover has emphasized demand as one of the problems in location research. However, his original method of determining the role of the lowest transport costs has not surpassed the similar methods used by his predecessors.7/

The most comprehensive consideration of transport costs for the allocation of industry in the Union of Soviet Socialist Republics has been given by Chanukov; it includes a methodological aspect of how to solve these problems.8/

Research performed by P. Sargant Florence led to the formulation of what is known as the "coefficient of location", which denotes the tendencies of an industry towards dispersion or concentration.9/ If this is taken for granted, such a method can hardly show how to solve existing locational problems. However, this method represents an attempt to shift from individual methods of research to methods of group industrial locations.

Owing to their diverse character, the solution of locational and space problems requires a continuing perfection of techniques. The naïve methodological location solutions given by Launhardt, Weber, Palander, Florence and others are useful only in solving very simple locational problems. Predöhl was the first to use the theory of space balance in explaining the allocation of

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5/ C. Ponsard (1955) Economie et espace, J.E.D.E.I.S., Paris.

6/ A. Lösch (1940) Die räumliche Ordnung der Wirtschaft, Jena, German Democratic Republic, pp.27-31.

7/ E. Hoover (1948) The Location of Economic Activity, McGraw-Hill, New York, pp.28-48.

8/ E. D. Hanukov (1955) Transport i razmeščenie proizvodstva, Moscow.

9/ P. S. Florence (1948) Investment, Location and Size of Plant, Cambridge University Press, London.

industry. He gave Lösch a basis by making the problems of location a part of the whole system of economy.[10] Among the numerous contributions of contemporary theorists, outstanding credit belongs to Isard and Leontief for pointing out the relativity of locational factors, the possibilities of substituting one for another and the need to give a dynamic basis to the theory of location.[11] Thus, the essential investigations of the methodological approach to the problems of location can be seen in a different light; this cannot be said of the individual locational investigation methods of a more static character.

Economic literature of centrally planned economy countries has taken a different approach to the theory and methods of location. This can best be seen from the history of the role given to Weber's theory of location.

Differences in East and West theories and methods of industrial location

Market economies, containing elements of liberal economy with private initiative and an aspiration towards the realization of private interests, were a starting point for the creation and initial development of the first theory of location. Locational methods have continued to develop along this line; until recently their task was to determine the optimal location for a certain industrial activity or factory. Between the two wars efforts were made by Predöhl, Ohlin, Lösch and others to extend the original individual theories into a general theory of location that would also contain elements with a broader social impact. However, only the intensive and manifold progress that has taken place in all fields of space economy after the Second World War has brought about a marked change toward that end.

The planning of economic development has often been applied in countries without centrally planned economies. Certain economic and social principles, made manifest through the need to develop underdeveloped regions (plans of development for southern Italy, Mediterranean regions and Bretagne in France),

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10/ A. Predöhl (1925) "Das Standortsproblem in der Wirtschaftstheorie", Weltwirtschaftliches Archiv, Vol.21.

11/ W. Isard and W. Leontief (1952) "The Extension of Input-Output Techniques to Interregional Analyses", in W. Leontief et al. (1953) Studies in the Structure of the American Economy, Oxford University Press, New York. W. Isard (1956) Location and Space Economy, Wiley, New York.

have gradually become part of development programmes. Industrialization of whole regional units has become the most frequent form of development policy.

At the same time, it has become necessary to improve methods of programming industrial locations as well as regional development planning. In this domain of economic literature, investigation of the methods applied to individual industrial location gave rise to the problems of programming group locations and to methods of space and regional planning. This tendency can be seen through changes in the professional economic literature of the West. On the other hand, even in a free enterprise economy with private initiative and decentralization of investment decisions, methods of programming individual locations have not lost their importance.

The theory and methods of location in centrally planned economy countries developed in a different way. Soon after the Revolution of 1917 the Union of Soviet Socialist Republics started preparations to create a planned economy. At the same time, the country was divided into areas; thus, from the very beginning economic plans laid down by the Government of the USSR took on a spatial dimension. In the elaboration and realization of the five-year plans, the distribution of the productive forces and the locational tendency of industry occupied a special place. Distribution was made in conformity with the proclaimed economic and political principles. In addition to the basic economic principle - the realization of maximal social effects - the development of all regions, the promotion of the underdeveloped ones, and similar social and political principles played an active role in the distribution of productive forces. For these reasons, research effects and problems of programming individual industrial locations were pushed into second place.

Weber's theory of location was used in setting up the first five-year plan of the Union of Soviet Socialist Republics. Soon after his book, "Über den Standort der Industrien", was translated into Russian in 1926, it became evident that Weber's theory could not help to solve problems of industrial locations in a centrally planned economy.[12/] Since then, all locational theories of the Weber type have been rigorously criticized in the economic literature of the USSR.[13/] To these theories Feigin, Nemčinov and others

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12/ F. Klitzsch (1953) Industrielle Standortsplanung, Berlin, p.30.

13/ Y. G. Feigin, Razmeščenie proizvodstva pri kapitalizme i socializme, Moscow, pp.118-160.

contrapose the basic principles of locational distribution of industry used in the USSR.[14]

The main task of industrial location planning does not lie in determining the optimal individual locational effects, but in the broader social role of economic development. Such an attitude, therefore, did not create in the centrally planned economy countries a basis for more intensive methodological research towards solving individual locational problems. This aspect must be taken into consideration when thinking of the almost non-existent research on the method of individual location. However, the last couple of years have, in the economic literature of centrally planned economy countries, seen a more intensive investigation of locational methods, including mathematical methods that can be applied in these fields of research.

When emphasizing the importance of possible savings in transport costs in the USSR and an increased interest in research into locational problems, the French economist Chambre foresaw that locational theories of the Weber type[15] might again be applied.

Thus, it can be said that in spite of divergent development, both basic techniques of programming industrial location have gradually acquired their proper place, importance and role in the theory and practice of the industrial development of the East and West. Methods and problems of individual location are given more importance in the literature of centrally planned economy countries. On the other hand, programming of group industrial locations has found an important place in the planning of economic development in many countries with free enterprise economies.

In spite of such development there still remain characteristic differences in the programming of industrial locations, resulting from differing systems of political and economic life.

14/ Y. G. Feigin (1956) Standortverteilung der Produktion im Kapitalismus und im Sozialismus [Translation of Feigin cited in footnote No.13], Verlag "Die Wirtschaft", Berlin. p.172.

V. Nemčinov (1961) "Teoretičeskie voprosy racional'nogo razmeščenija proizvoditel'nyh sil", Voprosy Ekonomiki (6), pp.1-15.

15/ M. Chambre (1959) L'aménagement du territoire en U.R.S.S., introduction à l'étude des régions économiques soviétiques, Mouton, Paris/Lattaye, pp.95-153.

METHODS TO DETERMINE INDIVIDUAL INDUSTRIAL LOCATIONS

Approaches to determine industrial locations can be best divided into two groups: (a) to determine the optimal location as a function of two or more locational factors; (b) to determine which of two or more locational projects would be optimal for the location of an industrial activity or factory.

Defined in this way the determination of industrial locations considerably influences the application of a corresponding technique in solving some of the locational problems. In the first case, some mathematical methods can be applied. In the second approach the comparative method offers valid results; taking this into consideration, the techniques to be applied in solving certain locational problems are outlined below.

Mathematical methods

Classical mathematical methods

Mathematical methods were first used in locational research to determine optimal individual industrial locations. Such problems were the subject of research of the earlier locational methods, that is, the locational triangle of Launhardt and Weber and the isodapane system of Weber and Palander. The determination of minimal transport costs was one of the most important results of applying these methods. Even when simplified in this way, such methods have proved too complicated to offer practical solutions.

The isodapane method has, however, certain advantages. It can be used to determine almost all relevant points within an investigated territory, that is - with respect to transport - those that have the same locational conditions. Additional methodolcgical techniques make it possible to choose from a series of locations the one to which locational features other than transport give a locational advantage. Although a detailed description of the isodapane method has been given and manifold possibilities of its application have been indicated, it has still not been used sufficiently for purposes of practical research.

Polyvector method

The requirements of both research and practical work mean that the problem of improving the techniques for solving individual locational problems is ever current. Constant development of mathematics brings about an improvement of

the vector theory. One of the theorems in this field of mathematical science is the methodological improvement in determining individual location with respect to the older methods already described. Applied in different fields of locational research, this method is called the polyvector method.[16/]

Like the other mathematical methods, this one has been the subject of criticism. The method takes for granted the shortest possible transport connexions and cannot be applied in regions with poor transportation. By applying this method the optimal solution can be obtained, which mathematically denotes the territorial gravity centre. Also, it denotes an improvement in the application of the locational results.

The advantages of this method when determining individual locations are:

(a) It can start simultaneously with a great number of similar factors, such as consumption centres, raw material and fuel supplies, and also with other location factors of equal importance;

(b) Application of graphic or analytical forms of the method is relatively simple; it enables locational results to be obtained fairly quickly, and the method can be widely applied in operative research;

(c) The method can help to acquire results for each phase; thus, subregional locational optimum is first investigated and afterwards the definite optimal solution is attained.

The location of a central transformer station in the west of Yugoslavia can be taken as an illustration of the possibilities of applying such a method.[17/] Savings in investments for transmission appliances and losses in transmitting the electrical energy depend upon the choice of location; they are in direct relation to the length of transmission ways.

The following prior conditions should be defined if this method is to be applied successfully:

(a) Prospective consumption of electrical energy of the region should be centralized to five local consumption centres. Distribution of electrical energy is performed from these centres through transformer stations of 110/35 kV to the final consumers;

16/ The method has been applied several times in the last ten years or so in setting up plans of industrialization in Yugoslavia. It has also been used to determine the location of one of the new cement factories now under construction in central Bosnia. In this connexion see I. Krešić (1962) Lokacija i problemi razmještaja naše cementne industrije [Locations and Problems of Distribution of the Yugoslav Cement Industry], Ekonomski Institut, Zagreb, Yugoslavia, pp.119-122.

17/ The necessary parameters in putting this example forward have been formed on the basis of the analysis of the perspective plan of electrification (I. Janić (1961) "Elektrifikacija Istre", Energija, No.7/8).

(b) Configuration of the soil makes it possible to connect consumers' centres directly to the location of the central transformer station of 220/110 kV;

(c) Sources of electrical energy that feed the central transformer station cannot be defined with respect to location nor with respect to the size of the unit. When elaborating this draft, it was taken for granted that sources of electrical energy have no influence in determining locations for the central transforming stations, although this is not the case.

Thus, basic parameters that influence determination of the location for a central or regional transformer station of 220/110 kV are those that show the amount of consumption of the electrical energy being distributed through local transformer stations of 110/35 kV. Annual consumption of each of the local centres will, according to the plan, amount in 1980 to:

Consumption of electrical energy in the local centres in 1980
(Transformer stations of 110/35 kV)

Buje	120 GWh	Rasa	170 GWh
Baderna	130 GWh	Plomin	180 GWh
Pula	250 GWh		

The locational task would be to select the optimal location for the central transformer station of 220/110 kV with respect to the local transformer stations of 110/35 kV. The optimal location allows the shortest possible transmission of electrical energy thus minimizing investment costs for the transmission appliances, current expenses for maintenance, and the losses in transmitting electrical energy.

The polyvector method refers the given region to co-ordinate axes and determines the co-ordinates of all five local centres of consumption (transforming stations of 110/35 kV). This makes it possible to set up the distances by simple measuring of the map, that is to find the length of the abscissa (x) and the ordinate (y).

In order to calculate the abscissa (X) and ordinate (Y) of the central transformer station the following table is made:

Centres of energy consumption	K	x	y	Kx	Ky
Buje	120	-	119	-	14,280
Baderna	130	15	75	1,850	9,750
Pula	250	29	-	7,250	-
Rasa	170	74	42	12,580	7,140
Plomin	180	83	57	14,940	10,260
Total	850			36,720	41,430

K = annual consumption of electrical energy in GWh; x = abscissa; y = ordinate.

Inserting the values of Kx and Ky given above into the appropriate formula:

$$X = \frac{\Sigma\ Kx}{\Sigma\ K}$$

$$= \frac{36,720}{850} = 43.2$$

$$Y = \frac{\Sigma\ Ky}{\Sigma\ K}$$

$$= \frac{41,430}{850} = 48.7$$

When the given values of the resulting abscissa (X) and the resulting ordinate (Y) are inserted into the prepared co-ordinate system, the required locational solution will be in the intersection (see figure following). The influence of certain practical requirements can mean minor corrections in order to determine microlocation for central transformer stations. These are the problems that should be solved within the limits of investment decision-making and technical characteristics of the location of a certain plant.

Individual locations in different cases can be determined by this method for industrial and other locations.[18] It is assumed that the locational optimality depends upon one or more locational factors, whose activity can be expressed in the same way. In case determination of the optimal location depends upon factors whose locational activity cannot be expressed in the same way, this method can be only of partial use, if any. In such a case the only solution would be to use the polyvector method to determine the partial solution based on factors of the same kind and to include, if possible, one factor of the most decisive locational activity. The final locational solution will

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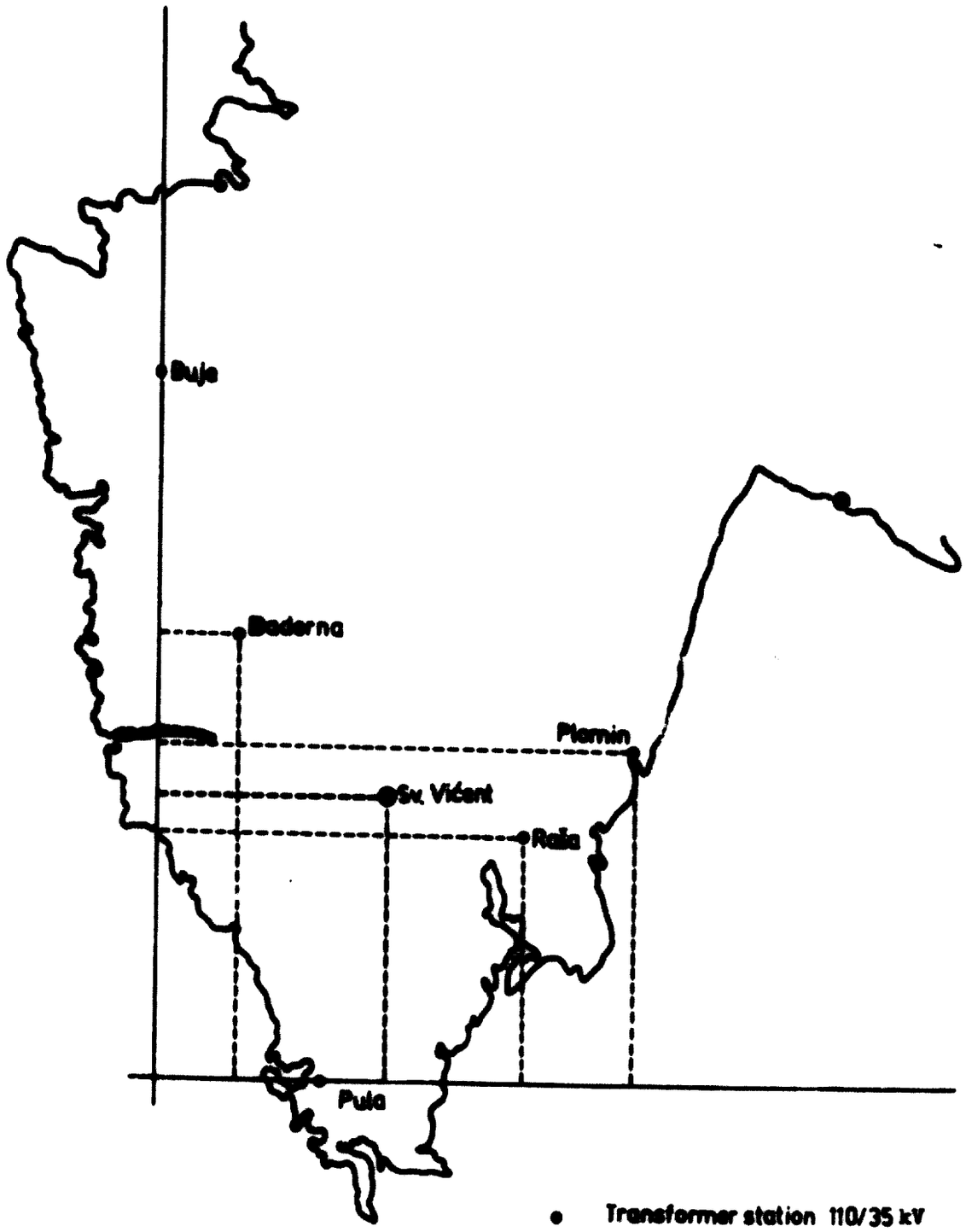
18/ A study of the Academy of Sciences of Czechoslovakia, published in 1965 in Prague, treats problems in connexion with determining the location of a regional shopping centre. The mathematical solution of the problem has been given in a similar way by M. Manas and A. Steker (1965) Steines-Weberova úloha a její použiti při řešeni lokačnich problémú, Ceskoslovenska Akademie Ved, Prague.

The location choice for central transformer station in the district of Istria



be found either analytically or through the comparative method after the given result has been corrected.

Comparative methods

Application of the comparative method in locational research is based on gradual adaptation of the general form of comparative analysis which has in various forms been applied to many fields of economic and non-economic research. Its high flexibility makes possible its efficient application in locational research.19/

The comparative method can be used directly and independently for less complicated cases; for more complicated locational research it is used as an instrument for quantitative economic analysis of the widest range. Its efficiency depends upon the form, tasks and field of application chosen. Here, the aim is to find an optimal locational solution from among many possible ones. It thus becomes one of the most important elements in investment decision-making.

The method has a dynamic aspect as it can be widely applied in different phases and on different levels of investigation of a given location problem. Such characteristics favour its application even within the widest range of dynamic economic analyses of complicated locational problems.

The influence of temporal changes upon the optimality of the same locational case, caused mostly by technological changes and technical improvements, can also be quantified through manifold application of the comparative analysis. In locational research, the comparative method can be used in the following methods.

19/ Examples of applying variants of the comparative method are numerous; of special interest is the role attached to it by Isard in programming industrial locations as part of regional planning. Supply of steel products for three regions is a simplified example of the application of the comparative costs method. The example has been described in W. Isard and J. Cumberland, Eds. (1961) Planification économique regionale, Paris, p.27. This review has been based on application of the comparative costs method in the interregional research. The method has been further elaborated by W. Isard and E. Smolensky (1961) "Développements récents dans la science économique régionale", Cahiers de l'Institut de Science Economique Appliquée (Série L) No.8, Paris.

Complex comparative method

When applying this form of the comparative method, all locational factors of technical or economical importance are taken into consideration, whether directly or indirectly connected with the given locational problem. Qualitative and quantitative locational factors are both relevant in such a comparative analysis. Such a complex comparative method allows the widest analytical approach in investigating locational problems. The following are the negative features of applying the complex comparative method:

(a) As a rule, it requires a relatively large amount of research and time, and in some cases it involves high costs before any final results are reached. It thus becomes less efficient, especially in the field of operative locational research;

(b) Locational results as functions of a great number of locational factors of different intensity, meaning and direction of activity, are often not clear or are difficult to understand. Such locational results cannot always be relied upon in cases where all parties are not equally interested in the final results.

Abridged comparative method

This variant of the comparative method introduces into the locational estimate only those relevant locational factors and elements of locational investigation that are of direct influence upon the final result. The selection and choice of the relevant factors implies the elimination of all locational factors that are of equal importance for all competing locations; and of all factors and parameters of locational estimate that are not essential for the final result and thus, for the determination and sequence of competing locations.

This variant of the comparative method is especially suitable for determining optimal industrial and other locations where all locational factors are equal or where there are only a few decisive factors of location. It thus shows its applicability for operative and practical cases of determining location. The final result is not only easier to obtain, but also becomes comprehensible and logical, creating the impression of an objective approach.

It might prove dangerous, however, to oversimplify the task of selecting the relevant factors. "Unimportant" locational factors must not be forgotten, as such oversights might result in incomplete or incorrect data creating a basis for inaccurate locational decision-making.

On the other hand, if the choice of the relevant location factors and parameters is competent, the abridged comparative method will prove of great practical advantage in all cases where individual location is being chosen. There are several phases in the process of application of the abridged comparative method.

Defining the locational task

A prior condition for a successful application of the abridged comparative method is to define the task clearly in advance. Although this method can be applied in some specific cases, it is basically used to determine the optimal among numerous possible locations for a certain industrial activity or project. To select the location that minimizes costs or maximizes the economic effects is one of the most frequent tasks in applying this and other locational methods.

The preliminary selection

When determining the best of the possible locations through the abridged comparative method, it is often possible to simplify the task beforehand. One must first eliminate those competing locations that do not meet the basic locational conditions. For example, when building an integrated steelworks, the minimal necessary ground would be 300 hectares, its carrying capacity at least 2 kilograms per square centimetre, minimal water supply of 2 cubic metres per second and so on. Other technical conditions can be determined in advance for whole series of factories or units. Elimination of the locations that cannot economically meet such needs, or other locational needs, can, in some cases, lead not only to a simplification of the task but also to the definite solution.

Determination of the relevant locational factors

A correct choice of the relevant locational factors, that is decisive parameters, is of the greatest importance for the efficiency and quality of the given results through the abridged comparative method. Besides a proper elimination of the less important factors, the selected locational factors must be divided into quantitative and qualitative factors.

Quantitative factors are those from which locational activity can be measured or quantified. They can be introduced into an exact or mathematical operation and directly related; that is, they can be compared. As a preliminary it is often necessary to put locational activities of more relevant quantitative factors under a common denominator. Most often the result is a type of scale of values, but it can also be some natural common scale such as kilometres or tons per kilometres. When production costs, investment costs, transport costs and other costs are taken as relevant quantitative factors, these would be suitable parameters for a subsidiary mathematical technique.

In order to measure the locational optimality on the basis of the scale of values of parameters, one must differentiate between recurrent costs and non-recurrent costs.

Recurrent costs are those repeated during the whole period the unit is in existence. Their size depends on the characteristics of each location, regardless of their relation to the business conditions (productional parameters, transport costs) or conditions of exploitation (exploitation costs, transport, energy supply exploitation costs and others). They are usually measured in equal temporal intervals, mostly annual. Although transport costs can be taken as recurrent costs, all other costs that are repeated throughout the duration of the working capacity of the selected location are also to be taken into consideration (production costs, maintenance costs and permanent losses, for example).

Expressed mathematically the general formula for the value of these costs would be:

$$C_r = C_{r_1} + C_{r_2} + \dots + C_{r_n}$$

where C_r = recurrent costs;

n = number of years.

Non-recurrent costs are closely connected with those relevant locational factors of location whose activity is manifested in one moment, such as investment costs.

Some locational factors manifest their locational force in both ways, that is their activity happens only once (value of investment costs) or is a permanent activity of recurrent costs. The supply of water or electrical

energy means different costs on different locations. Maintenance costs, losses and other costs for the supply of water and electrical energy are recurrent costs, being repeated at intervals. That is why the activity of one and the same quantitative factor can be manifested in both ways.

Locational factors that cannot be measured by objective means such as working skills and industrial atmosphere of a certain location are qualitative. It is difficult to find their common element, but any comparison lacking this element is impossible to make.

Comparison based on quantitative factors

The aim of each exact method of determining location is to obtain an equal result in relation to all quantitative factors. In order to reach that aim one must first place various locational activities under a common denominator. Synthesizing recurrent and non-recurrent costs can in our example be done in two ways.

Non-recurrent costs, as for example investment costs, can be reduced to temporal costs, this being achieved through the process of determining the annuities.[20]

In this way non-recurrent costs are given their temporal value; consequently, they are characterized by the same feature as are the recurrent (annual) costs. Only after both types of costs have been reduced to the terms of a common value can they be summed up. The given results for any number of competing locations can then be compared in order to determine their locational optimality.

Recurrent costs can be accumulated into one sum by reducing all temporal costs to the present value. Recurrent costs (production costs, transport costs, exploitation costs) are repeated throughout the whole existence of the unit being located. These costs are discounted on the present value which enables their direct summing up and comparison with non-recurrent costs, such as investment costs.

For such an analysis, the economic expectation of life for the unit subject to location must be determined; this is at the same time the capitalization term. For the same purpose, the profitability rate must be determined

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[20] Gorupić et al. (1963) Investicije u poduzeću [Investment in Enterprises], Informator, Zagreb, Yugoslavia, p.130.

for the branch of activity (it will also be the rate of interest for discounting the recurrent costs). Thus, discount term and rate of interest enable recurrent costs to be reduced to the present value by applying the classical formula for discounting:

$$T_n = A \frac{r^n - 1}{r^n(r - 1)}$$

where T = total costs;

A = amount of annual expenses;

n = number of years;

$r = (1 + \frac{P}{100})$.

The mathematical expression would be as follows:

$$C = C_i + C_r$$

$$C_n = C_i + C_r IV_p^n$$

where C = costs;

C_i = investment costs;

C_r = annual recurrent costs;

n = number of years;

IV_p^n = discount coefficient in Spitzer tables.

The amounts obtained in such a way on the basis of the equal relevant parameters make a direct comparison possible. Comparing the quantitative results gives an insight into the level of optimality of each location. Quantification of the activity of all of the relevant factors is the best way to determine the most optimal of all locations.

An example of the application of the abridged comparative method on the basis of chosen quantitative factors has been set forth in a study which considers the sequence of seven competing locations for a planned steelworks on the Yugoslav coast.[21] Table 2 gives the sequence of the competing locations in accordance with the optimality, based on quantitative parameters.

21/ I. Krešić (1962) "Primjena skraćene komparativne metode u lokacionim istraživanjima" [Application of the Abridged Comparative Method in Locational Research], Ekonomske Studije, No.1.

A review of the global locational optimality

When consideration is given only to quantitative locational factors, some important locational factors with qualitative characteristics may fail to be taken into consideration, such as the industrial atmosphere, applicability for further expansion, the birthrate in the region and supply of local manpower. Taking these factors into consideration is methodologically difficult and can lead to subjective judgement in determining locational importance. However, these should not be disregarded; review and consideration will be given to the comparative method as a means of judging their locational activity.

The qualitative locational factors cannot be quantified; consequently, the possibility of a simple synthesis with other relevant locational factors does not exist. In cases where these factors have a predominant influence upon the optimal results in determining a location, there is a real difficulty in reaching an objective decision.

The abridged comparative method can be met most often when such methodological difficulties are involved. It should be decided first what the real impact of qualitative factors would be upon the choice of a location. In such cases the system of points is used to determine the locational importance of these factors.[22]

The task is easier when the pointing of qualitative factors is only required as a correction of the sequence of locations and the results achieved on the basis of quantitative, measurable parameters. A direct pointing of all relevant locational factors (quantitative and qualitative) is incompatible with research ideas that rely heavily on quantitative methodological techniques. Determination of the objective locational result indicates that only the necessary minimum of the subjective element is considered in such research work; this means that locational activity of each of the factors should be objective.

Naturally, there is not always the need nor the ability to apply such strict criteria. However, the locational importance of qualitative factors should not be neglected.

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[22] In the postwar period there were several reviews published of the point system in locational research. They appeared first in American economic literature. An illustrative example is given in A. S. Knowles and [illegible] Industrial Management, New York, pp.92-93.

Table 1

Locationally relevant recurrent costs of seven competing locations based on quantitative factors
(millions of new dinars)

Location	Exploitation costs				Transport costs				Total
	Electrical energy	Supply of water	Supply of lime-stone	Total	Sea fares	Road fares	Railway fares	Total	
A	3.23	2.40	2.90	8.53	4.43	-	80.55	84.98	93.51
B	1.97	2.03	2.78	6.78	0.83	0.64	74.95	76.42	83.20
C	2.90	3.44	3.44	9.78	0.83	-	84.30	85.13	94.91
D	2.22	1.03	3.10	6.35	1.58	-	81.50	83.08	89.43
E	2.22	5.18	2.87	10.27	2.43	1.20	82.26	85.89	96.16
F	2.01	1.90	3.93	7.84	1.58	0.24	80.84	82.66	90.50
G	2.22	1.31	2.75	6.28	-	-	84.69	84.69	90.97

Table 2

Order of seven competing locations with regard to optimality based on quantitative factors

Location	Millions of new dinars					Order of locations with regard to optimality
	Annual cost	Present value	Locationally relevant investments	Total value	Difference in accordance with minimal location	
A	93.51	848.79	362.13	1,210.92	+180.89	VII
B	83.20	755.21	442.60	1,197.81	+167.78	VI
C	94.91	861.50	201.81	1,063.31	+33.28	II
D	89.43	811.76	218.27	1,030.03	-	I
E	96.16	872.85	295.60	1,168.45	+138.42	V
F	90.50	821.42	247.56	1,069.03	+39.00	III
G	90.97	825.74	336.39	1,162.13	+132.10	IV

Table 3

Final order of the seven competing locations with regard to optimality based on quantitative and qualitative factors

Location	Quantitative result		Qualitative result	Total points	Corrected order of locations with regard to optimality
	Value in millions of new dinars	Points (80%)	Points (20%)		
A	1,210.92	680	79	759	VII
B	1,197.81	688	87	775	VI
C	1,063.31	775	200	975	I
D	1,030.03	800	166	966	II
E	1,168.45	705	110	815	V
F	1,069.03	771	105	876	IV
G	1,162.13	709	172	881	III

In order to get a better insight into the technique of determining the locational activity of both kinds of locational factors, examples of such a method follow. This would be a correction or complement to the results from tables 1 and 2, both achieved on the basis of quantitative factors.

It is necessary first to distribute the total amount of points among the qualitative and quantitative factors. It has been determined that from 1,000 possible points, the quantitative factors share 800 points (for the most suitable location D, table 2). The most suitable location can gain a further 200 points on the basis of qualitative factors. This is the case with location C of the example in table 3. In order to get the most objective results, the pointing should be performed by commission; later, points of each of the locations may be compared.

Table 3 shows that the limited influence of locational factors with qualitative characteristics has caused a correction of the achieved results and sequence of locations based on quantitative factors alone. Locations D and C have rotated in the scale of locational optimality (table 2 and table 3).

PROGRAMMING METHODS FOR GROUP INDUSTRIAL LOCATIONS AND ALLOCATION OF INDUSTRY

Much less time has been devoted to the development of theories and methods of programming group industrial locations than to investigation of individual industrial locations. Weber was aware of group locational problems,[23] yet during the two following decades no significant activity took place. The problems of group industrial locations and the allocation of industry were tackled only after Lösch, Ohlin and others, and after planned industrialization had been initiated by the USSR. They are still the dominant problems of contemporary locational economy.

The problems of programming group industrial locations have multiplied [illegible] the intensity of modern industrial development. Advanced [illegible] pose increasingly complicated tasks. These tasks are the main [illegible] preventing a simple and quick development of new techniques in [illegible] group industrial locations and the allocation of industry.

[illegible] methodology of space planning the following problems must be [illegible]: programming group industrial locations on the basis of

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— [illegible] Theory of the Location of Industries, University of [illegible], Chicago, Illinois, pp.112-211.

their technological and economic connexions; and efficiency of space allocation of industry.

Differentiated in such a way, problems of group industrial locations have been solved in various ways by applying corresponding methods of programming. However, the results obtained in creating specific techniques for programming such industrial location, are not sufficient. For this reason, the use of quantitative economic analysis is still important.

Bearing in mind the two problems mentioned above, two specific methods for solving locational problems can be pointed out. These are industrial complex analysis of the Isard type, and spatial models for allocating industry. Economic analysis can serve as a basis for both, although each approaches modern mathematical methods in a different way, especially in investigating the final results and effects. Other methods, especially modern mathematical ones, can be of considerable help.

Quantitative analytical methods

Intensive industrial development has brought about new locational problems and features, creating new approaches and methods in programming industrial locations. These techniques are concerned with programming group industrial locations regardless of whether they are called industrial complexes, combinates, industrial centres, focuses of development or anything else.

Industrial complexes analysis

Industrial complexes are groups of industrial activities and individual locations which, from the technological and economic point of view, form a unit. French economist Jean Chardonnet was the first to make a detailed analysis of these complexes.[24/] He has given greater consideration to agglomerative industrial problems - to which Weber and some other theoreticians of the older school paid only sporadic attention - than to individual problems. Chardonnet's analysis, however, is still within the limits of classical economics, as it does not touch on the problems of quantitative measurement in industrial complexes. The industrial complex analysis, as elaborated and applied by Isard and his co-operators, represents this type of methodological

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24/ J. Chardonnet (1953) Les grandes types de complexes industriels, Paris.

system for investigating group industrial locations and their problems[25] which is within the limits of quantitative economic analysis. Industrial complex analysis comprises many methods including quantitative ones, such as comparative costs analysis and the input-output technique. These methods are also applied in analysing final results.

Owing to its complex approach and flexibility, this technique of programming can be applied in different cases of research for group industrial locations. The possibility of quantifying the results through this method is of vital importance for both locational programming and investment decision-making. For example, the comparative advantage of the so-called "Dacron A" in Puerto Rico, when compared with the second best variant, was estimated to have a yearly net profitability of US$311,000.[26]

The technique of programming industrial aggregates as shown above can help a great deal in solving these locational problems, but it cannot provide the solution for all group locations. Exact locational results depend on exact subsidiary methods rather than on the industrial complex analysis as a whole.

Other quantitative and analytical techniques

Professional literature of the USSR analyses the method of programming group industrial locations in the same way. These analyses remain mostly within the limits of classical economic analysis. They comprise the analysis of technical parameters of location rather than quantitative analytical elements.[27] The analysis of focuses of development, established as a part of the regional theory in France, shows similar characteristics.

Spatial models

Industrial agglomerations and complexes still represent, as a rule, only one of the forms of group industrial locations. There remains the problem of discovering methods to solve the problems of programming group industrial

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25/ W. Isard, E. W. Schooler and T. Vietorisz (1959) Industrial Complex Analysis and Regional Development, a case study of refinery-synthetic fibre complexes in Puerto Rico, Wiley, New York.

26/ W. Isard and E. Smolensky, op. cit.

27/ Burlakov et al. (1964) Osnovy rajonoj planirovki promyšlenyh rajonov, Moscow, pp.43-69.

locations for a whole territorial or regional unit and to answer the question: "How can all industrial enterprises or industrial capacities of a region be economically or even optimally allocated?" In addition to general analytical methods, spatial models can be used in programming locations.

In spite of a difference in the aim and scope of construction and application, the method using spatial models can be considered as a specific instrument in programming group industrial locations. In countries with a planned economy, the method of spatial models helps to determine the most economic locational realization of the industrial development plans.

When trying to determine the most economic distribution of coal in the United States, Henderson adopted this method, although he omitted some of its specific features.[28] A similar path was followed by Marschak to determine the best productional effects in the oil industry.[29] In both of these cases suitable mathematical methods were used to find those spatial solutions that would produce maximum economic effects. Both Böventer and Lefeber wished to determine the general spatial balance in a similar way, though their work differed; emphasis, however, was laid on the theoretical solution of the problem.[30] Spatial models can be arranged in three essential groups[31] homogeneous, heterogeneous and complex.

Homogeneous spatial models

Research in this group concerns units and activities of the same kind, although territories may vary. Homogeneous spatial models deal with the most economic allocation of similar factories in a country or region, such as steelworks, refineries, or cement factories. These are the so-called spatial models of industrial groups. At the moment, this sort of spatial model provides the

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28/ J. M. Henderson (1958) The Efficiency of the Coal Industry: an Application of Linear Programming, Harvard University Press, Cambridge, Massachusetts.

29/ T. Marschak (1963) "A Spatial Model of US Petroleum Refining", in A. S. Manne and H. M. Markowitz, Eds. (1963) Studies in Process Analysis: Economy-Wide Production Capabilities, Cowles Monograph No.18, Wiley, New York.

30/ L. Lefeber (1959) Allocation in Space, North Holland Publishing Co., Amsterdam, and E. von Böventer (1962) Theorie des räumlichen Gleichgewichts, Mohr, Tübingen, Federal Republic of Germany.

31/ Böventer, in his "Theorie des räumlichen Gleichgewichts" (page 2) divided them into "Totalmodelle" and "Partialmodelle".

greatest achievements and the most exact results and effects of spatial allocation in a region or country.

This method can also be applied to solve problems of distribution of various tertiary economic and non-economic activities, such as laundries or medical centres within an urban area, or the allocation of hospitals in a region or country.

Due to its relative simplicity, the homogeneous spatial models method is at the moment the only one applied in programming the locations[32] of factories engaged in a common industry.

The application of the spatial models method demands analytical preparations, including the definition and volume of the activity investigated (for example, allocation of sugar mills or cement factories in a country). The scope of the method must also be determined: minimizing transport or locationally relevant production costs, and maximizing productional output and so on. The quality of the results depends not only on the analysis of the given situation but also on the variations in quantity and size of factories in a given region.

Results of the model are arrived at through the application of the mathematical programming method, most often through the transport model of linear programming. The elaboration of the corresponding algorithms depends on the type of subject and task; the final result depends mostly on the correct choice of locational factors or parameters.

To obtain the locational distribution of a homogeneous industrial group, for example the cement industry of a region, in which a harmonious relation exists between production and consumption, a mathematical solution can be

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32/ Simultaneously with the elaboration of the current five-year plan of the economic development in Yugoslavia (1966-1970), homogeneous spatial models are being elaborated for some locationally relevant groups. This is being done in order to check whether this method could be applied in the locational realization of the planned programme of industrial development. The author of this paper has also prepared a basic methodological study: Osnovi prostornih modela [Spatial Models] for the needs of Federal Planning Bureau, Belgrade.

found within the limits of the one-stage closed transport model. The general form would be as follows:

$$\min.T = \sum_i \sum_j c_{ij}\, x_{ij}$$

provided that

$$\sum_{i=1}^{m} a_i = \sum_{j=1}^{n} b_j$$

where

T = total costs

c_{ij} are matrix elements denoting unit transport costs from producer i to consumer j

x_{ij} = quantities of cement transported from producer i to consumer j; $(x_{ij} \geq 0)$

$a_i = \sum_j x_{ij}$ $(i = 1, 2, \ldots m)$ = capacity of producer i

$b_j = \sum_i x_{ij}$ $(j = 1, 2, \ldots n)$ = needs of consumer j

In this way the supply arrangements for specific consumers are obtained; by introducing a fictitious consumer $j = n + 1$, the most economic distribution of production centres is found.

The mathematical solution will take a different form if optimality of the location depends not only on the cost of marketing the goods, but also on the cost of delivering the raw materials. In such a case, the double-stage transport model will be used. The mathematical formula would be as follows:

$$\min.T = \sum_{i=1}^{r} \sum_{j=1}^{\ell} c_{ij}\, x_{ij} + \sum_{i=r+1}^{m} \sum_{j=\ell+1}^{s} c_{ij}\, x_{ij}$$

where

c_{ij} elements now denote transport costs from raw material producer i to final goods producer j or from final goods producer i to consumer j

i = 1, 2, ... r applies to raw material producers

i = r + 1, r + 2, ... m and j = 1, 2, ... ℓ apply to final goods producers

j = ℓ + 1, ℓ + 2, ... s applies to consumers

ℓ = m − r − 1

Different problems that arise in programming group locations will require different procedures, but all of them remain within the limits of mathematical

programming of the linear and non-linear type. This is, at present, the only way of ensuring the optimum variant of distribution.

Heterogeneous spatial models

The method is concerned with seeking the maximum effects of distribution of several or all groups of industry in any region. In such a case, several industrial institutions or factories belonging to different branches of industry can be subject to investigation; these would comprise the contents of two or more homogeneous spatial models. At the moment, there is no specific methodology in programming such group industrial locations other than classical economic analysis.

Complex spatial models

This method includes the whole territory or region; it can be roughly identified with methods of regional planning. A detailed discussion of such models is unnecessary as they do not strictly belong to the techniques of industrial locations programming.

Modern mathematical methods

An aspiration towards exact results directed the theory of location from the beginning towards a full use of mathematical methodical means. Thünen developed a whole book-keeping system to quantify his locational results. The mathematical section is one of the composite parts of Weber's main work "Über den Standorts der Industrien". A number of other theorists have directed their research towards improving these methods.

Modern development of space economy has also been accompanied by a development of quantitative methods; mathematical theorems have become a part of the industrial locations programming technique.

A dynamic and complex approach to locational problems prevents static and schematic solutions. Thus, the dynamic economic analysis, with the final results greatly quantified, remains the basis of research and programming for almost all types of locations. Mathematical methods, applied in quantifying the analytical results, are becoming an indispensable tool in almost all fields of locational research.

Among the modern mathematical methods relevant to economic research mathematical programming must be emphasized. The transport model in linear

programming has gained vital importance in programming some locations, especially in quantitative and analytical locational methods. Other mathematical methods and theorems can be given only a sporadic role in locational research.

In general, the application of mathematical methods, including mathematical programming, is still used in scientific work rather than in practical solutions of locational problems. This applies particularly to the programming of group industrial locations, in finding the optimal solutions in the allocation of industry. The application of modern mathematical methods in programming locations is still at the research stage; further results can be expected in the future.

Conclusion

Although considerable achievement has been made in improving a number of methods for industrial locations programming, no universal methodological means or "ready-made" schemes exist that can be applied to solve all locational problems. This is not due to imperfect techniques in programming and determining location, but rather to various locational problems, constant changes of locational conditions and varying degrees of importance attached to locational factors.

There do exist, however, locational problems that can be solved in a simple way. In some cases, such as operative programming of industrial locations, text-books and indicators compiled specifically for spatial research can be used.[33/] One thing is certain, schematic and hasty locational solutions and hasty location programming do more harm than good.

Quantitative economic analysis still represents the best methodology to be applied to the needs of industrial locations programming. Many exact methods can be efficiently applied within the limits of this method.

The type of locational problem determines the methodology chosen. Although a number of possible techniques in programming industrial locations are given in this paper, the author does not wish to imply that there are no other locational methods that can be used for the same or a similar purpose.

33/ I. Krešić (1964) Sistem ekonomsko-tehničkih indikatora [The System of Economic and Technical Indicators], Ekonomski Institut, Zagreb, Yugoslavia.

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2. THE USE OF INDICATIVE PLANNING TO PASS FROM OVER-ALL PLANS TO LOCATION OF INDIVIDUAL PROJECTS

by P. David[1]

INTRODUCTION

Since over-all plans express the will to establish guidelines, they are bound to treat the question of location in a way that conflicts with the attitude of those who control individual projects, which nearly always reflects a desire for freedom of action. Pressed to their extremes, these opposite tendencies lead either to rigid compulsion or to unfettered licence. Indicative planning offers a third choice: the harmony that can be created by a dialogue between the people concerned, instead of an equilibrium that reflects the play of impersonal forces.

Individual projects whose location conflicts with the objectives of over-all plans involve both the public and private sectors. The reconciliation of interests is essential for many reasons. The clash between the public and private character of any activity is a matter for legal decision, not confined to the socio-economic questions which are the concern of this study. Moreover, private projects cannot be considered separately from public schemes, which generally buttress them, provide their infrastructure and make their implementation possible. That is why the passage from over-all plans to private operations often takes place in two stages, the private project taking over from the public interest. The second part of the journey cannot be understood without understanding the pitfalls of the first.

Conflicts between over-all programmes and individual opinions are, perhaps, more pronounced and formidable in the public sector than in the private domain; they relate to both objectives and methods. The location

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1/ Ministry of Construction, Paris, France.

objectives of over-all plans can be best clarified by contrasting them with the aims of individual programmes in the public sector and with those of private projects.

The location of individual operations in the public sector, for example, of an industrial zone, is not decided upon at the national or purely local level but at an intermediate level which tends increasingly to be that of the region. Consequently, the conflict is between the location objectives of the national plan and those of regional plans.

In France, for instance, the spatial objectives of the national policy in the industrial field have been clearly stated by Guichard, a member of the Regional Development Board (Délégation à l'Aménagement du Territoire et à l'Action Régionale, DATAR): [1]2/

(a) The industrialization of the western, southwestern and central regions of the country, which suffer from a chronic disequilibrium between potential demand for employment and the supply of jobs created by the spontaneous development of the economy;

(b) Solution of local difficulties arising from the decline of a dominant industry, particularly in certain mining or textile agglomerations in the north, east or centre;

(c) Decongesting the Paris region;

(d) Removal of certain more localized difficulties in providing employment which, because of natural or historical circumstances, appear in some regions which are otherwise dynamic.

The British National Plan of 1965 emphasizes the economic more than the social aspects of employment. It proclaims the necessity to use all available resources, particularly manpower. In regions where the structure is obsolete the production equipment must be modified and likewise the social and economic environment, in order to ensure a more balanced regional development of industry and housing for a rapidly growing population.

In a more general way, a study sponsored by the European Free Trade Association [2] emphasizes that in the member countries the essential objectives of spatial policies are of national interest. The aim is to use all resources in the most efficient way to promote a general expansion which can spread higher living standards over all the regions. The special features of lagging regions and the feelings of their inhabitants should not be ignored.

2/ Figures in square brackets refer to references listed at the end of this paper.

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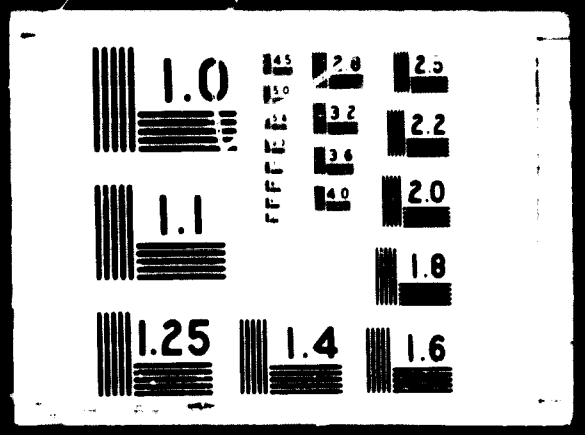

In fact, it is not certain at first sight that the population of depressed regions considers the growth of the national product to be their main objective. On the contrary, they devote their efforts to pressing the central authorities to undertake projects beneficial to their own region, without consideration for other regions or the maximization of national income. There is the danger, however, that the demands put forward by the regions will greatly exceed in total the financial and technical resources of the nation.

The plan of the Austrian province of Lower Austria illustrates the narrowness of regional objectives. It analyses the industrial location factors in the region, deduces from these the production sectors that might take advantage of them and the improvements necessary, mainly in infrastructure. However, such a study made at the national level would also have taken into account full employment and the equilibrium of regional economic structures [3].

In the same way, it has been said that the authors of French regional plans have too often defined what they believed desirable instead of what was possible to undertake in a national framework, since they did not have access to the relevant data [4].

Colombo, when Italian Minister of Industry, stressed that the purpose of regional plans should be less to express needs than to list resources [5]. But certain objectives do exist, even though they are more or less consciously sensed by the population of the regions, rather than explicitly stated. With its methods of discussion and compromise, indicative planning offers some interesting possibilities to resolve these latent conflicts.

The conflict of objectives between over-all plans and private projects in the matter of location is perhaps more obvious, but by the same token undoubtedly less dangerous. The dispute centres on the well-known distinction between private costs and social costs.

In their location studies, industrialists compare the net production costs at alternative sites. Obviously, they try to minimize their net costs, in other words, to maximize their profits [6]. Such an attitude, which is logical in a free-enterprise system, arouses among the advocates of planning two major objections.

The first objection is that the industrialist takes into account only a part of the total costs borne by the community. He leaves out the costs borne by other economic entities, namely, other firms, households, public groups, the community as a whole and foreign countries [7]. In particular, he disregards losses due to the diseconomies of agglomeration: growth of transport difficulties and of the cost, if not the price, of public services [8]. These indirect expenses are becoming more and more substantial with the modern trend towards concentration in metropolitan cities whose dimensions often seem to exceed the optimum.

Streeten has shown how diffused and important social costs can be, for example, those that are connected with the lack of diversification in a backward area [9]. F. A. Angers has stressed the impact in the case of developing countries of social costs resulting from the operations of a dominant foreign firm whose profits are repatriated and whose tax payments are likely to be rather low [10].

These social costs tend to be taken into consideration to an increasing extent by public authorities. In a paper on area development programmes in Europe, Victor Roterus stresses the growing importance of social costs. He points out that these costs are particularly high in over-industrialized and supersaturated urban centres. In these agglomerations new enterprises can use, often free of charge, express highways, public means of transport, prepared sites and other services which, through the system of grants, cost the nation a lot of money. Decentralized areas and smaller urban centres, however, are much less of a burden on public funds. Europeans widely agree that, under certain circumstances, grants to induce industrialists to locate away from overcrowded areas can save more than enough in social costs to offset the cost of the grants [11].

But to make such comparisons requires an analysis in some detail of the concept of social costs. For that purpose, Lombardini suggests using cost differentials, that is to say, the difference from cost at a reference location. It would be necessary to include: (a) a part of the cost of housing, to the extent that the plant locations being considered would cause transfers of population requiring investment in buildings, greater than would be needed at the reference location; (b) cost differentials of public infrastructures -- initial costs and operating costs; since the operating costs are incurred in

many different periods of time, it will be necessary to calculate their discounted present value [12].

This social cost analysis should be extended in two respects. In the first place there is no reason why this research should be limited to housing and public infrastructure. There are other necessary elements in the workers' life, such as transportation, with their costs in money and time. In addition to infrastructure, superstructure should be mentioned, and private concerns as well as public institutions. An analysis would be useful of the impact of new plants on the activity and operating methods of already established firms - on their manpower and wage scales, on their suppliers and conditions of supply, on their markets in terms of volume, location and prices. It is not certain that all of these influences would be unfavourable.

In the second place it does not seem satisfactory to limit this kind of research to one side of the balance sheet - the cost side. It does not seem logical to be silent about the social benefits, which can be greater in large communities than in small ones: more widely used public services, greater manpower productivity, external economies for existing firms and the like. It is worth while trying to strike a balance between positive and negative aspects; it would help to define the concept of optimum size of agglomerations and to guide spatial development policies more effectively. It would also be necessary to consider the second kind of objection to the minimum-cost criterion, namely, the actual meaning of prices.

In liberal economic theory, prices tend to be equal to marginal costs; they express consumer preferences and to some extent social utility. Prices guide investments by a spontaneous, democratic and decentralized mechanism. The second objection of the advocates of planning is that the system does not run without shocks; the cost calculation, which must take into account investments and research, tends to become an increasingly stochastic process and, in the last analysis, subjective. The idea that social utility is expressed by the consumer's economically attainable desires is increasingly challenged. Even consumer preferences seem less and less independent of external pressures, such as advertising. Lastly, for social or political reasons, the public authorities sometimes fix prices basic to the functioning of the ecoromy at levels that make any financial equilibrium impossible. This is particularly true in the areas of transport and energy [13].

A return to true prices in such situations has been suggested [14], or the taxation of social costs [15]. But in the short term a means of reconciliation in this new conflict between over-all and individual views has to be found. Discernible at the level of location objectives, the contrasts are no less apparent at the level of location methods. The above distinction between individual projects in the public and private sectors must again be taken up in this context.

The conflict between over-all plans and individual projects in the public sector about location methods is exemplified by the problem of allocating public investments to the regions. The question is whether priority should be given to the development of strong or depressed regions. The answer is not immediately obvious. Davin observed that the development of well-endowed regions caused a chain reaction that benefitted the poor regions, as a result of which the whole economy experienced an over-all expansion greater than would have been the case if dynamic regions had been left to follow their natural evolution and government intervention had been concentrated in depressed regions [16]. In another study Davin takes the argument forward as follows: developed regions with permanent over-employment possess the most favourable conditions to utilize the most advanced techniques, for example, a reservoir of skilled manpower, a high rate of savings, modern social services, a progressive outlook and a high standard of living. Sophisticated products tend to enlarge outlets and to maximize the profitability of regional advantages [17]. Le Pas shares this viewpoint and asserts that in the over-all interest of a nation it is dangerous not to ensure the optimum growth of its developed regions (instead of its depressed zones). Moreover, for an equal investment, the burden on income account is relatively less heavy if a plant is set up in a region already thrusting forward [18].

Other authors express different points of view. Nowicki, asking if depressed zones should be driven forward by themselves or pulled forward by expanding regions, observes that pulling effects come into play only at a certain threshold. To reach this level basic investments, whose profitability may not be immediate [19], must be made in these backward areas. Hirschman contends likewise that the central government, through a voluntary concentration of public investments, must give lagging regions the initial conditions for expansion [20].

By drawing a distinction between types of investments, it is possible to bring these points of view closer together; thus, Hansen distinguishes basic investments as being economic or social in character. For those of an economic character better alternatives exist, within certain limits, in intermediate regions than in retarded ones; this thesis corresponds closely to the views of Davin and Le Pas. For basic investments of a social character, on the contrary, the return will be greater in arrested regions; this conclusion is close to those of Nowicki and Hirschman [21]. This distinction emphasizes the human factors in development and serves to recall that social progress and economic expansion are complementary in the opposite way to what is generally assumed; that is, social progress prompts economic expansion rather than the reverse. Looked at in this way, social investments are deferred economic ones. However, one has to be able to wait, and that is not always possible for economic, psychological or political reasons. The creation in underdeveloped regions of cumulative processes of agglomeration has also been recommended, concentrating in them investments that are profitable only in the long-term [22]. In the last analysis, the choice would depend upon the price one set on time and it is uncertain whether this price would be the same for the central as for the regional level. Waiting is a luxury the poor cannot afford. Here again a compromise is necessary; the dialectical methods of indicative planning will prove useful in working one out.

The same is true where there is a conflict between the location factors evaluated by private firms and the criteria used by the public authorities in designating development zones to attract new enterprises.

Since a great deal has been written about the location of plants, only two observations will be made here. Industrialists seem to be increasingly sensitive to market size and the socio-economic climate of the agglomeration they consider joining. In a lecture at the Industrial Development Institute, Oklahoma University, Norman, Oklahoma, D. M. Barthold, an industrialist, suggested the following as location factors: nearness to raw materials and markets; favourable community and cultural climate; suitable terrain with minimum site-development costs; a stable political climate; a good labour pool and sound wage policies; equitable power costs and tax rates; abundant water supply; good transport facilities by rail, road and water; and possibilities of waste disposal [23].

This list seems to meet the present-day needs of the great majority of plants. The importance it gives to markets and to the receiving agglomeration is partially explained by an interesting study by Mrs. Anne P. Carter on the evolution of input-output tables for American industry between 1947 and 1958. This comparison shows the extent to which firms are becoming more dependent upon each other and how the importance of general inputs, mainly services, tends to grow at the expense of material inputs [24]. Thus, industries are less sensitive to distance from their suppliers than to nearness to their customers (often other industries) and to the suppliers of services, who are generally linked to an urban complex. In short, the essential is an industrial and urban milieu, sufficiently large and diversified. This development is not, at first sight, favourable to critical regions, which are characterized by a mediocre or undiversified environment.

In addition, regions proposed by public authorities to new industrialists for development are generally chosen for reasons quite distinct from location factors, namely unemployment or low personal incomes. Sometimes complementary criteria are taken into consideration, for example, tax yields in Austria, emigration in Belgium and Denmark, the probability of unemployment in France or the inadaptability of the economic and social infrastructure in Greece. As Klaassen points out, these criteria are nearly all negative [25]. Governments think first of stricken regions rather than of areas to be developed; fortunately, a new trend can be detected. In developing countries, regional expansion seems to correspond to a political choice asserted almost everywhere - to reduce inequalities and disequilibria within nations. In Africa this is true for Senegal (with Dakar), the Ivory Coast (with Abidjan), the Niger, Gabon, Madagascar, and so on [26].

Thus, location factors for private firms and development criteria for public authorities seem to be clearly differentiated. Since policies should express a purpose, it could hardly be otherwise. But objectives can be more or less ambitious and methods more or less rigid. To harmonize over-all plans and individual projects in the public and private sectors, indicative planning must elaborate sophisticated methods of co-ordinating seemingly contradictory objectives in regard to location. It will be possible in the last analysis to discern a marked trend towards a kind of spontaneous harmonization between public policies and private initiatives.

OVER-ALL PLANS AND LOCATION OF INDIVIDUAL PROJECTS IN THE PUBLIC SECTOR

Indicative planning intervenes in two ways in the passage from over-all plans to the location of individual projects in the public sector; it affects institutions or public bodies by the technique of participation and it affects procedures by the technique of regionalization.

Institutional participation

A distinction should be made between public institutions and para-public bodies. The first are mainly information-oriented; and the second, action-oriented.

A description follows of the traditional types of organization, the British regional councils and boards and the French regional economic development commissions, (CODERs):

Public institutions

In the Netherlands, the Minister of Economic Affairs requests the provinces, after discussion with the municipalities, to submit projects to him. A small expert committee, the Industrial Development Committee for Problem Regions, evaluates these proposals for their contribution to economic expansion. This committee is composed of representatives from various ministries. It gives its advice only after conferring with the provincial governments on the choice of works to be undertaken, their order of importance, time scheduling and other matters. In the event of disagreement between the committee and a provincial government, the problem is submitted to the minister concerned.

In practice, however, the current tendency is to replace consultations with individual local representatives by the advice of a representative group, specially set up for this purpose. For example, in Greece regional committees have been constituted, headed by an inspector-general of the public service, which hold meetings with the representatives in the region of the central Government, of local groups and of professional and trade union organizations. These committees give their advice on all matters that in any way concern the economic development of the region and act as intermediaries between the

public authorities and the population in order to obtain positive support for the tasks to be undertaken [27].

In countries with a federal constitution, local representation tends naturally to be undertaken by the state governments with the assistance of representatives of the Federal Government. This is the system adopted in the United States under the Public Works and Economic Development Act of 1965, on which an interesting study has appeared in the review Redevelopment, published by the Department of Commerce [28]. The new arrangements envisage the setting up of "multi-state regional planning commissions" composed of representatives from each participating state who are in principle the Governors, with someone from the Federal Government serving as co-chairman. The findings of these commissions must be approved by the majority of the state representatives and by the federal co-chairman. The commissions initiate and co-ordinate general programmes of long-term economic development, prepare particular plans and make legislative and other recommendations concerning short- or long-term projects. In addition, the commissions establish priorities for the implementation of approved programmes and plans and ensure that the necessary studies and consultations are undertaken, especially through the medium of public meetings and citizen councils [29]. Such an institution is of interest in two respects. The commissions are able to play an important role that goes far beyond mere consultation: in programme promotion, recommendation of measures, public participation. Secondly, the harmonization of the views of the federal authorities and those of the individual states is ensured, not by decision of the central authorities in the last resort, but by the need for the majority of the local representatives and the federal co-chairman to reach agreement. The federal form of the United States Government seems to have enabled it to set up regional institutions more sophisticated in certain respects than those of unitary states. It is true that the problems are different; the co-ordination of public policies seems to be more difficult in a federal than in a unitary state.

The federal structure of certain developing countries should likewise facilitate the participation of their local representatives in institutions for regional development. In the Federal Republic of Cameroon, the preparation of the second five-year plan (1966-1970) made it necessary to set up four regional planning commissions with representation from the private sector [30].

In Madagascar, the regional technical committees for planning and development have the chief representative of the central Government (préfet) as chairman, the other members being regional delegates or representatives of the ministries concerned, the head of the rural development centre and, with a consultative vote, three representatives elected by the General Council. As a first step, the General Commissariat for Planning asked the regional committees to work out their development plans on the basis of national objectives, allocated regionally. At this stage the regional committees had to define the agricultural objectives of the area for which they are responsible and determine on the basis of these objectives the programmes of the other sectors, distribute geographically the zones in which new operations will be located and, lastly, draw up a list of the actions to be taken. The general commissariat has made a coherent synthesis of these draft regional plans, on the basis of which the major outlines of a national plan were submitted to the Government. Subsequently, the regional committees took up their work again on the basis of the approved objectives and instructions given by the Government; thus they were able to break down the definitive regional plans into detail, by specifying ways and means of locations [31]. In Senegal, regional development committees confer with national authorities as in Madagascar [32]. These planning institutions have evolved on similar lines to the British and French experiments.

Regional planning councils and boards in the United Kingdom of Great Britain

Regional councils and boards in the United Kingdom work in close co-operation, but their composition and duties are not identical; the former are consultative bodies, the latter deal with co-ordination.

Regional councils (regional economic planning councils) have the following tasks:

(a) To help draw up regional plans, seeking to use available resources to the best advantage;

(b) To advise on measures for implementing regional plans with the help of data furnished by economic planning boards;

(c) To advise on the effect on the regions of national economic policy.

Councils have an active role in that they can take the initiative in bringing up matters which, in their opinion, ought to be examined by the economic planning boards. The boards prepare draft plans for their respective

regions and co-ordinate the action of various ministerial departments in the implementation of definitive programmes [33].

The main contribution of these bodies, and especially of the councils, is to aid in estimating and assessing regional needs and national resources [34]. In short, councils and boards are concerned with the long-term implications of economic planning. They first evaluate the economic potential of each region and the measures to be taken for its full development, including social measures such as the creation of a more attractive environment. This first task is difficult and immediate results cannot be expected. However, decisions must be taken by the Government in matters of economic policy, communications and spatial planning that will have a long-term impact on the regional economy. Councils and boards can draw the attention of the central authorities to the concrete effects in various regions of measures under preparation, before they are finalized. This procedure has been followed for the development of large ports and for long-term road planning as well as for closing down branch railway lines and the reorganization of the coal industry. Councils can also accomplish a great deal by encouraging local authorities and non-official organizations to adopt a regional viewpoint in solving common problems, for instance, in the arts, tourism or reclamation by industry of disused land [35].

The members of the regional economic planning councils are chosen as individual experts and not as representatives of special interests. The number of council members ranges from 18 to 37 and they have experience in local government, industry, the universities or social service. In short, councils are collective consultants with higher standing than an individual consultant because of their collective insight. Membership is honorary, and the point of view is neither political, academic, professional, trade unionist, nor that of the employer, but a little of each. The choice of chairman of the councils reflects the respect for amateurism, so dear to the English. The chairmen of the eight councils in England consist of two industrialists, two university professors, one local politician, one teacher, one trade unionist and the chairman of the governing body of a hospital [36].

The regional economic planning boards are composed of regional representatives of the departments concerned with economic planning such as the Board of Trade and the Ministries of Labour, Housing and Local Government, Transportation, Technology, Agriculture, Public Works, Power, and Land and Natural

Resources. In England, the chairman is an official of the Department of Economic Affairs; in Scotland he is an official of the Scottish Office.

Regional economic development commissions in France

Established by the law of 14 March 1964, the regional economic development commissions (commissions de développement économique régional, CODERs) are composed of 20 to 50 members selected as follows:

(a) As to at least one fourth: one or more councillors designated by each general council from among its members, and one or more mayors designated for each department by the general council from outside its membership; however, the mayor of the capital of the region is a member ex officio of the commission;

(b) As to one half: members designated by chambers of commerce and industry, chambers of agriculture and of trades, and by professional organizations, trade unions and employers' associations for industry, agriculture and commerce. The chairman of the regional development committee is a member ex officio of the commission;

(c) As to the remainder: members designated by the Prime Minister.

The instructions for préfets to guide them in the choice of qualified persons are of interest. They are advised to choose people with known competence in economic, social, family, scientific or cultural fields. They should avoid putting forward persons whose only experience is political. It is desirable that a suitable proportion of promising young people should serve on the commissions, and if there are not a sufficient number of them in the first two categories mentioned above, the préfets should propose them for inclusion in the third. Moreover, préfets are asked not to designate a person as qualified, on the sole ground that he is a member of Parliament [37].

Among the 20 CODERs with a total of 920 members, there are in fact 255 representatives of local communities, namely, 103 mayors and 152 members of general councils, that is, a little more than one quarter of the total. Taking into account the double role of some members, the figures show: 72 deputies, 53 senators, 202 general councillors and 286 mayors. In short, more than one fifth of CODER members are general councillors and a third are municipal representatives. The participation of elected local officials is two thirds, a proportion markedly higher than foreseen by the law of 1964. The socio-professional categories of the CODER members are as follows: agriculture, 170; artisans, 37; industry, 200; employees, 185; and social activities, 109. From among the liberal professions: 36 barristers,

8 solicitors, 8 notaries, 34 physicians, and 2 chartered accountants but, surprisingly, no architects or economists.

The chairmanship has been given less often to economic specialists than to political personalities, and moreover generally to well-known ones such as Chaban-Delmas in Aquitaine, Edgar Faure in Franche-Comté, Maurice Faure in Midi-Pyrénées, Pleven in Brittany, Pflimlin in Alsace and Pinay in Rhône-Alpes [38].

Yet the role of the CODERs is not political. These bodies are called upon to give advice on the implementation of the national plan for economic and social development and the regional development programme in their regions. They are consulted on regional aspects of the main options included in the national plan and on the regional sub-plans at the time of their detailed elaboration. The CODERs are kept regularly informed on progress in executing the plan [39]. Often these commissions are brought into the work of preparing the regional details within the national budget and can study problems such as the contribution of local communities to financing the plan, housing difficulties, employment trends and general perspectives for regional expansion [40].

As Bauchet points out, most of the CODERs are so active that some people have feared the rebirth of the provincial parliaments that existed before the French Revolution [41]. Still, by reason of their geographical base and the originality of their composition, the commissions should make it possible to create a new form of participation in public life, provided they accept the idea of discussion with the central authorities with the object of imparting information and collaborating. They must not lose themselves in a fruitless game of staking claims and opposition [42]. The CODERs were in some respects anticipated by the regional economic expansion committees, which are para-public institutions.

Para-public institutions

Among the para-public institutions that enable regional executives to participate in the location of individual projects, there are in France the economic expansion committees, chambers of commerce and industrialization boards.

(a) Regional economic expansion committees

A French law and an official circular of 20 January 1961 dealt with the establishment of regional economic expansion committees. These bodies enable the economic and social groups of a region to participate in the elaboration and execution of regional plans. In order to gain official recognition they had to ensure that the various departments of the region were equitably represented. In the professional field they had to include representatives from agriculture, commerce, industry, artisans and trade unions. They could also recruit people from university circles, credit institutions, consumer groups and family associations.

Following the establishment of the CODERs, a general instruction on 26 May 1964 divided duties between the two institutions, assigning a consultative role to one and research and promotion to the other. Consultation is the province of the CODERs, which officially formulate the opinions of the regions. This official advice can only emanate from an official public organization, working with the préfet, who is the Government's representative in the region. The tasks of research and promotion, however, will continue to be undertaken by the regional expansion committees which, with their private status, have greater flexibility and can obtain the help of a considerable variety of specialists, through the medium of study groups. (The "creative function" belongs to the regional expansion committee, and the "role of decision" is reserved for the CODER [43].)

After the expansion committees lost part of their authority to the CODERs, it was proposed in compensation to transform them into committees of inquiry with a para-public status. Some would like to make them into economic information bureaux [44]. Yet such activities would only be an extension of the official estimates. Actually, relations are close between the two bodies, which are often run by the same leaders. This is also true of regional chambers of commerce and industry.

(b) Regional chambers of commerce and industry

These organizations, created by a decree of 4 December 1964, were designed to represent industry and business in their relations with the public authorities and "to advise Government on means to increase economic prosperity".

Regional chambers of commerce and industry play an important role in the execution of public investment in transport infrastructure, industrial zones, railhead wholesale markets - in brief, the economic assets of a conurbation. Sometimes chambers of commerce set up information bureaux for new industries, as was done by the regional chamber in Bordeaux [45]. The Lille Chamber of Commerce has instituted a successful industrial promotion service, which has prepared a card index of available industrial property and sites and has done extensive research on town planning and real estate projects that could be of interest to firms. The group has also equipped a 150-hectare industrial zone, which could be expanded to 250 hectares [46]. These activities are similar to those of industrial conversion and expansion bureaux.

(c) Industrial conversion and expansion bureaux

Wishing to have a hand in solving the problems of their own future, local economic bodies and businessmen have established industrial conversion and expansion bureaux, aided by the public authorities, who join with them in defining objectives and the means to attain them [47].

These para-public bodies, private in nature but public in their objectives and by virtue of their collaboration with administrative authorities, sometimes have a diversified structure. In the administrative region of the Nord the industrial bureau, known as the Association for Industrial Expansion of the Nord and Pas-de-Calais, has four tiers:

(a) An assembly composed of the association's founders: the coal mines of the Nord and Pas-de-Calais, the regional iron and steel industry, regional chambers of commerce and industry and local employers;

(b) A bureau which consists of the founders, members of the public administration including the two préfets, representatives from a chamber of commerce and the regional expansion committee;

(c) A technical committee which advises the new organization on particular questions; and

(d) A consultative committee [48].

Co-ordination between the diverse participants is thus facilitated and local residents take part willingly. It has been said that the industrial bureaux were, first and foremost, "federating bodies" [49]. These associations, in short, represent the last phase of a significant evolution: the participation of local representatives and industrial circles in the solution of development problems, particularly in the location of public installations, has

grown and has become increasingly institutionalized. Collaboration between public authorities and private persons is no longer left to chance circumstances or sympathies; it takes the shape of institutions whose structures, because of their increasing differentiation, encourage specialization and, it may be hoped, greater efficiency.

Regionalization of procedures

Regionalized procedures can affect national planning in the medium term and annual budgets in the short term. The following commentary is devoted mainly to the French experiment, which has been unquestionably in the forefront of this field.

Regionalization of the plan

The regionalization of the French Fifth Plan (1966-1970) was inspired by a number of objectives, of which the following relate especially to industrial development and new plant location. The industrialization of the West was given first priority to avoid an irremediable deterioration of the existing structures by around 1970. A persistence of past trends would have resulted in the emigration of at least 250,000 persons between 1962 and 1970. It was necessary to oontinue the incentive policy initiated by the Fourth Plan and to ensure that 35 to 40 per cent of new industrial jobs in the country would be located in the West. The volume of emigration would thus be reduoed by a third.

Development of the North and East was thought of in relation to their proximity to the European centre of gravity. The North had to make good its backwardness due to the decline of the extractive industries and a lack of dynamism in other sectors. The East needed to persist in the re-equipment effort that it had carried out since the end of the Second World War. Centred on an economic axis (North Sea - Mediterranean), urban facilities, a network of communications and industrial zones were to create the necessary framework for expansion.

Lastly, specific actions were envisaged, particularly conversion operations in lightly industrialized areas. These interventions had to be organized sufficiently in advance to avoid sudden strains caused by external competition. The policy involved ensuring a retraining of manpower and at

the same time co-ordinating the initiatives of all the bodies engaged in carrying out or facilitating these operations. Comparable efforts had to be made in favour of depressed rural areas [50].

In order to attain these objectives, the Fifth Plan procedure of regionalization benefitted from some important innovations compared with the Fourth Plan. Regionalization of the Fourth Plan was introduced only after its approval by Parliament. It consisted in the elaboration of "operational sub-plans", since known as "regional sub-plans", subdividing according to regions the estimates of employment, economic activity and public investment previously fixed as national totals. For the Fifth Plan, work on the regional details began sooner, so that local representatives were able to be associated with it during preparation of the plan and not only after is approval by Parliament [51].

There were three successive stages of work on the regional details of the Fifth Plan. In the first, the national options were prepared and regional participation was limited to studies and surveys. These studies were made at the request of the central government departments or of the committees of the General Commissariat of the Plan. Some were spontaneously undertaken by the regions; they involved:

(a) Employment and economic development; thus an analysis of employment trends between 1954 and 1964 gave a better understanding of economic and demographic trends;

(b) Public facilities: the extent to which the quantity and quality of existing facilities have been able to meet needs;

(c) Specific studies asked for by regional préfets and sanctioned by the General Commissariat of the Plan to increase knowledge about particular problems such as the supply of professional manpower or the reception of new industries [52].

This research was used during the second stage of the regional planning, when the regional bodies had to make known their viewpoint on the orientation to be given to long- and short-term spatial policy in their region.

In preparing long-term forecasts (1985), the regional organizations have been helped by the first report of the National Commission for Regional Development (Commission Nationale d'Aménagement du Territoire, CNAT), to which the following documents were appended: regional estimates of population and occupational activities in 1985; estimates of industrial production in 1985, and of rural area development; report on the urban structure; preliminary report

on transport facilities in relation to regional development; report on the North Sea - Mediterranean axis, and on the West.

Furthermore, these questions could be the subject of complementary studies entrusted in each region to small groups of experts. The regional perspectives for medium-term economic development were mainly concerned with employment forecasts for the Fifth Plan period, 1966-1970.

To facilitate all of these tasks, the National Institute for Statistics and Economic Studies (Institut National de la Statistique et des Etudes Economiques, INSEE) worked out for each region two demographic projections for 1970. The first was based on the assumption that past trends in migration would continue in the future; the second on the hypothesis of a population growth undisturbed by migration. Manpower needs in 1970 were estimated for each region for 28 occupational groups.

The regional organizations also had available two kinds of studies already mentioned: (a) systematic research carried out in all regions, of which the quantitative findings were synthesized at the national level: employment balances, professional manpower resources, indices of the situation of public facilities, power problems; and (b) specific research on particular questions: the adjustment between supply of and demand for jobs at a lower level than that of the region, the trend of certain activities, the establishment of new enterprises. Moreover, regional bodies could make use of work done in preparing urban programmes [53].

With the help of all this information and that from local experts, regional orientation reports were drawn up according to the following tripartite pattern.

Part One: perspectives for regional area development, 1985, in accordance with the guidelines drawn up by CNAT, that is to say:

(a) Long-term demographic perspectives: total regional population by age-groups, school population, population of large agglomerations, rural and urban population, available manpower, and estimates of trends in the active agricultural population;

(b) Development perspectives for rural areas: restructuring of buildings, estimates of agricultural school facilities (programme law), and trends towards concentration or dispersion of rural facilities (pilot sectors - village centres);

(c) Urban structure perspectives: outline of urban structure, urban development policy (in liaison with adjoining regions) and perspectives for development of principal towns;

(d) Communications development perspectives: outline of major road network (express highways and three- or four-lane roads); main river communications and navigable waterways; and air connexions;

(e) Water policy (only for some regions).

Most regions have modified the demographic projections of INSEE, and INSEE has as a rule accepted these corrections, agreeing that its sector studies are relatively theoretical and that, especially with regard to employment, regional specialists are usually better informed than national experts concerning the probable establishment of new enterprises in the next few years. This observation is very significant. At this level of the dialogue between the central authorities and regional representatives the latter, because of their direct practical experience, easily impose their point of view.

In order to follow the above pattern the regional planners had to consider economic development perspectives and future plant location. Most reports recommend the concentration of new plants in a few favoured towns, to their profit in terms of social and economic facilities, especially those for schooling and housing. Regional views on all of these points have prevailed in discussions with the central authorities.

Part Two: regional perspectives for economic development, 1966-1970, including the following:

(a) Demographic forecasts: total population by age-group, school population, rural and urban population (population forecasts according to categories of commune), population movements within and between regions;

(b) Employment forecasts: manpower availability, manpower needs for each of 28 occupational groups, employment equilibrium within the region as a whole, and vocational training requirements;

(c) Economic development perspectives: agricultural production forecasts for some groups of products, expected agricultural employment and structural evolution, a study of industrial possibilities in the region, specific actions for industrial conversion and rural area rehabilitation, problems posed by foreign trade developments, study of exchange flows for some products, study of exchange between frontier regions and neighbouring countries.

Regions have thus been asked to express their views on industrial possibilities. They have analysed their current position in regard to industrial development and made some attempt to forecast what they could accomplish during the next five years. As a result, fixed asset investment has been concentrated in two respects: in favoured localities and in certain industrial sectors.

This double choice in industrial location by the regional authorities is bound to influence the central government in its distribution of credit facilities and the regional authorities in their initiatives and financial grants for equipping industrial zones.

Part Three: a study of public investment including the following:

(a) Current regional situation: place of the region in the national situation, 1960-1965, particularly as regards housing and urban facilities, facilities for primary, secondary and technical education and for adult vocational training, sanitary and social facilities, and rural facilities;

(b) Proposals for relative priorities among the main investment sectors;

(c) Proposals for relative priorities within a given sector.

These situation reports were drawn up under the responsibility of the regional Préfets, each of whom had at his disposal a "mission" of administrative and technical civil servants and specialized working groups composed of civil servants, members of the CODER and experts. After having been submitted for comment to the relevant CODERs, the reports were transmitted to the General Commissariat of the Plan [54].

With the aid of these regional reports, the General Commissariat of the Plan could make a list of regional desiderata, review its priorities for fixed asset investment in terms of expressed needs and even reconsider the regional development objectives in the national plan. On the basis of a synthesis of the regional reports, the national committees of the plan have been led to recast their estimates for production, employment or investment. At this second stage the regional studies have thus caused some objectives to be modified, have clarified some choices or corrected national statistics.

During the third and last stage of regional work on the plan, it was necessary to make explicit the objectives for each region, to propose a certain number of development axes and in particular to distribute among the 21 regions the major programmes of public investment, distinguishing operations of a national character and those affecting a region or département. National operations included some major projects for university facilities, for research, for regional development of agriculture, irrigation or tourism and also the main communication routes by air, road and water. For these programmes there was no preparation by the regions. Their location was decided with due consideration for the general objectives of regional development. Regional préfets were simply notified about these projects.

For investments at the level of a region or *département* the distribution was made on the basis of objective criteria established by the ministries concerned, the General Commissariat of the Plan and the Regional Development Board, DATAR. Broadly speaking, these investments had to ensure an equal level of services throughout the country. Their distribution, therefore, was based essentially on the situation in 1965 and on demographic trends. But a reserve of 5 to 15 per cent of expenditure according to the sector was set aside in order to allow for adjustments after regional consultation and to meet unexpected situations which might arise during the execution of the plan.

Within the framework of these allocations, the *préfets* have worked out the sub-plan for their regions, essentially a programme based on lists of operations classified according to their urgency and location (regional investments) or on financial totals allocated to each *département* (departmental investments). This regional planning covers housing and industrial zones, as well as the ten main sectors of public investment: school, university and sports facilities, vocational training facilities, scientific research facilities, sanitary and social facilities, rural community facilities, urban facilities, road, other transport, post and telecommunications facilities.

The draft regional sub-plans prepared by *préfets* were submitted for comment to the CODERs and then sent to the General Commissariat of the Plan, which correlated them. Some adjustments and increases proposed by regions for housing, post and telecommunications or schools were taken into consideration and put into effect during the execution of the plan.

Hence a systematic dialogue at the study and programming stages resulted in the location of individual projects, for instance, of industrial zones, and at the same time of their indispensable adjuncts: housing, school, road and cultural facilities. This formula, with its sophisticated techniques of participation and consultation, is a significant example of indicative planning possibilities in the location of individual projects in the public sector. The system is based upon persuasion rather than authority. And it works efficiently since the budgetary ceilings placed on each region's expenditure must be observed, as well as the objectives of regionalization. In short, the central authorities have made the rules and settled the amount at stake in the game. But within these objective limits there is complete freedom and, for the unlucky, the chance for a second try through the reserve fund. The free enterprise system is not always so considerate.

Regionalization of the budget

French budget regionalization follows from the regional sub-planning of the national plan, since the budget should respect the regional estimates and control regional progress from year to year. The law of 4 August 1962 approving the Fourth Plan envisaged in the annual budget an analysis of credits according to programme regions. Furthermore, even if there were no plan, budget regionalization would ensure coherence among the investment programmes of various national ministries.

For these reasons, the main responsibility for budget regionalization is assumed by the Regional Development Board, DATAR. Since it has direct access to the Prime Minister, DATAR has enough authority to perform the co-ordinating role essential to regional development vis-à-vis the technical ministries.

All investments cannot be allocated according to region. In the first place, ministries must keep a national reserve for unscheduled operations which may become necessary during the budgetary year. Secondly, some funds remain blocked, such as those for large housing developments. Lastly, some programmes affect many regions and their apportionment is not possible - for example, investments which have a national dimension, such as express highways or short-wave radio transmission networks. In short, within the budgetary credits for various programmes, the percentage listed on a regional basis ranges from 50 for the Ministry of Education to nearly 90 for public works, cultural affairs or construction [55].

For a geographic distribution of investments, certain criteria of choice are necessary; whenever possible, they take the form of distribution "keys". The Fifth Plan programmes take into account two major aims: (a) balanced growth in public facilities - the preferred criterion for distributing investments among regions and determining operations is the notion of "keeping in step"; and (b) selective pressures to promote economic growth in regions or areas whose spontaneous development is considered unsatisfactory.

Some actions by the public authorities, therefore, have an equalizing purpose and others involve more localized choices. Included in the first category are social investments. For primary and secondary school facilities for general cultural activities and for health facilities the objective is clearly an equalizing one. Into this category must also be put housing policies - considered one of the factors in "keeping in step" - and water,

sewerage and telephone infrastructures. However, in these cases the criteria for distribution must take into account the geographic evolution of urban areas.

As examples of actions based on a clear choice among geographic priorities one can cite the location of research in a few multi-disciplinary centres of national scope, the development of very high level facilities which, outside Paris, can only be located near a regional metropolis, and the development of large tourist complexes such as Languedoc-Roussillon [56]. In any case, whether the choice is governed by a policy of "keeping in step" or of incentives, it is essential to ensure consistency in the investments. Since each spending ministry is apt to have its own "key" for deciding the distribution, the functions of co-ordinator, undertaken by DATAR, assure a harmonious and efficient result.

It is important also that regions should participate in the budgeting of policies that they have helped to elaborate. This participation, whose nature had not been established at the time of the inception of the plan, could take two forms. First, the members of DATAR would have at their disposal the annual reports of the regional préfets. These should enable them to evaluate the rate of progress in investments compared with the approved amount for each main sector of the regional sub-plan. Hence it would be possible to postpone or cancel operations whose fulfilment had encountered, at the regional level, unforeseen difficulties. Likewise, local financing problems - including the need to borrow funds - would be studied with more precision in the light of the information given by local specialists. Finally, these reports would convey the viewpoint of the region itself, and not simply of regional officials, since the CODERs (whose representative nature has been stressed) would be associated with the work.

In the second place, these commissions would probably be invited to participate in the preparation of regional items in the budgets. Naturally, it would not be possible every year to decentralize altogether the budget procedure. Nevertheless, it would be useful if DATAR could make known in budgetary discussions the position of local authorities on essential points. Thus the trend to regionalization through consultation affects even the normal functioning of traditional public services [57].

The idea of budget regionalization is becoming increasingly accepted. The national plan of the United Kingdom refers to it; ministries would issue each year a regional breakdown of their expenditure estimates for new buildings and works. Regional boards are associated with this task at least in defining objectives and specifying the needs of their region [58]. An advanced system exists in the Republic of Mali, where, since 1963, regions have had their own budgets. The receipts transferred from national accounts to the new regional budgets are raised essentially by direct taxation; expenditures are for all kinds of regional activities [59]. In many respects the budgetary experiment of Mali seems more developed than that of the United Kingdom or France.

These regional budgets, together with their supplementary documents, are of additional value for the information conveyed, particularly to the local population. The latter, if the concrete problems are explained, the necessary choices pointed out and the region's future possibilities depicted, are able to participate with renewed efficiency in forming regional policy and in locating the individual projects which are the end-product of this process.

These problems of information are just as important, if not more so, in deciding the location of individual projects in the private sector.

OVER-ALL PLANS AND LOCATION OF INDIVIDUAL PROJECTS IN THE PRIVATE SECTOR

In order to harmonize over-all plans and the location of individual projects in the private sector, indicative planning attempts to gain the agreement of private industrialists on plant location through the medium of information and a technique of persuasion/dissuasion. These procedures tend to gain a freely given support by the decision-takers (in the case of industrial location, the entrepreneurs) by means which are void of all compulsion. More specifically, the measures described below are designed to attract the attention of industrialists, to engage them in the discussion, and to prompt them to present their views. It is the quintessence of indicative planning that is brought into play in this way.

Information

The insufficiency of available information for use in locating projects, especially industrial projects, has led the public authorities to take steps towards improvement in this field.

Inadequacies of the conventional information of industrialists concerning location

The defects of the conventional information of industrialists concerning location are well known. A somewhat old but still significant study by the Federal Reserve Bank of Boston points out that very few industrialists are suitably informed on the economy of New England. Moreover, solid data available are generally outdated. As a rule, books on economics or economic geography dealing with New England stressed the migration of the textile industry to the South. This one-sided presentation overlooked the progress made by other more dynamic sectors. The presentation of facts is sometimes tendentious. Changes in population, industrial activity, income and other economic characteristics are often expressed for different regions as a percentage of national results. New England, one of the oldest and most developed areas of the country, has been unable in recent years to grow as rapidly as some other less developed regions. It is easy to give the impression that New England is declining in absolute and not simply relative terms [60]. Certain facts, but still more certain interpretations and presentations, had created in the minds of industrialists an unfavourable image of New England.

This concept of image is important, for it tends to explain some economic phenomena that rational analysis cannot justify. In France the traditional indifference of industrialists to Brittany resulted from an unfavourable image - that of an antiquated, retarded region - at a time when its demographic evolution and its human resources made it one of the youngest and most dynamic provinces. In order to rejuvenate the image of Brittany it was necessary to group together there, by a concerted policy, factories and research centres in the most sophisticated sectors: electronics, telecommunications, chemistry and pharmaceuticals. These new features, as well as the development of leisure activities and seaside resorts, have helped remodel Brittany's image and to make Rennes, its chief town, one of the most rapidly growing French cities [61].

Hirschman has noted that progressive regions and sectors are impressed by the dynamism of their own development and they tend to distinguish themselves

from less favoured areas by picturing the population of those areas as lazy, scheming and generally without hope. This tendency to set one's own group or region apart from the others seems a very general one. Very often a success which is due to natural resources, history or other factors is attributed to the moral qualities which people easily persuade themselves and seek to persuade others that they possess. The system tends to be self-perpetuating, for in order to keep their reputation, dynamic groups end by practising these virtues [62]. So, due to a favourable or unfavourable collective image, certain sectors or regions become dynamic or suffer from economic depression. The image does not explain why some areas are expansive and others the reverse, but it does explain why they have continued to expand or decline long after the causal factors have disappeared [63].

Images are dangerous because of the irreversible, cumulative processes they set in motion and the extremes to which they can lead in the depopulation of some regions and the overcrowding of others. The public authorities can at least make the images reflect impartially the concrete facts of general interest in their policy. It would be even better if the role of collective images in economic development and plant location were to be studied more systematically.

Images affect not only decision makers in the matter of industrial location, but also their colleagues and the population of the communities where they may settle. Business executives are often reluctant to transfer their residences. (Once more the image explains their inertia without justifying it.) The local population at times manifests towards new industries an excessive indifference or enthusiasm, which can lead to unrealistic attitudes and then to disillusionment. The role of motivating images seems to be decisive in all such behaviour [64].

Measures taken by public authorities to improve the information of industrialists concerning location

Writers on the subject invite public authorities to inform industrialists on the current situation of regional development and future opportunities, with a clear statement of their willingness to prepare the ground and of the direction of their efforts [65]. In turn, the public authorities emphasize the problems of information and the measures they have taken or are about to take to deal with these problems.

In the United States all states offer information to prospective industrialists. Specialized programmes have been established in Florida, Illinois,

Iowa, Kentucky and Nevada. Florida calls on consultants to put together information about profit possibilities for specific industries; Illinois gives its firms information on exports; and Kentucky issues data for each county on the location advantages for specific industries [66].

Since France is a unitary state, the measures had to be more centralized. A decree of 15 June 1960 created an interdepartmental information centre for industrial decentralization and adaptation. In creating such an organization the motives were:

(a) To improve the quality of the general information used by the many people responsible for regional expansion, by making it more homogeneous, more accessible and more up-to-date;

(b) To facilitate the work of those concerned by gathering in one place all information needed;

(c) To develop the two functions of reception of industrialists and evaluation of their applications, by separating them into distinct but not isolated services;

(d) To give officials with varied administrative backgrounds the opportunity to work permanently in a team which would work successfully only if the services concerned truly collaborated with each other.

In short, the new organization had a double information role - towards the users and among the officials themselves.

The decree of 15 June 1960 laid down that the tasks of the centre were essentially to give economic and financial information and advice about location to industrialists wishing to make investments that might qualify for government aid; to receive requests from industrialists and to assist them in preparing their applications; and to ensure that action is taken on these applications by the relevant services.

Among the main activities of this information centre the reception of visitors is foremost. Direct contact between industrialists and the director of the centre has proved useful to both. In particular, it helps industrialists to understand better the policy of the authorities, its reasons, its objectives and the means adopted; and it enables the administration to be better informed about industrial problems, especially production costs and competitive prices. Among the visitors are members of local authorities and chambers of commerce, and in general people interested in the industrial development of their community or region.

The information centre also receives requests from industrialists for grants and loans or reduction of transfer tax and checks these applications

before transmitting them to the services that evaluate them or to the committee which decides the matter, with all of whom it works in close co-operation [67].

Proposals have been submitted for study, under which the information centre would have more powerful means at its disposal, in particular a team of specialists on such questions as financing, housing, industrial zones and real estate leases. As a result, it would no longer be necessary to wait behind a counter, so to speak, for industrialists, but it would become possible to seek out heads of firms to offer them help in solving some of their problems [68]. In short, it is largely the information centre that carries out the policy of persuasion/dissuasion adopted in France, as in many other countries.

Persuasion and dissuasion

Policies of persuasion by incentives are much more widespread than policies of dissuasion by controls but the latter, owing to the way they are applied, also have a clearly indicative character.

Persuasion

Most countries have created a system of incentives to industrial location in depressed areas. Generally these incentives take the form of bonuses or subsidies, loans, reduced rates of interest, tax benefits and various facilities for industrial buildings and sites, manpower training, housing, and so forth.

The United Kingdom has a very elaborate system in the development areas for the renting or construction of factories by public bodies, including loans to industrialists, subsidies up to 40 per cent for equipment and machines, and of 25 to 35 per cent for buildings; in the absence of these subsidies, tax advantages are offered in the form of accelerated depreciation at the rate of 30 per cent [69]. In Canada aid consists of: (a) tax incentives which allow new firms in designated areas to enjoy a three-year tax holiday; (b) capital subsidies, exempt from federal income tax, of up to one third the cost of new buildings and equipment, subject to a limit of US$5 million for each project; and (c) permission to depreciate machines, equipment and buildings at special rates, for fiscal purposes.

In the United States incentives for industrial development vary from state to state and often from community to community. For example, in Louisiana a new incentive consists of a graduated tax exemption on natural gas

bought by industry; and the number of states that have duty-free zones has increased. Such measures cannot be neglected by those concerned with promoting manufacture, entrepôt and export trade development.

Tax benefits and other concessions to enterprises continue to make their appearance, but these methods tend to be subordinated to more elaborate measures such as technical services, detailed information and expansion programmes. In the financial field, private bodies still predominate. In 1965 business development corporations had $50 million of current loans to industry, compared with $34 million in 1961 [70].

The action of the American federal authorities in this respect is of considerable benefit to both industrialists and public sector bodies at the town, county and state level. The incentives consist of subsidies for public works and facilities intended to help expansion; loans up to 100 per cent for public works and up to 65 per cent for industrial and commercial development; and guarantees up to 90 per cent of sums borrowed by public bodies. Aid can also be provided for technical assistance and research, and special conditions are offered for loans and subsidies in conversion areas and multi-county development districts [71].

In the Federal Republic of Germany industrialists who locate their plants in economic development regions obtain loans at low interest rates: 3.5 per cent for buildings and 4 per cent for machinery and equipment. In the eastern frontier zone an interest rate subsidy is given on loans for rationalization and transport costs are also subsidized.

In addition, firms in depressed areas benefit by tax reliefs or advantages as follows: (a) exemption or deferment of payment of income tax, undistributed profits tax, the Berlin assistance tax, capital tax, and the charges equalization tax; (b) permission to charge extraordinary depreciation on investment goods such as machinery bought or made by firms in depressed regions - up to 50 per cent for movable assets and 30 per cent for fixed assets; (c) tax exemption for investments made by self-financing; and (d) exemption or long-delayed payment of the turnover or transmission tax (Umsatzsteuer) [72]. Local authorities, especially the Länder, utilize similar methods to attract industries; as in most federal states this creates difficult problems of co-ordination [73].

In Italy the system of incentives to new industrialists in depressed regions, and especially in the Mezzogiorno, is particularly comprehensive:

(a) Tax facilities: 50 per cent reduction in the general turnover tax (imposta generale sull' entrata, I.C.E.) for industrial materials

and equipment; 10 years' exemption from tax on non-property income (ricchezza mobile, R.M.) for new industrial plants; similar exemption from this tax in respect of income arising from extension of production facilities; exemption from tax on R.M. applied as an industrial investment in the Mezzogiorno; total or partial exemption from local taxes;

(b) Exemption from customs duties on materials and equipment necessary for industrializing the Mezzogiorno;

(c) Some compensations for bad debts;

(d) Financing on particularly favourable terms as regards interest rates and duration of loans, including credits from special institutions such as ISVEIMER for southern Italy, IRFIS for Sicily, or CIS for Sardinia;

(e) Equity participation and technical assistance;

(f) Various aids such as reductions in transport rates and in the price of hydrocarbons;

(g) Equipping of industrial zones [74].

In France incentives to industrial location in development or conversion zones are very elaborate. They include:

(a) Industrial development premiums ranging from 5 to 20 per cent of investment expenses;

(b) Industrial adaptation premiums in conversion zones - maximum rate also 20 per cent;

(c) Tax reliefs: reduction of transfer tax, total or partial exemption from licence tax, a special 25 per cent depreciation of new buildings, reduction of tax on capital gains from real estate;

(d) Loans granted by the Social and Economic Development Fund (100 million francs in 1967) and by public banking establishments such as the Crédit National (at 6.75 per cent for 15 and, exceptionally, 20 years), the Crédit Hôtelier (6 per cent, same duration as for Crédit National) and regional development societies (minority participation in share capital of enterprises; and 7 or 8 per cent loans for 12 years);

(e) Compensation for decentralization paid to industrialists who leave the Paris region (60 per cent of removal expenses);

(f) Manpower assistance: vocational training, retraining and help with removal costs;

(g) Aid from local communities and organizations with regard to industrial sites and buildings and exemption of local taxes;

(h) In the case of large operations, an agreement concluded with the enterprise setting up a plant, whereby the state grants special assistance with housing, telecommunications and vocational training;

(i) The recently introduced system called Crédit Bail Immobilier whereby industrialists making an initial cash investment of a quarter of total building construction costs are granted special 20-year loans with the possibility of a government guarantee [75] [76].

In South Africa special incentives are offered to industrialists who locate their plants in depressed regions. These aids consist in low railway rates to urban centres, tax exemptions and low prices for water and energy. In addition, the central government has financed a certain number of industrial zones in these regions [77].

While there is agreement in practice on offering these forms of aid, their material effectiveness is more controversial. Thomas Wilson considers the financial advantages connected with plant location in development districts in the United Kingdom very generous. Some concessions, however, diminish the value of others; the value of subsidies, for example, is reduced by the subsequent reduction in depreciation charges. Moreover, help with depreciation is also granted outside development districts. It is estimated that on the average during the years 1960 to 1962 enterprises in development areas had to supply four fifths of their capital from their own funds, against nine tenths in the rest of the country. A distinction should be drawn between the initial improvement in the cash position of enterprises and any permanent reduction in production costs. The first item may not be negligible, especially if the profits are large enough to allow the depreciation advantages to be claimed. The advantage in costs is less evident, about 12 to 14 per cent of capital charges in development areas compared with other areas of the United Kingdom; this may represent 4 per cent, or less, of annual expenses. According to Wilson, such measures cannot cause serious distortions in the spontaneous distribution of plant locations [78].

According to a study made in Wisconsin [79], assistance in industrial development is a more important location factor within a region than in the choice of a region, although differences in total costs within regions are generally lower than interregional disparities. Even when the choice of location is limited to a particular region, such assistance is probably a secondary factor. In most cases cost reductions due to incentives are small compared to total cost differences. The essential elements are variations in wage or transport costs. For this reason the majority of firms who have received assistance do not consider it was an essential factor in their choice. Nevertheless it is useful to take the size of the enterprise into consideration. Small firms are more sensitive to facilities for financing, others to tax advantages.

A survey made among recently installed French industrialists indicated the following average results, expressed as percentages of the investment, discounting future expenses at 7 per cent. (The town of Chartres, which has neither aid nor penalties, was chosen as base for the comparisons.)

Geographic comparison of incentives to new industries
(per cent of investment cost)

	Paris	Chartres	Angers	Mayenne	Nantes
Transfer tax reduction	-	-	+0.3	+0.3	+0.3
Licence tax exemption	-	-	+5.7	+5.7	+5.7
Special depreciation	-	-	-	+2.5	+2.5
Development premium	-	-	-	+6.4	+12.8
Special aid to industrial zones	-	-	-	-	+1.6
Penalty for premises built in Paris region	-12.0	-	-	-	-
	-12.0	-	+6.0	+14.9	+22.9

In short, a firm able to choose Paris or Nantes for its location will obtain a net saving amounting to 34.9 per cent of its investment by choosing Nantes, compared with Paris [80].

Yet even in France industrial location incentives are considered by industrialists to have a limited efficiency; and an official attached to DATAR conceded that incentives used by the Government to guide industrial location have only a very marginal effect on the choice. Bearing in mind their real financial weight, inoentives can affect the choice only when the two localities seem in other respects about equal. State aid can then tip the scales [81].

Klaassen suggests that measures in favour of new industries often have greater psychological than financial consequences [82]. Here again the idea of the image comes in. The study on Wisconsin rightly stresses this aspect of the questior. The offer of incentives by Wisconsin may markedly improve that state's image in the eyes of industrialists. The image of an area depends in part upon costs and in part upon less tangible factors. Bergin points out that while most state agencies still stress tax advantages and financial incentives as essential factors in industrial location, surveys show that these initial offers are far less important than the climate of co-operation that they inspire [79].

In this respect one might make a distinction between two kinds of incentives: local assistance and that extended by the central authorities. The first directly improves the regional or community image, since it reflects dynamism, interest and a welcoming attitude on the part of local groups. The effect of the second type of incentive is different. It might even be thought at first sight that the action of the central services indicates the inadequacy of local initiatives. Generally this is not the case; aid from the national authorities tends to reinforce the drive and to bolster the slender material resources of local bodies. The image concept is a little more complicated here; incentives contribute indirectly to improve the image of the region, through the interest that the region has been able to arouse on the part of the central authorities and this is retransmitted, duly magnified, to industrialists looking where to locate their enterprises.

Incentives represent in economic terms a very limited advantage for firms, but they call the attention of industrialists to certain regions or towns whose image, until then doubtful, thereby becomes brighter. Previously neglected, depressed, distant, the development zone becomes dynamic, protected, favoured by the public purse. That is why the assistance policies seem to match so well the needs and the spirit of indicative planning, by employing techniques of suggestion and persuasion similar to those of commercial advertising.

Dissuasion

Among countries that employ indicative planning, only the United Kingdom and France appear to use methods of dissuasion in industrial location. In the United Kingdom, under the Control of Office and Industrial Development Act of 1965, all new industrial premises of 1,000 square feet or more due to be constructed in certain defined areas of the midlands and southeast England must be approved in advance by the Board of Trade issuing an industrial development certificate. The Board must be satisfied that the proposed operation fully complies with the requirements of industrial distribution [83] [84].

In practice, enforcement of the regulations has been flexible and many exceptions have been granted, some near London itself. During the period 1960 to 1965 industrialists were refused permission in respect of only 7.8 per cent of the total area they requested, although the percentage was 18.7 in the midlands. It is worth noting that, between 1947 and 1960, less employment was provided by new firms in the whole of Scotland than in the seven new

towns in eastern England, which were only a part of the total expansion that occurred within a 100-mile radius of the centre of London [78].

Holmans points out that the need to obtain industrial development certificates for establishing new plants has not prevented demographic expansion in southeast England. He notes that during the period 1950-1962 (1958-1959 being excluded for statistical reasons) development certificates granted in the southeast involved 190,000 jobs. Yet the number of additional workers during this period in the sectors concerned was between 577,000 and 612,000. The author explains these larger figures by the construction of many small workshops and by expansion without additional surface area - all operations to which the regulations do not apply. The conclusion is that the sources of employment growth are so diverse in the southeast that building control could only slow down the current development [85].

The French system is similar to the British controls, although more elaborate. In the Paris region and during recent years in the region of Lyons, the specific consent of the Ministry of Equipment - previously the Ministry of Construction - was needed to build or extend industrial premises with a surface area exceeding 500 square metres. Agreement is not necessary for extensions of less than 10 per cent of the surface area in use on 5 January 1955. For the construction of industrial premises in the Paris region penalty fees of 50 to 100 francs per square metre have been instituted, varying according to the zone. On the other hand, the elimination of this kind of building gives rise to a bonus of the same amount, paid by the Government to the owner of the property [86].

More generally, industrial construction may be prohibited throughout the country by the application of article 15 of the 30 November 1961 decree for national control of urban development. According to this article, "when, by their size, their situation or their use, buildings would conflict with the needs of regional development and town planning, building licences may be refused or granted only subject to special conditions". Public authorities are therefore able to oppose a plant location they deem undesirable on socio-economic grounds [87]. Under these regulations, applications for a permit to build industrial premises of more than 2,000 square metres are submitted for preliminary comment to the regional member of DATAR.

This control, which might appear rather restrictive, is in fact applied very flexibly. The number of refusals by virtue of article 15 of the town

planning decree is not published, to the author's knowledge, but it must be very small. The application of the special regulations for the Paris region, however, is analysed each year in the statistical bulletin of the Ministry of Equipment. According to the last published information, 580 applications by industrialists for permits to build or extend premises in the Paris region were up for decision in 1964 and the refusals numbered 108, or 21.3 per cent. This is close to the 18.7 per cent refusals registered in the English midlands. It cannot be concluded from this, however, that the French controls are more severe than their British counterparts; British industrialists may practice a self-discipline to which their French colleagues are less accustomed [88].

In the last analysis, these systems of authorization seem mainly - as the small percentage of refusals suggests - intended to induce an exchange of views between public authorities and industrialists. When industrialists want to locate or expand in overcrowded areas they must convince the authorities that their choice is motivated by rational socio-economic factors and not by subjective considerations. This policy of dissuasion is still, in practice, one of persuasion; the law has had the effect only of reversing the burden of proof. The authorities no longer have to convince firms where they should locate; instead, industrialists must persuade officials that they cannot locate outside a chosen place. It is the same game but the rules have been changed. In large centres the value of external economies to enterprises and the diseconomies of scale for the public authorities are such that the usual regulations to persuade by incentives would not have worked. For this reason it was necessary to employ another sort of indicative planning, one involving restraints but still open to free discussion. Here restriction is used only to the extent needed to ensure persuasion on the basis of objective rather than subjective considerations.

The confrontation between the authorities and industrialists is often more apparent than real and a many-faceted development is already discernible towards a spontaneous harmonization of public policies and private initiatives in the location of new enterprises.

RECONCILIATION OF PUBLIC POLICIES FOR LOCATION WITH THE PRIVATE ENTERPRISE SYSTEM

There are four angles to achieving a spontaneous agreement between public policies for location and private projects: they concern objectives, methods

of forecasting, the process of economic development and the trend towards integration.

Objectives

Public objectives and the goals of private enterprise were traditionally distinct, if not conflicting. The former were inspired by social considerations such as the reduction of unemployment, the equalization of incomes in the various regions of the country, or preventing the abandonment of poor areas. The latter, on the other hand, were connected exclusively with economic considerations such as profit maximization, the competitiveness of the enterprise or guaranteeing the possibility of its expansion. But objectives, public or private, alter and it can be seen that the paths of their development are converging.

Public-sector objectives

Although they were purely social in the beginning, public objectives have become increasingly affected by economic considerations. Myers observes that in Western Europe regional policies are no longer dictated by the sole concern to ensure a high rate of employment throughout the country but that they tend increasingly to concentrate on exploiting the economic potential of each region [89]; these measures are therefore only one part of national policies that aim at a higher growth rate, that is, an increased and widely spread prosperity [90]. The evolution of the terminology is significant in this respect: "depressed", "critical", "underdeveloped", "lagging" regions are now designated as "development areas", "growth centres", "growth poles". The stress has manifestly been shifted from social to economic preoccupations.

In some countries the evolution is particularly marked. In the United Kingdom regional policy tends to industrialize certain "development zones" less, it seems, to diminish unemployment than to improve the use of manpower, an essential factor for general expansion and for reducing the overcrowding in the midlands and southeast England that threatens to limit growth and breed inflation. Economic development is all the more necessary and carries a high priority, because it must match the demographic expansion of the country [91]. For this reason in the United Kingdom, as in some other countries, regional planning is integrated into the national plan.

In many countries there is this same shift of regional policy towards economic preoccupations. It is worth quoting a clear Swedish statement about the possibility of assistance to foster industrial decentralization: "This policy should aim to assign to enterprise areas that are economically viable. The authorities must be guided by economic logic ... we will even say that firms, whether they belong to the private or public sector, should take into account only purely commercial factors in considering their location." This viewpoint was stated by a representative of a trade union, not an employers' association [92]. This shows how far, in a country where social policy is most generous, it is widely accepted that the regions must stick to economic considerations.

In the United States the shift in regional policy from social to economic goals became manifest in 1965 with the Public Works and Economic Development Act (Public Law 89-136). The intervention of public authorities is now intended to promote long-term economic development in the regions concerned. The purpose is to help lagging areas help themselves. The new measures aim to furnish the framework for a close, effective and lasting collaboration between public and private sectors in order to bring about the continuous growth of the economy, permit a more effective use of technological innovations and ensure that all parts of the country will have the opportunity to develop their potential [93]. The term potential is used here in the widest sense to include natural and human resources as well as those of technology.

The same preoccupations exist in developing countries. The Sudan industrial location policy has as its main objective to take advantage of all natural resources in all regions of the country, particularly in the south which is the less exploited zone. Location is considered in the Sudan as one of the most important factors for the success of industry. It is essential to choose and organize locations most favourable from an economic point of view [94].

In short, public objectives in the matter of location policy have spontaneously come closer to private objectives by the adoption of an economic concept of growth. This evolution is undoubtedly due in the main to the general decrease in unemployment and the economic and demographic expansion after the Second World War. Indicative planning techniques may also have had something to do with this development. According to Chamberlain, disagreements between public authorities and private entrepreneurs are resolved in

the last analysis by negotiation. For this, the representatives of firms are not unarmed; they have pressure groups. The compromises which result from these discussions diminish the extent to which public objectives are achieved but increase the probability that anything at all will be achieved. In the end, if planning is to be effective, public objectives must be broadly compatible with private objectives [95]. It is also possible to uphold the inverse proposition: to be assured of success, the plans of a firm must not be incompatible with those of the nation. In short, those in charge of private and public affairs must have, if not similar, at least compatible preoccupations.

Private-sector objectives

Since the Second World War the heads of private enterprises have tended generally to show a greater preoccupation with social factors. For reasons which may not always be disinterested, entrepreneurs are concerned about the problems of education, housing, unemployment or reconversion. Some techno-economic factors have encouraged this awareness, such as the depression in many traditional manufacturing regions, the specialization of businesses and workers and the growth of mass production (where the workers are also necessarily the consumers). In the United States as in Europe, public authorities tend to solve social problems by encouraging local action by economic groups, mainly in the fields of employment, housing and vocational training. Those concerned have thus become more aware of their social responsibilities and above all of the effectiveness of the action they could take. The expansion of professional organizations has been related to this evolution. These associations, which act as intermediaries between the public service and private firms, have been useful in translating the preoccupations of the one into the language of the other. Because they understand each other, all are now under the impression that they speak the same language even if they do not express a single thought but a variety of views. Lastly, the evolution of social philosophy cannot be neglected, especially the social doctrine of the Catholic Church. As early as 1961 Pope John XXIII in his encyclical "Mater and Magistra" stressed, in the name of justice, the necessity for regional development and pointed out that "even private enterprises must share in bringing about social and economic equilibrium between the various areas of their country" [96].

Methods of forecasting

The inadequacy of traditional methods of forecasting used in private business is fortunately counterbalanced by the contribution of public planning.

Traditional forecasting methods in the private sector

The location of private firms is still carried out according to generally unsatisfactory procedures, and this situation is explained in large part by the inadequacy of the forecasting methods which they use.

Traditional location methods still give the main emphasis to transport costs, doubtless because their original exponents, the famous German theoreticians, Lösch among others, wrote before 1940, at a time when transport costs had an importance they tend not to have today [97]. In practice the techniques for analysing comparative and industrial-complex costs are not perfect. They tend to underestimate sociological or personal factors and to treat unsatisfactorily the phenomena of agglomeration [98].

These methods seem still less adapted to their object if one considers what is involved in the idea of the spatial optimum for any particular enterprise. This optimum appears to vary with the circumstances, insofar as it is tied to the state of technique; it also appears to be provisional, since the calculations depend on the value attached to various economic variables such as the wage level and taxes. This optimum is also relative, not absolute, since it depends on a price system that cannot reflect the marginal cost of goods and services [99].

Under these conditions it is not surprising that many plant locations are made without serious study. Needleman and Scott have stressed that the majority of firms in the United Kingdom are located without systematic surveys. The search is apparently made not for the best location but only for a satisfactory one, without comparing costs between the prospective sites [100]. Similarly, Fogarty points out that British industrialists do not study sufficiently the choice of their location and that if they do, they are nevertheless swayed by myths, by fear of the unfamiliar, by social prestige, etc. [101]. Here again we encounter the concept of the image. These irrational considerations carry proportionately more weight when logical methods seem incapable of getting to the bottom of the complicated problems involved. A primitive kind of mentality is at work here, which appeals to a mythical image to justify or explain

phenomena in "magic" terms, where scientific knowledge cannot yet provide answers. For this reason the persuasive techniques of indicative planning are very useful. Industrialists are all the more easily convinced to modify their choice when they cannot marshal logical arguments based on scientific methods, save in exceptional cases. And there is always the fact that the future is uncertain.

In truth, industrial location is a matter of the future and the long term. The forecasting methods of the private sector are very suitable for the short term (market studies), inadequate for the medium term (because they fail to take account of trends in the branch of industry) and almost non-existent for the long term (when the total national picture must be considered). As Boudeville points out, it is not pragmatic but utopian to ask entrepreneurs to make long-term (1985) forecasts of their expected growth. At this level isolated market studies and an analysis of the possible growth of production capacity do not give a realistic picture. National and regional interrelationships have to be taken into account as well as the requirements for harmonized growth which adjust supply and demand in each sector, preventing price distortions and other social pressures [102]. Public planning can achieve a great deal in these fields.

The contribution of public planning

Studies of prospective comparative costs involve a gamble, since future prices depend on the unfcreseeable evolution of supply and demand. But the plan, being a statement of the choices available, tends to lessen the risk. Planning, above all, reduces uncertainty by its mechanism of comparing the effects of alternative choices and by the stabilizing affect of the body of decisions which it enshrines [103]. In effect, planning assembles in a comprehensive market study the forecasts of all economic agents and helps to make their future supply and demand consistent. By fixing objectives and laying down the means for attaining them, planning sets up a body of likely decisions, thus tending to restrict the field of possible developments. The plan does not eliminate uncertainty, but it limits its scope.

The plan thus allows the private sector to have a more detailed perspective of the future; the risk is therefore less. The planning procedure also permits greater accuracy in economic calculations. As confidence in the plan grows, the decisions of the private sector tend to conform more closely to it,

and this in turn reduces risk and uncertainty in the economy by a sort of cumulative process [104]. Hence the two main features of the plan, forecasting and decision-taking, are closely linked. The value of the plan's forecasts does not lie in highly developed means of investigation or sophisticated economic models, but in the exemplary character of a set of probable decisions that public authorities and private entrepreneurs have prepared jointly and which have seemed to them more likely than any other solution to correspond to the general interest, by providing for a coherent pattern of expansion.

Firms are free to participate or not in the harmonious development thus proposed. They know that objectives fixed by the plan should allow the various sectors to find the goods and services they require and the customers they need without an excessive strain on the market which would jeopardize price stability or the flow of production. Nevertheless, entrepreneurs can refuse the findings of this comprehensive market study placed at their disposal by the national plan. They can reject the guidance of the public authorities and the agreement of employer organizations, as well as the compliance of the vast majority of other firms. Their refusal would not necessarily be rational and likely to maximize production or profits. Opposition is a gamble as much as consent or as the plan itself. To paraphrase Pascal, it might be said that in any event one must gamble and the greatest risk would be not to place any bet at all. If the plan is rejected by a firm, that decision makes sense only if other firms follow suit in sufficient numbers to upset in some respects the general equilibrium of the planned programme. But this eventuality seems very doubtful for two reasons. First, the plan has been not only accepted but largely prepared by professional organizations, which presumably have the ear of the majority of enterprises. Secondly, the plan is a motivating image. By its very existence it attracts, it invites action. Its psychological pull cannot be denied. It indicates the direction of the current, at least for the near future, and the consensus between what the public authorities want and the other firms accept.

Concerning the relations between planning and free enterprise, Poley, former Assistant Secretary of the United States Department of Commerce, expressed the view that the purpose of modern planning was to free the entrepreneurs from the obstacles and problems that stand in the way of success and to help them define their full potential and attain it. In an economy as huge and as complicated as that of the United States, he commented, no single

enterprise could comprehend and influence the factors that directly affect it. Plans are needed "not to control enterprises, but to allow them to control themselves intelligently" [105].

This effort of collective forecasting which constitutes the plan should be readily accepted by industrialists precisely because it is mainly their work and not that of the government services. In preparing the Fifth Plan, the committee for the French manufacturing industries was composed as follows: employer organizations, 32 members; entrepreneurs, 19; trade unions, 8; public officials, 7; and others, 2. In short, out of 68 members 51 represented industries on their professional organizations, and 7 were public officials [106].

The public authorities and the private sector tend to adopt the same forecasting methods not because entrepreneurs have been won over to the views of the public authorities but rather because the latter have adopted views on the future elaborated by industrialists and their professional organizations.

Development procedures

Traditional industrial location policies tend to prevent the concentration of establishments in areas that are likely to become quickly overcrowded. They are policies of dispersion intended to produce a more or less equal distribution of population throughout the country. The reservations of industrialists derived from the advantages that firms find precisely in the concentration of activities. National policies have in this respect shown a remarkable evolution. For some years the stress has been placed on the value of a geographic concentration of enterprises. These new ideas merely translate in terms of space the shift from purely social to economic preoccupations. A first consequence of the geographic concentration of industrial development concerned the size of expansion zones. When assistance was more or less linked to unemployment, the beneficiary districts corresponded closely to the unemployment map, for it would have been illogical to disassociate cause from effect. But unemployment is often scattered and discontinuous; there are patches of unemployment on the maps. Consequently, the division into the zones given assistance was itself more atomic than molecular. With the reversal of the trend, these zones were regrouped, especially in the United Kingdom and France. To assure the growth of an industrial concentration or

pole, a sufficiently large hinterland was needed with suitable resources and markets. It was also necessary to set up the reception structure. All these arrangements could not fail to be approved by industrialists, because they corresponded to their declared requirements.

Extension of the zones and the concentration of public measures

Extension of the zones takes various forms; one of the most important is the tendency to consider increasingly larger regions. In France there are currently 21 programme regions, which are superimposed on the 95 départements. But this grouping is already under question. Since 1961 experts of the European Economic Community, better known as the Common Market, designated in France nine large territorial units that could equal in importance the German Länder or the Italian regions [107]. Furthermore, the National Commission for Regional Development has proposed dividing France into three large zones: Paris, the West and the East, and this division was adopted in the Fifth Plan [108]. It was thought preferable not to use too ambitious economic models at the outset but rather to stick to a very schematic representation of the reality.

There is no doubt that regions tend to spread out to encompass increasingly greater space. They tend to overlap and to break out of their geographic borders. Thus, alongside the Paris region the Paris Basin was recently defined, a zone under the direct influence of the capital involving no less than six regions and fifteen départements.

The tendency towards the spatial expansion of zones for concerted action can be seen in other countries. In the United States the experience of the Area Redevelopment Administration has proved that many local development problems were better treated on a broader geographic basis. Neighbouring counties, working together, are better able to "feel" their common problems and, by combining their means, can achieve more efficient solutions [109]. In the same way, in the Netherlands the new development areas designated in 1959 were larger than the preceding ones; they included expansion nuclei [110]. In effect the extension of regions or zones of development justifies and requires the concentration of public interventions in certain favoured areas that serve as bastions of the industrial expansion.

Agreement is almost universal on the importance of this geographic concentration of intervention by the public authorities. According to Iden, a

member of the Area Redevelopment Administration, the number of zones in the United States eligible for aid should be limited and interventions concentrated on areas which have a development potential, that is, where the cumulative results would be more likely to constitute an effective driving force towards long-term economic growth [111]. In Sweden the policy seeks to assist the largest centres suitable for industrial development, since experience has shown that the major firms tend to choose the biggest agglomerations. Internal migrations should be guided accordingly [112]. In the Netherlands public assistance has been concentrated since 1959 in 18 main centres and 26 secondary centres [113]. This policy is similar to that of "central points" which has been applied in the Federal Republic of Germany since 1959 [114]. Emphasis on the expansion of growth points, medium-sized towns capable of developing rapidly into centres of industrial progress, has also been advocated for developing countries [115].

The reception structure

These centres of expansion must be equipped with the reception structure that the future factories will use. All the factors that make up the life of an enterprise must be brought together: physical elements such as land, transport, power and telephones; human elements such as manpower training, housing, entertainment and leisure activities.

Housing is a particularly sensitive question, decisive in the installation of workers, especially skilled workers and executive grades. Public authorities generally take special measures in the housing field for social reasons, to reinforce their actions in providing facilities directly required for new factories, such as industrial zones and railway sidings. In France, DATAR has a special allocation of assisted housing, which has risen from 2,000 units in 1964 to 4,000 in 1965 and 5,000 in 1966. In addition, DATAR subsidizes parapublic construction companies that build houses for industrial executives in towns indicated by the Government.

All these measures echo the most pressing requirements of industrialists, who are increasingly sensitive to the climate, way of life and reception accorded in the area they are about to inhabit. Here again, therefore, the policy of the public authorities spontaneously matches the wishes of those who direct private enterprises and no efforts have to be spent in persuading the latter group.

Integration tendencies

The tendencies towards integration are of two kinds: professional organizations of private firms are increasingly integrated into the work of preparing over-all plans; and these plans have to reflect the evolution of states towards one form or another of supra-national organization - which paradoxically tends to bring them closer to the programmes prepared by the private sector.

Integration and professional organizations

Professional organizations are anxious to be associated with the preparation of general plans, where they affect the location of private firms. In France the principle of co-operation has been set forth very precisely by Georges Villiers, president of the French National Employers' Council (Conseil National du Patronat Français, CNPF): "Since regional development is going to be an essential element of our social and economic policy, employers have the duty to co-operate with the organizations concerned, in seeking a harmonious equilibrium between the over-all orientation necessarily given by the public authorities and the safeguarding of the initiative of enterprises which, above all, must ensure their competitive position on internal and external markets" [116]. Morane, president of the regional activities committee of the CNPF, states specifically that employer participation must be secured both at the regional and national levels. The CNPF opposed cutting up into 21 regional parts the national sectoral forecasts worked out by the national planning commissions. It likewise opposed the establishment by regional authorities of regional forecasts, whose simple juxtaposition would constitute the national plan. Such a "miniaturization" of the national plan might lead to control stretching right down to the level of the individual enterprise [117]. The employer representatives acted here as supporters of indicative planning by the concern they showed that it should remain a framework of discussion sufficiently broad not to impinge on programming at the enterprise level, which is the responsibility of private entrepreneurs. The employers' thesis was accepted by the Government: the regional details of the French plan affect only public investments, excluding all sectoral forecasts.

The resulting association of employer organizations with the regional details of the Fifth Plan has been very close, especially in respect to location. Thus an instruction to the préfets from the General Commissariat of

the Plan for Equipment and Productivity, specified that concrete development proposals for the regional sub-plans must be adopted "after study with economic circles regarding, for instance, the orientation of vocational training, the location of industrial zones, and so on". Moreover, the sectors responsible must be associated with the preparation of regional sub-plans, even before the latter are submitted for comment to the CODERs, in which (as we have shown) employer circles are strongly represented. Thus, the entrepreneurs are not only invited to formulate their observations on a draft drawn up by others, but they are also associated with the actual preparation of the regional programme [118]. With such a close integration of employers, essentially represented by their professional organizations in the work of the over-all plans, it is hard to see how they could fail to correspond to the viewpoints of industrialists and to be adapted to their needs in the matter of location.

In fact, many similarities can be found in the thinking and the actions of the public services and professional organizations; this facilitates agreement and contributes to a harmonization of views between state and industry. Often the senior officers have received the same education at the Faculty of Law or even the National School of Administration. They know each other, are accustomed to working together, have the same methods, broadly the same objectives and, above all, the same intellectual insistence on rigorousness and realism. These new administrators are as different from the old-style civil servants as from the unenlightened employers of the last century. Standing half way between these archetypes, their mutual understanding when they meet is apparently sponanteous. This does not prevent differences in views; on the contrary, it creates an atmosphere of debate - the very spirit of indicative planning [119].

Integration and supra-national institutions

Supra-national institutions such as the European Common Market that work for the reduction of tariff barriers between participating countries, may well exacerbate the regional imbalances in their initial phases. In Europe this risk is by no means negligible: the strong regions at the geographic centre of the Common Market, located along the Rhine and generally in what was called Lotharingia in ancient times, could develop even further in the absence of frontiers at the expense of the weak peripheral regions such as southern Italy and western France [120].

On the other hand, one of the most important tasks that the Treaty of Rome assigns to the Community directly concerns regional policy. It consists, according to Article Two, in "promoting a harmonious development of economic activities throughout the Community". For this reason the Community institutions have recently studied a development pole, that of Bari-Taranto in southern Italy [121]. Among the Community's financial establishments, the European Investment Bank in particular is required to foster the improvement of the less-developed regions and the European Social Fund was created to help vocational retraining and grant relocation allowances and aid to workers in the case of reconversion of enterprises [122].

The addition of the Community to national institutions should encourage in many respects the harmonization of public policies of location with private interests. First, the material means which the countries will have at their disposal, following the creation of financial bodies just mentioned will be such as to eliminate many objections and facilitate agreement. Secondly, the very functioning of Community institutions tends to foster direct contacts between officials and industrialists and this helps them to reach agreement. Last but not least, with the virtual elimination of frontiers foreign competition makes its presence felt throughout the domestic market. The need to ensure that firms are competitive and to maintain the dynamism of private enterprise - a basic thesis of the employers - has come to be largely accepted by the national authorities. The opening up of markets facilitates the technico-financial concentration of firms that is advantageous for technical or financial reasons, but this goes together with the geographic deconcentration of establishments, as the experience of the United States seems to prove. Likewise, the elimination of frontiers fosters in each country the establishment of foreign enterprises, especially those from other countries of the Community. Foreign firms seem more amenable to the guidance of the public authorities than national ones, undoubtedly because their managers have less precise or more objective images of the developing regions.

Under these conditions it appears that the trend towards supra-national integration of whatever form, far from creating new difficulties, fosters this multiform evolution towards a spontaneous harmonization between the views of the public authorities and private interests in the matter of location.

CONCLUSIONS

The problem of how to use indicative planning to pass from over-all plans to the location of individual projects seems rooted in the concept of infrastructure. This is the justification of the distinction made in the introduction to the present study between private operations, such as setting up a factory, and programmes in the public sector, such as setting up an industrial zone. Private projects seem to be indirectly controlled by the public sector investment in infrastructure. In other words, between over-all plans and private operations, the public sector projects are the necessary intermediaries: they are the key to harmonization, part of the answer to the problem - only a part, however, because the difficulties are not so much overcome as displaced. Research succeeds in answering one question only by bringing to light the seriousness of new obstacles. We have stressed the trump cards that indicative planning possesses to effect an agreement in the matter of location between general plans and private projects and have shown that an apparently spontaneous convergence is brought about, multiform in nature, as a result of the way opinions and institutions, including international ones, have developed.

Broadly speaking, once it was accepted that the public authorities could and should install general facilities (the infrastructure) no longer simply at the request of users to meet current needs but also on their own initiative initiating future needs, planning was born. At that moment, the problem of the relation of planning to private decisions was both posed and solved. Under the previous system the industrial user seemed to be the master of public works; he had means of pressure, political or other, and sooner or later the state gave him the facilities he needed. But in an economy based on forecasting, mastery can be equated to anticipation: he who knows before the others can be sure of making his views prevail. The state can anticipate for the medium or long term; industrialists cannot. The state knows the future of the country because it reflects its collective will and because the future is to a large extent made by the state. All the industrialist knows about this future are the views and will of the state. The Government has a policy with respect to location, and it installs the infrastructure for reception accordingly. Of course the industrialist is almost everywhere free, in the [illegible] meaning of the term, to settle in other locations, but he will be [illegible] from the public authorities, the professional organizations and other

firms. Now that enterprises seem increasingly interdependent and are increasingly customers of each other, the freedom of the isolated firm is really economic slavery. Moreover, the industrialist cannot enjoy true psychological liberty. The concept of reception, propagated through motivating images by the public authorities, aided by the professional organizations, largely takes the form of the infrastructure, economic and social, human and material. The most attractive location will be the one that is best equipped for the firm to make profits and for assuring the well-being, that is, the stability of employment, of those who work in it. Willing or not, the industrialist will be psychologically, economically, and socially obliged to choose his location in conformity with the decisions of the public authorities concerning the installation of facilities.

Freedom, however, is never absent from indicative planning - not just a formal freedom but one with a socio-economic burden. The true freedom for industrialists in choice of location is not after the public authorities have installed the infrastructure for their reception; it is before this happens, also an act of anticipation. Industrialists, or their representatives, have the opportunity to influence the public authorities while they are preparing their global policy. Thus the industrialists, collectively, guide the state, which in turn guides the individual industrialist. The circle is closed and freedom goes by the name of discussion. But the game is not played by only two players; the regions or their representatives make a third participant.

All or nearly all regions want to have their own reception infrastructure. Discussions between them and the public authorities can be difficult since they do not always speak the same language; regional representatives express themselves in terms of needs, the central authorities in terms of possibilities and there is no common factor. Needs are almost unlimited, possibilities are always insufficient. It cannot be insufficient. It cannot be claimed that the techniques of participation and regionalization discussed in this paper work as well for projects in the public sector as for those in the private sector. In the former case, the problem is political rather than socio-economic.

When it comes to a choice between the national and the purely regional interest in defining a regional policy, the only guide-posts are the unshakeable concepts of the state and the common good. In practice, an understanding is achieved by compromise, the technique of indicative planning. But at a

time when the idea of the state needs to evolve at both the intra-national and international levels, regionalism carries with it the danger of a break-up. The theme of "Europe of the regions" may be recalled, which gained a considerable hearing at the beginning of the 1960s when the European Economic Community achieved its first successes. Hirschman [20, page 185] and Streeten [9, page 337] warned that regional imbalances could prove irreversible, because no compensatory mechanism operated between strong and weak regions as it does in international trade. The theory of comparative advantage does not work between regions, only absolute advantages matter: the strong region has no need to buy from the weak region in order to sell to it and the latter can deteriorate indefinitely. In the end, one can only encourage migration between regions or give them some attributes of sovereignty (of which the willingness to compromise is already an example).

This does not mean that the break-up of the state appear inevitable. Paradoxically, the regions are weakened by their own success, by their multiplication in number and geographic extension. They multiply since they are the projection in space of economic problems, in that each problem tends to correspond to a particular area. In France, 21 programme regions were established after all previous administrative districts had been unified. Nevertheless this territorial framework is ignored in many contexts. The national plan distinguishes three major regions; industrialization incentives are spread over five zones; and the eight regional capitals and their hinterland do not fit into the division into 21 regions. The river basins which serve as the framework for water policy do not correspond with the boundaries of any programme areas. It cannot be otherwise, because a single pattern of subdivision must disregard the specificity in spatial terms of particular problems and could lead to unrealistic solutions. But this geographic heterogeneity of regions weakens their bargaining power. François Perroux and his school point out that economic space is not an ordinary surface, it is multiform: expansion zone, space around a pole, programme area. The region like the economic order is multiform and that will always be in contradiction to the unity of the land. This fundamental antagonism does not seem easily soluble. It seems to show that between the economic world and geographic space there is a difference in nature that makes them unyielding to one another. A region, that is to say the land, cannot be the expression of purely economic phenomena.

Regions tend to grow in size without check, both in the United States and in Europe. This corresponds to the growth of economic units and also the interdependence of markets. In the European context, for instance, regions tend to cross national frontiers and soon their dimensions will outgrow those of the nations themselves. Then the states in turn will threaten the regions from within and, in that endless duel, roles and advantages will be reversed. Every victory tends in the eternal renewal of history to secrete the seeds of its own defeat.

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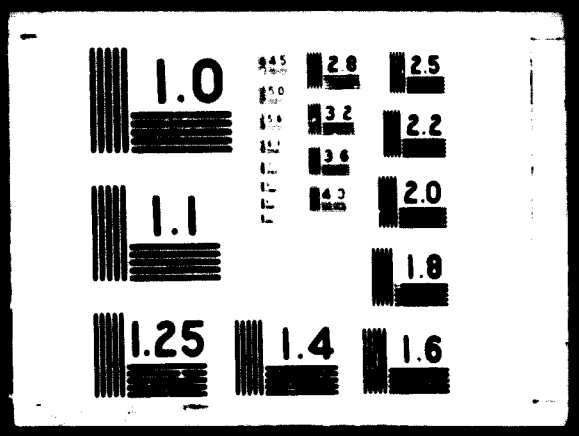

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3. TERRITORIAL DIVISION OF LABOUR AND DISTRIBUTION OF PRODUCTIVE FORCES

by S. A. Nikolajev[1]

Introduction

The many issues involved in the optimum planning of economic development have been the focus of attention not only of economists and statesmen, but also, to some degree, of almost every member of society. Over the years the science of economics has developed extensive techniques for analysing the problems of expansion. Recently, as a new and vital technique, mathematic modelling of economic processes has been adopted.

Economics is increasingly gaining ground as an exact science. It is concerned with research into and determination of the clear-cut quantitative interdependencies among the many phenomena of economic existence. However, the core and heart of any economic expansion - the growth rate of the total social product as well as the size and structure of personal consumption over a given planned period of time - are not ascertainable from the analysis of the phenomena which the science of economics regards as its subject matter.

The above social objectives must be defined in the interest of all members of society with the understanding that these interests coincide. In other words, economics helps to establish ways to achieve goals in the interest of society, but does not find the goals themselves. In so doing, it is of paramount importance to determine the proportions between the share of national income meant for accumulation and that intended for consumption. In certain circumstances the limit values of the interrelations between these shares can and should be arrived at by using precise methods of economic analysis.

The lower limit of the share of consumption in the national income may be described in terms of the minimum permissible standard of living, while the

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upper limit can be obtained by using the whole national income for consumption. Generally speaking, the higher the accumulation share, the greater will be the increase in economic growth (all other conditions being equal) and the lower the uptrend in living standards; and conversely, the more rapid the rise of living standards, the greater the slowdown in economic growth. This does not suggest, however, that a given share for consumption will lead to an arbitrary establishment of the concrete value of the economic expansion rate. The objective of optimum planning is to maximize the rate of economic growth or of living standards, in the presence of pre-set correlations between the share of consumption and of accumulation, by seeking to find the most effective road towards national economic development.

There are many ways to formulate the social objectives of development, and all such formulations are interconnected. In their optimum planning the socialist countries assume, as the starting point, a certain size and structure of the ultimate personal consumption of the population over a given planned period. Thus, under socialism the ultimate goal of production - the satisfaction of the material and moral requirements of each person - is the immediate objective and the starting point of optimum planning. Such an approach suggests that all members of society possess a common interest or, in other words, that private and social interests coincide. In the absence of this prerequisite, optimum planning is stripped of its objective basis because the divergent interests of separate social groups make it impossible to lay down a common goal of development.

If an ultimate personal consumption of a given size and structure is assumed as the social goal of economic development, the object is to gain it at a minimum total cost and to ensure, in this way, the maximum possible expansion of the economy as a whole. After the formulation of social goals and effective criteria, economic methods may be applied in order to try to settle the problems.

These methods necessitate a comparison of the expenditures associated with different trends in the development of industries, transportation, agriculture, construction and services. The same results (a given size and structure of the ultimate personal consumption) can be brought about by stepping up the production of various branches requiring a different level of total costs; from among these the optimal can be chosen. The problem of finding optimum proportions of

productive branches in terms of the whole country, can be solved by the construction of a planned dynamic interbranch balance. Although the construction of the balance, in principle, seems sufficiently well understood, there is one important question left unanswered, namely, what are the concrete values of the expenditures which are to be made operable? It should be borne in mind that current prices, even though fully in keeping with the costs or socially necessary labour inputs, suggest the existing system of distribution and development of produotive forces, whereas optimum planning deals with a somewhat new branch and territorial economic system in which socially necessary expenditures on the same product may change from the current prices of the basic year. The resultant gap depends on the changes in the branch pattern of production, and also on territorial distribution. The factors that cause the value of socially necessary expenditures on the production of a given product to change are closely interwoven; this value is an outcome of the branch pattern and territorial distribution of production.

Among these factors, the most common is that any change in the size, quality or assortment of products in a given branch entails, as a rule, changes in the value of inputs in other branches. Thus, solutions to the problems involved in planning the optimum branch pattern and territorial distribution of production observe the same effective criterion: that is, the minimisation of expenditures to attain the pre-set size and structure of production. The above criterion is a concrete form of other more general criteria - the need to achieve maximum (in certain circumstances) labour productivity on a country-wide scale, and the principle of work-time economies.

At present, two general trends have crystallised in the economic science concerned with problems of optimum planning: research into the optimum branch pattern of economy, and the optimum territorial distribution of production. Because the problems involved in optimum planning can only be solved on the basis of the interconnected advancement of both the branch and territorial aspects, each of the two research trends has its own specific objective. The first research trend is aimed towards the study of the branch proportions and branch pattern of production, while the objective of the second trend is territorial proportions or the territorial pattern of economy.

After these general remarks on the approach to the problem of the distribution of productive forces and their interrelation with the problems of

determining the optimum branch proportions, a more detailed consideration of the laws of shaping the territorial pattern of economy follows.

Territorial division of labour and its place in the system of social division of labour

The history of the development of productive forces has shown a deepening and broadening of the division of labour, since a newly born productive force suggests an increased division of labour.

The following types of social division of labour are usually indicated: between independent enterprises (unit division of labour); between branches (or sections of production); intra-industrial, intra-agricultural, intra-transport, intra-construction, etc. (specific division of labour); between national economic branches (general division of labour) and, finally, territorial division of labour.

It must be emphasized that the process of the deepening of the social division of labour is the core and heart of economic advance and general social progress. The level of social division of labour determines the country's general level of productive forces. In the literature of the USSR concerned with economics and economic geography authors take various views of the concept of territorial division of labour.

In general terms, the territorial division of labour is the division of labour between territorial productive complexes, or groups of people who live and work in those territories. The complexes themselves may vary considerably such as an industrial node; an intra-regional or regional district; a larger economic area or economic zone; or a country or even groups of countries.

At first glance, the division of labour between territorial productive complexes seems to lie within the framework of general, specific and unit types of division of labour, and does not require singling out. In point of fact, interregional exchange is action between corresponding enterprises within or without the same branch of national economy. However, territorial division of labour is only manifest in the interenterprise kind of division of labour without being confined wholly to it, just as a higher form of motion cannot be confined to its simpler component forms.

The product of every enterprise, an immediate partner in the inter-regional exchange, is not only an outcome of its own activity but also, directly or indirectly, of the whole territorial productive complex. The efficiency of an enterprise depends to no small extent on the characteristics of the territorial productive complex to which it belongs. In turn, any change in the characteristics of this enterprise affects, in varying ways, other links in the territorial productive complex. In other words, the inter-enterprise type of division of labour is a manifestation of the territorial division of labour.

It must be added here that taxonomic units of the territorial division of labour, beginning with economic regions, combine in a well developed form the main types of economic activity: industry, agriculture, transportation and construction. By this evaluation, territorial division of labour is a special kind of synthesis of other types and kinds of division of labour. Its development suggests in a general way the development of component parts (general, specific and unit), and, consequently, the general level of economic development of the country as a whole, as well as individual regions. This is an important conclusion as it throws some light on a pressing problem of the economics of location: the relationship between the branch and the national economic optima.

The view that territorial division of labour is a synthesis of the various kinds of labour predicates that branch solutions, in all probability, will be non-effective from the standpoint of territorial division of labour. The global or national economic optimum, usually opposite to the branch one, is nothing more than the optimum solution to the system of territorial division of labour.

It is known that any type of division of labour leads to each producer specializing by reducing the variety of products that he manufactures. This operation has economic meaning so long as the total costs of all producers for the manufacture in the region of a given volume and mix of products remains less than their total costs in the alternative situation in which each producer would aim at "universality" by manufacturing every product. This generally happens, because the sharp reduction in production costs more than offsets the rise in distribution costs.

The following economic prerequisites of territorial division of labour can be pointed out. Any kind of division of labour rests on the foundation of a differentiation of natural media throughout the world. The share of materialized labour and "live" labour inputs in the production of a unit of the same kind of product varies in different regions (or other types of territorial productive complexes) in accordance with differences in the natural environment. This factor is, therefore, the first and foremost economic prerequisite of territorial division of labour. In view of the geological occurrence of mineral resources, the quantity of useful raw materials and other natural conditions, inputs in the extraction of a given type of mineral undergo changes. Severe climatic conditions require greater expenditure for the construction of industrial equipment and housing, for example, as well as the production of food and clothes needed to meet demand. This situation causes an increase in the cost of the labour force through pay raises; furthermore, prices of items produced in the area subsequently increase. Examples of this kind could be easily multiplied. The specialization of many newly introduced areas is dictated by the quantitative and qualitative idiom of their natural resources, as well as by natural conditions generally: for instance, non-ferrous, rare and noble metals, fish and timber in the Far East; unique power potentials, timber and non-ferrous metals in East Siberia; favourable cotton growing conditions, gas resources and hydropower potential in the Middle Asia; and finally, oil deposits and gas and timber potential in the west Siberian depression.

But as the process of development goes on, there appears a sharp territorial differentiation of economic conditions whose effects upon the division of labour are more often than not comparable with natural differences.

Generally, economic differences show up in the ragged territorial distribution of national wealth accumulated over a long period of development. Highly cultivated and economically well developed old industrial regions provide for reduced capital investments in the construction of new units, or the expansion of existing productive units, compared to less cultivated regions. This is a result of reduced investments in the construction of communication, cultural and housing facilities, larger grounds for the combination and specialization of production and greater advantage taken of the distribution of enterprises by groups. A region's economic condition has a substantial role

to play in determining current inputs. In other words, older industrial areas provide at one time or another better economic conditions reflecting, in general terms, the amount of materialized labour and "live" labour accumulated in the area and favouring the expansion of production in a higher measure than do the advantageous natural resources of a less developed area.

The concept of "economic conditions" involves not only the accumulated total of materialized labour and "live" labour, but also the latter's structural and qualitative characteristics, such as types of industries, their concentration and specialization, composition of labour resources by trades, and the existence and capacity of construction bodies.

The combination of natural and economic conditions in different regions affects in various ways their economic growth. For example, the territorial pattern of production in the USSR centres around the problem of determining the optimum proportions between the country's west and east zones. The east zone is comprised of Siberia, the Far East, Kazakhstan, and Middle Asia, while the country's European area and the Urals are in the west zone.

The natural and economic prerequisites of territorial division of labour are different in the two zones and, furthermore, they operate in opposite directions. The east zone possesses large fuel resources (90 per cent of the country's coal), water resources (except for Middle Asia and Kazakhstan), hydropower (72 per cent of the country's total) and a variety of raw materials. These eastern areas have a shortage of manpower (the residents make up 10.5 per cent of the total population) which appears to be fairly "costly" because of high wages. The lower level of economic development in these areas, in combination with a higher wage rate and complex climatic conditions, dictate the need for higher investments in the construction of processing industries.

Western areas are characterized by a deficit in their fuel and power balance, high costs of fuels and power (the price of Donbas coal is five to seven times that of Kansk and Atchinsk or Ekibastoos), tight water balance, little raw material potential with difficult technical and economic characteristics in its acquisition (and no large resources of iron ore, oil and gas). On the other hand, the bulk of the country's population lives in the western areas where huge productive and nonproductive funds were set up, therefore reducing current and single inputs in the newly organized industries and in the expansion of existing industries.

Finally, the specific economic geographic and transport position of the territorial productive complexes and their territorial distribution make one more vital prerequisite for territorial division of labour. This prerequisite, a derivative of many factors, does not operate independently, and is a manifestation of the two prerequisites for territorial division of labour, namely, natural and economic conditions. Correct evaluation of all these conditions is a matter of exceptional significance for economic analysis.

National and regional proportions of production

It has been pointed out that the structure of production in a region is, as a rule, different from that of production in other regions, or in the country as a whole, since it is the objective foundation of the territorial division of labour.

The whole of the production yield in a region can be broken down into two groups: production meant for interregional, or for intra-regional use. The first type of production issues from and comes into interregional exchange with the aim of securing nation-wide economy arising from territorial division of labour. The second type of production contributes indirectly to territorial division of labour, being an immediate item in the cost of the first type of production. If a region is aimed specifically towards the manufacture of engineering items, the production of ferrous and non-ferrous metal industries, electric power, coal producing, and chemical and other industries are part of the costs of the ultimate production issue to be shipped outside the region (in this case, engineering items). The volume of the second type of production - that immediately consumed by the population of the region (services included) - is determined by the strength of the population (taking into account its income) employed in the above-mentioned industries. Thus, the size of both types of production yield is determined, directly or indirectly, by the laws of territorial division of labour. This factor makes possible the introduction of two combined indices indicative of the part played by the region in territorial division of labour: (a) the level of specialization of the region, which is the relation in percentage between the total value of production exported from the region and the gross production within the region; (b) the level of satisfying the requirements of the region from the internal production, which is the relation in percentage between the value of the produce meant for internal use and the value of the production consumed in the region.

The level of specialization falls invariably below 100 per cent; otherwise, the region would produce nothing for internal demand, clearly an impossibility. Similarly, the level of satisfying the requirements of the region from internal production must also be under 100 per cent; or the region would be totally divorced from territorial division of labour and, consequently, not an economic region in the present-day meaning of the word. The two levels interact in such a way that a rise in either level entails a drop in the other. The optimum relationship between these levels can only be found if one regards collectively all the regions within the system in question. In concrete terms, the relationship between the level of specialization and the level of satisfying the requirements of the region from internal production depends on the types of production of certain items in the given region, that is, with regard to the production proportions by regions (territorial proportions).

To achieve the optimum in the distribution of productive forces it is necessary to fix at a bare minimum (both productive and transport) expenditures allotted to reach the established size of production. Applied to the problem of constructing optimum regional programmes, this leads to determining production proportions for all of the regions that would ensure minimum total expenditure on the production and transportation of all types of products. To establish the proportions of production for all types of products in the entire country over a given planned period, or to achieve the desired level of the ultimate personal consumption requires a precondition for developing regional programmes. Production proportions in terms of every region can and must be substantially different from national proportions, although the sum total of the amount of production of a given kind of product by all regions should accord with the pre-established volume of national production of this product.

Thus, theoretically speaking, the size of production of a given type of product in a region can vary, ranging from zero to the volume needed to meet the country's total requirement. In practice, however, such variation is rare as there are always natural, technical and economic restrictions. This approach demands that emphasis be placed on the problem of finding the criterion to establish production in each region for items whose consumption properties seem incomparable, since all kinds of products issued in a region should be treated as interchangeable (within restrictions). This is how the approach differs in relation to nation-wide and district proportions. In terms of the whole

country (apart from foreign trade) the requirement for any product can be satisfied from the country's production, and the interchangeability is only conceivable in terms of those products whose consumption properties are identical. Regional analysis presents an entirely different case. The region's specialization and its contribution to territorial division of labour suggest a broad variety of the types of production, of which every type should be assessed from the standpoint of its relative efficiency.

Such comparison can, in the last analysis, be based upon the value of the effect of territorial division of labour. The effect of the contribution of a given region to territorial division of labour by a certain type of product can be expressed in the following formula:[2/]

$$E_j^s = B_j^{sr} \cdot C_j^r - (B_j^{sr} \cdot C_j^s + B_j^{sr} \cdot T_j^{sr}) \qquad (1)$$

where E_j^s is the effect of the region's participation in territorial division of labour; by a certain product;

B_j^{sr} is the size of the exports of the product j from the region s to the region r;

C_j^r is the cost of production of a unit measure of the product j in the region r;

C_j^s is the cost of production of a unit measure of the product j in the region s;

T_j^{sr} is the cost of transporting a unit measure of the product j from the region s to the region r.

Therefore, the higher the value E_j^s the more effective the type of expansion in the problem. The values C_j^s and C_j^r are not constant as they are subject to change depending on the type of territorial proportions involved. To make the above clear: region s is a producer of aluminium to be exported to the region r where its production is more costly. But in the region s electric power is only available through either mine or opencast coal extraction.

The size of opencast coal extraction has a limit of value, and if the demand for coal surpasses this limit, the gap can be covered only by mine coal extraction, which is more costly. The cost of the power to produce aluminium and, consequently, the cost of the aluminium itself will be dependent, therefore, on the total coal requirement for aluminium production

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2/ See A. Probst (1963) "Determination of economic effects of specialization in the economy of a region", Moscow University Journal, No.12.

and for all other economic branches in this region. If the total requirement for coal does not exceed the permissible level of opencast coal extraction, the price of aluminium will be lower than when mine extraction must be used as well.

The price of aluminium in region r, in the above example, is not constant, and may change as a result of various types of economic expansion in region r and in all other regions. In other words, it is necessary to arrive at the maximum total effect of territorial division of labour in the whole system of regions, taking into account all interbranch correlations.

$$\sum_j \sum_s E_j^s = \sum_j \sum_s \sum_r B_j^{sr} \cdot C_j^r - \sum_j \sum_s \sum_r B_j^{sr} \cdot C_j^s - \sum_j \sum_s \sum_r B_j^{sr} \cdot T_j^{sr} \rightarrow \max. \quad (2)$$

If this is so, the type of expansion associated with the maximum total effect of territorial division of labour may not coincide with that making possible the maximum value of this effect in terms of a given economic branch.

This non-coincidence can be caused by the inequality of the value C_j^r with the value C_j^s. In the first formula these values mirror the existing branch and territorial production pattern, while in the second formula some new, pre-planned structure that is bound to be optimum from the standpoint of the accepted effective criterion, is the case. That is the cause of the non-coincidence between the solutions to the problems in terms of economic branches and those in terms of territorial division of labour.

Thus, the optimum system of territorial division of labour presupposes that such interrelated proportions of production will be found in every region, providing for the maximum value of the total effect of territorial division of labour by the country as a whole. At the same time it represents the optimum distribution of productive forces in general.

Organization of an effective system of territorial division of labour requires effective economic and mathematical techniques, a large normative base; only a step-by-step solution can be contemplated.

From the economic standpoint, an attempt to find a solution to the problem of the distribution of productive forces by determining the maximum

value of the total effect of territorial division of labour has the following strong points:

(a) It aims to find the type of distribution of productive forces that involves the minimum social input in the achievement of a given level of production for the country as a whole;

(b) It arrives at the numerical criteria of the optimum pattern of the region's economy which, therefore, is no longer quantitatively indefinite;

(c) It helps to find the mounting sources of labour productivity that follow immediately from the advantages of territorial division of labour and, consequently, from the optimum distribution of productive forces.

This method appears to be universal, but it is hardly attainable with the present-day use of computers and economic information. Other simplified methods can be employed, however, with considerable practical effect. Some of these methods are outlined below.

Regional approach to the distribution of productive forces

Generally, it is possible to consider three main approaches to solving problems involved in the optimum distribution of productive forces.

The first approach is to attempt to settle the over-all problem of optimum planning: that is, to find both branch and territorial proportions, through trying out the various types of expansion and distribution of all individual enterprises, considering the countless kinds of relationships between them. This approach is practically impossible.

Obviously, there is a need to employ simpler methods, making possible an approximation of the solution to the problem. In recent years the methods of linear and non-linear programming for solving the so-called branch problems have gained wide use. Their use has resulted in the need to determine the size of production of existing and newly introduced enterprises, which means to meet, in its entirety, the requirement for one or several kinds of products. The problem presents itself under different aspects. For instance, effective criteria can be found in: (a) minimization of all expenditures (production and transportation) in the achievement of a given size of production issue; (b) maximization of the production issue at the given size of capital

investments; (c) minimization of current expenditures at the given sizes of production and capital investments; and (d) minimization of the size of capital investments at the given size of production.

It should be stressed that branch problems find solutions with a high degree of accuracy, and there has been much information published on ways and means of solving these problems. However, the branch approach to the distribution of productive forces is not backed by any theoretical foundation. Indeed, the questions arise: why is it that some groups of enterprises can break through from within the whole economic system and be optimized? Is such an approach in any way justifiable?

The justification is solely that such partial optimization is more effective than other solutions to the same problem divorced from mathematical methods. How these partial optima relate to the global, national economic optimum, however, is still not clear.

In general, it is possible to point out the following causes of the non-coincidence between the branch and national economic optimum solutions to the problems involved in the distribution of productive forces.

The multiple interbranch relationships of every one of the enterprises of an economic branch are unaccounted for, which can give rise to some non-effective production endeavours, or produce derogatory effects upon the other elements of the regional complex.

Furthermore, the amount of consumption of a given kind of product, and especially its territorial distribution, can be defined either intuitively, or by means of rough calculations. As a result, the highly important problem of the distribution of productive forces - reduced transportation costs of production - remains practically unsolved, because efficient economic-mathematical techniques are based on rough calculations of the size and localization of consumption.

Finally, no solution has been found to the problem of putting to use, in the most economically effective fashion, primary resources consumed by many industries. These include, above all, such universal resources as the labour force, a wide assortment of raw materials, fuel-and-power resources and water supply sources.

In other words, the branch approach strives for the settlement of the problem of the distribution of enterprises of a given industry in a highly accurate and detailed manner by taking no account of the multiplicity of their relationships in actuality.

The non-coincidence between branch and national economic optima in the process of finding solutions to the problems involved in the distribution of productive forces are due to a single cause: namely, any change in the distribution of production of a given type of product results in change in the value of the total spending on the production and transportation in other industries.

In terms of branches, the importance of the gap between branch and national economic optima varies and, it seems, increases from mining industries to processing industries. The regional approach offers an alternative, by developing regional optimum models, which regard the region as an economic whole. This approach suggests a certain degree of generalization (often in proportion to the size of the territory), but it gives consideration to the entire system of territorial division of labour.

In other words, the regional approach to the settlement of the over-all problem of the distribution of productive forces, that is, the determination of the optimum proportions of production in the whole interrelated system of economic regions, is based on the laws of territorial division of labour. In this approach the maximum total effect of territorial division of labour is assumed as a modification of the general economically effective criterion (maximum effect at minimum costs). Other means of optimization are not considered, as the given presentation of the problem presupposes the determination of optimum branch proportions by the country as a whole.

An approximation to the settlement of the over-all problem of the distribution of productive forces can be obtained by constructing interregional and regional models utilizing location factors in the most effective way. These factors are the basic elements which are subsequently combined with the inputs in the production of any given type of product, and also some external limited factors involved in this production. Location factors constitute a substantial value and a considerable part of the total amount of expenditure on a given type of product and vary, in terms of value, from one region to another. In the last analysis, the cost of any product is made up of the inputs of location factors, and, therefore, as soon as the most economical use is made of these

factors in putting up the pre-given size of production by the country as a whole, it can be said that the requirement for the general economic effective criterion is satisfied. On the whole, location factors include: labour resources, fuel-and-power resources, raw materials and maintenance materials, water and land resources, transportation resources, capital investment resources, and effects of the agglomeration of production.

A further breakdown of location factors depends on whether interdistrict or intra-district models are constructed. The interregional model of optimum territorial proportions of production can be constructed through a distribution of production of all of the reviewed products by regions so as to ensure minimum total inputs of location factors (in value). In the following model an attempt is made to steer clear of complications and thus, adhere to reality. At the same time there has been no oversimplification that might rob the model of its practical significance. The following designations have been employed:

i-resources ($i = 1, 2, \ldots m$), specifically,

$i = 1, 2, \ldots k$ - primary resources; $k < m$.

j-products ($j = k + 1, k + 2, \ldots n$). It comprises all of the products included in the model, less primary resources.

r,s - regions; ($r,s = 1, 2, \ldots R$).

a_{ij}^{rs} - ratios (natural) of the inputs of a unit measure of a resource i from the region r in the production of a unit measure of a product j in the region s. In this case, if we do not mean to account for region-to-region differences in the same productive techniques, or the transportation losses of the resource in question, the ratios are bound to take up the form a_{ij}.

C_i^{rs} - transportation costs of exporting of a unit measure of the resource i from the region r to the region s. With $r = s$, $C_i^{rs} = 0$.

$a_{ij}^{rs} \cdot C_i^{rs}$ - the values of transportation costs of exporting the number of a unit measure of the resource i from the region r needed to produce a unit measure of the product j in the region s; ($i = 1, 2, \ldots m$).

K_i^r - the value of inputs in the expansion of production of a unit measure of the resource i in the region r; ($i = 1, 2, \ldots k$).

d_j - the value of specific capital investments in j product divided by the normative term of repayment; ($j = k + 1, k + 2, \ldots n$).

h_j^s - ratio of the increase in the costs of construction for starting the production of the product j in the region s as against the lowest cost by all of the regions under review assumed as a unit cost; (j = k + 1, k + 2, ... n).

A_j - the size of the production bulge j of the product by the country as a whole as to the close of the period under planning.

X_j^s - the size of production of the unit measure of the product j in the region s, sought for; (j = k + 1, k + 2, ... n).

The point now is to arrive at such sizes X_j^s as to fix at a minimum all of the spendings in the model. The purpose function has the form:

$$\sum_{i=1}^{m}\sum_{j=k+1}^{n}\sum_{r=1}^{R}\sum_{s=1}^{R} a_{ij}^{rs}\cdot K_i^r\cdot X_j^s + \sum_{i=1}^{m}\sum_{j=k+1}^{n}\sum_{r=1}^{R}\sum_{s=1}^{R} a_{ij}^{rs}\cdot C_i^{rs}\cdot X_j^s + \sum_{j=k+1}^{n}\sum_{s=1}^{R} d_j^s\cdot h_j^s\cdot X_j^s \to \min \qquad (3)$$

provided the following conditions are observed:

(a) $$\sum_{s=1}^{R} X_j^s = A_j \qquad (j = k+1,\ k+2,\ \ldots\ n)$$

Then, the total size of production of the product j by all of the regions involved is equal to the pre-established sizes of production of this product by the country as a whole.

(b) $$X_i^r \le F_i^r \qquad (i = 1, 2, \ldots k;\ \ r = 1, 2, \ldots R)$$

That would mean that the productive potential (or utilization) of primary resources in any of the region r push against some upper limit.

(c) $$X_i^r = \sum_{j=k+1}^{n}\sum_{s=1}^{R} a_{ij}^{rs}\cdot X_j^s \qquad (i = 1, 2, \ldots k;\ r = 1, 2, \ldots R)$$

(d) $$X_j^s = \sum_{i=1}^{m}\sum_{r=1}^{R} X_{ij}^{rs}$$

Where X_{ij}^{rs} reflects the variant of supplying production of the product j in the region s by resource i from the region r.

The size of production of unit measures of the resource i in the region r is equal to the total consumption of this resource for the production of all of the products j in all of the regions involved.

Following are a few observations concerning the economic meaning of the model described here to be settled by one of the methods of linear programming.

In view of the specific conditions of a given country, the assortment of primary resources and products in the model may vary. In general, primary resources should involve (i = 1, 2, ... k): labour force (with a breakdown, if necessary, into male and female), coal (types specified), oil (types specified), natural and companion gas, timber (with a breakdown into hardwood and softwood), iron ore, non-ferrous ores, non-metallic raw materials, farming raw material resources, water and land resources.

It is noted that the assortment of types of primary resources can be affected not only by the country's concrete conditions but also by the objectives with which the research is concerned. The fewer primary resources and products included in the model, the narrower, as a rule, is the ground for optimization.

These primary resources must be assessed in value terms in every one of the viewed regions (K_i^r). In the conditions of the USSR the value

$$K_i^r = C_i^r + \frac{Kb_i^r}{N}$$

where C_i^r is the production cost of a unit measure of the resource i in the region r; Kb_i^r is capital investments per unit measure of the expansion of production of the resource i in the region r; N is the consolidated normative term of repayment of capital investments by all of the types of production assumed to be about seven years.

In terms of labour resources the value K_i^r represents the average hourly wage (with account taken of regional differences) in the industry where the labour force is employed. Accordingly, the ratio a_{ij} is expressive of the size of labour inputs in the production of a unit measure of the product j in manhours.

The second group of resources ($i = k + 1, k + 2, \ldots m$) well deserves the name of secondary resources, or intermediary products. The number of secondary resources exceeds by far primary resources, as all of the products which can come out as elements of the working funds involved in the production of at least one of the many products included in the model belong here. In other words, this group comprises the products which are continuously usable in the production of any one of the products included in the model, and constitute a component part of the current cost of this production. Among secondary resources are electric power, ferrous and non-ferrous metals, products of chemical and mechanic timber processing, chemical raw materials obtained in the processing of oil, coal, non-ferrous ores and many other types of raw materials, semi-fabricated items and materials. Expenditures on the production of secondary resources can be made available by settling the problem through the summation of inputs in the production of primary resources with the capital investments (with account taken of regional differences) per unit measure of a secondary resource divided by the normative term of repayment ($d_j \cdot h_j^s$).

Whether the use of either primary or secondary resources is effective can be determined only when account is taken of the transportation costs of these resources from the regions of production to the regions of consumption ($a_{ij}^{rs} \cdot C_i^{rs}$). However, the total expenditure of resources on the products included in the model is lower than the whole necessary size of their production by the country as a whole since the model cannot and should not combine all the products issued in this country. Part of the industries and the whole sphere of services must be within reach of the consumer population. Therefore, the model is not developed before all these types of activities are distributed, as is the population. As a result, the total expenditure of resources upon local types of activity can be incorporated in the model as pre-given values.

The problem can be viewed at a different angle. Admittedly, there can exist some migration from individual regions with an abundance of labour resources, whose size and direction (within given limits) will be made clear in the course of finding solutions to the problem. Notably, the value C_i^{rs} as applied to the migration of population must incorporate not only the actual amount of transportation costs, but also the additional expenditures arising from the need to stimulate migration. In this case, the corresponding size of the input of resources in the local types of activity associated with the migrating part of population also becomes a variable involved in the process of solving the model.

The third group of products included in the model appear as ultimate (in terms of the given model) products. They cannot be regarded as elements of expenditure, and their distribution, therefore, does not depend on the transportation costs of bringing end products to the consumer. This assumption is basic to understanding the economic purport of the model. The share of transportation costs in the total cost of these products is, as a rule, rather low.

In addition, various types of transportation of end products tend to level off with one another, as an outcome of a more even distribution of population (if compared with individual branches). Thus, it is possible to disregard the size of expenditure on the supply of end products to the consumer. This is true of countries with a fairly small territory and even distribution of economy. In the conditions of sharp territorial differences in the level of economic development (as is the case in the USSR) transportation can be incorporated in the model as one more resource. In this case, the ratio a_{ij}^{rs} represents the average transportation costs per unit measure of the product j in the region s and is deducible from an expert assessment. There is no necessity to introduce this ratio in terms of every end product.

For example, in the conditions of the USSR, a large part of the production of aluminium in East Siberia in vast quantities will be exported to the European part of the country. The transportation costs involved in the production of one ton of aluminium in East Siberia can be incorporated in the model. It is noteworthy that the development of a model presupposes a profound analysis of the country's economy and, above all, an analysis of the problems involved in the distribution of productive forces. The determination of optimum territorial proportions by means of the above model is by no means confined to the many mathematical operations, but is a creative process (in all stages) of utilizing both quantitative and qualitative elements of analysis.

Inputs in the production of a unit measure of end products are made of the expenditure of primary and secondary resources along with specific capital investments in a given region, divided by the normative term of repayment. In other words, the model operates in such a way that the value of current and capital inputs in the production of unit measure of end products is shown.

Although the current inputs contained in the model do not embrace the current inputs in existence in actual fact (no account is taken of the inputs

of some kinds of raw materials and maintenance materials, and of wear-and-tear deductions) this latter factor affects in no way the accuracy of calculations. The point is that, first, the part of the inputs left out of account is relatively low in absolute terms and, second, these types of inputs have - which is more important - no substantial region-to-region differences.

The value $d_j \cdot h_j^s$ ($j = k + 1, k + 2, \ldots n$) is highly meaningful from the economic standpoint. A breakdown of investments by regions, meant for the production of a unit measure of the same product in terms of a unit of capacity involved in it, mirrors differences both in the levels of economic development and the natural conditions of the regions involved; that is, it lays down the main prerequisites for the territorial division of labour. Generally speaking, differences in the levels of economic development are manifest, above all, in the differentiation by regions of specific capital investments in the production of a unit of capacity spent on the production of the same product. The value h_j^s cannot be obtained before special research has measured the effects of the region's economic and natural conditions upon the cost of construction.

It is necessary that $d_j \cdot h_j^s$ should involve not only inputs immediately associated with the construction of an industrial enterprise, but also those for housing and welfare construction programmes. The latter make it possible to account for such an important factor as the degree of development of a certain territory. In older regions there are available labour resources possessed, to some extent or another, of housing, cultural and welfare facilities which may often be missing in newly cultivated regions. This approach ensures a fuller account of the factors sending up the costs of housing and welfare construction programmes.

In constructing a model it is important to point out the possibilities of producing the same product by different techniques. Thus, electric power can be generated, for example, by using coal, mazut, natural gas, hydropower resources or peat. It is necessary, therefore, that the model should include instead of one product (electric power) some five products in keeping with the number of available techniques.

In order to make the model work in practice, use has to be made of aggregating both products and regions. The principle of aggregating is of greatest importance. The similarity index of the economic characteristics of location factors can be assumed as such a principle to single out economic regions.

That means that in the whole territory of the region eligible for constructing the model of optimum territorial proportions, each of the location factors is bound to have similar economic characteristics. Naturally, the smaller the territory of the region the stricter adherence to the criterion of regional breakdown and similarity to the economic characteristics of location factors.

In aggregating products, there arises a similar problem of grouping various kinds of products in such a way that the share of any location factor in the structure of expenditure on the production of items included in this group would be more or less the same. In other words, this group combines products with a similar pattern of inputs of location factors. Practical work on aggregating products can find the correlative method of mathematical statistics highly useful.

The interregional model of optimum territorial proportions displayed above suggests that there be linear dependence between the cost of a unit measure of a primary resource and the size of its production. It is possible to disregard this assumption and, subsequently, to formulate the non-linear presentation of the problem on the basis of studying the actual dependence between these values.

Following the preparation of an interregional model, the construction of an intra-regional model of optimum territorial proportions begins. Since the optimum territorial proportions by the region as a whole are crystal clear, the problem now is to distribute them throughout the territory of each region. In essence, the problem is similar to the one treated above. However, its solution requires that new specific factors be taken into account.

The value and idiom of the economy of the reviewed region dictate the breakdown into subregions or location points. The underlying principles of intra-region breakdown are the same as those involved in the construction of the interregion model. As for the points of distribution, they can be singled out of all of the settlements of the given region by a pre-analysis of their developmental conditions. This approach to the problem of the distribution of productive forces in the economic region (through the singling out of location points) is of special interest, as it permits the simultaneous determination of the most effective assortment of enterprises in industrial centres.

The distribution of enterprises in industrial nodes secures considerable economy of both capital and current expenditures compared with individual and

isolated locations. The effect of aggregate location can be evaluated in the stage of project development, although the problem of optimum assortment of industries in a given industrial node cannot be settled through analysing one centre alone. To this end, it is necessary to construct an intra-region model under which location points or industrial nodes act as taxonometic units. Despite some similarity of the principles underlying the construction of inter-regional and intra-regional models, the latter is characterized by the need to account for a number of new factors and restrictions.

These are the so-called local conditions of location points, namely: a detailed analysis of labour resources (with a breakdown into male and female, and with a view of the need to observe some proportion between them, as well as the skill and composition by trades); the available productive machinery and especially the base of the construction industry; sites of industrial and civil construction; possibilities of distributing injurious types of production; transport situation; traffic and welfare facilities; and important industrial plants in the centre and their potential capacity.

It is necessary to watch closely the effect (through reducing current costs and capital investments) of various combinations of production units. The extent of this effect alters considerably with the accepted type of combining production units, and it must be described in general terms prior to the development of the model. It is subsequently introduced in the model as a function of various types of combining production units.

Summary

The optimum long-term planning of a national economy consists of two larger sections of economic science, concerned respectively with the problem of branch and territorial proportions. Either section, although observing the same effective criteria and closely interrelated, has its own objective. The study of the economy of distribution of productive forces seeks to construct the most effective system of territorial division of labour leading to higher productivity of labour through the best conceivable territorial organization of production.

Territorial division of labour, or its division between territorial productive complexes of any order, is a combination of other kinds of division of labour. As a result, the distribution of individual branches of economy [illegible] and must be revised from the standpoint of territorial division of labour.

The optimum territorial pattern of production cannot be arrived at by developing the distribution patterns of individual industries or production units, since each type of the distribution of a given branch gives rise not only to the changes in the inputs in production and transportation within this branch but in other economic branches as well. This latter factor is not taken account of in constructing branch models of location. The regional type of approach to the problem of optimum distribution of productive forces combines organically the interbranch and interregional aspects of analysis, and thus eliminates the above-mentioned drawbacks of the branch type of approach. Thus, the need to maximize the effect of territorial division of labour becomes the reliable effective criterion.

The optimum distribution of productive forces can be arrived at solely if the optimal proportions of production for every region are found; that is, the proportions that ensure the highest value of the effect of territorial division of labour. In theory, it is possible to deal simultaneously with the problems involved in the determination of optimum territorial and branch proportions. However, methods to achieve this are practically non-existent as yet; for this reason the problem of distributing productive forces is formulated as that of distributing, by regions, the proportions of production by the country as a whole, which have been crystallized at a previous stage of analysis.

One of the possible solutions to the problem is the development of the interregional and regional models of optimum territorial proportions by making the most effective use of location factors.

4. DATA REQUIREMENTS FOR INDUSTRIAL LOCATION

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One of the serious problems of locating industrial projects and planning regional development is the lack of data and information. The problem is not that the quantity of data is inadequate, but that the data are often incomplete as to time, space and other required aspects. The data are not framed in a coherent system to enable long-term evaluation of spatial requirements for the advantageous and suitable distribution of industry. Moreover, the existing information is dispersed in various institutions. The result is that undue weight is sometimes attached to narrow local aspects, and the application of a uniform procedure from the national point of view becomes impossible.

The seriousness of the lack of coherent systems of data for spatial planning has become evident in recent years, when it has become necessary to ensure an equilibrium of natural, technical and economic conditions for the people within a certain area.

Only recently have urbanization and spatial economics dealt with the question of how to remedy damages caused by the uneven development of industry in traditional regions (for example, exhausted resources, air and water pollution, problems of transport and excessive noise). These social costs were accepted in the name of the profitability of industry, and no thought was given to the fact that space also was limited. Whenever the interests of industry clashed with the use of space, industry was exclusively favoured. At present, experts in urbanization and spatial economics seek ways and means of securing the harmonious, long-term development of an area. Even within these scientific disciplines, questions arise relating to prospective development and planning. This has created the need for a system of information that would gradually cover the entire area of the state - a uniform system of classification which could be continuously up-dated.

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The question arises whether such a coherent system of information, covering the entire area of a state, is needed in developing countries which do not have problems caused by an excessive concentration of industry. At first glance it might seem that in these countries, as was once true of advanced countries, the one-sided criterion of the suitability of a certain area for the construction of industrial projects should be applied, leaving the future development of the area to chance. In this case, however, the developing countries find themselves in an advantageous position, since they may learn from the experiences of advanced countries, and may thus avoid eventual losses caused by the necessary reconstruction of whole regions, the relocation of transport and communications, the regulation of waterways, the restoration of natural conditions and so on.

The present study draws attention to the system worked out in Czechoslovakia, by which information on natural, technical and economic conditions of individual regions and of the entire area of the economy is collected and classified. It is a graphic and tabular system of continuously up-dated information that provides background material for ascertaining advantageous conditions for the distribution of industrial and other projects, and for planning the development of the area in the light of future requirements.

The essence of the spatial classification system

In the evaluation of industrial projects, technical, technological, economic and financial aspects must be considered from the point of view of all possible variants of a project's location. The construction and the operation of every plant will depend on the geographic and social environment in which it is to be located. On the other hand, each plant will make an impact on its environment in different ways. Each plant is a system of technical linkages of the productive process in the area, which thus becomes the technical and economic factor of its existence.

It has become necessary to establish a documentation system of spatial conditions which supplies information needed for ascertaining the efficiency of industrial location. First, documentation of the plant site is made, followed by documentation of the agglomeration area of regions and subregions and, finally, of the entire area of the economy. However, most of these modes of documentation came into being as isolated systems, in the form of physical plans of towns and villages, zones, production regions and so on.

A spatial project which provides a uniform method of documenting the technical parameters in the entire area of a country, and which is continuously updated in harmony with the dynamics of economic development, is almost unique in the world. The first steps towards undertaking such a project in Czechoslovakia were made in 1964. The first part of this general spatial projection, completed in 1965, contains an analysis of the prevailing spatial and technical conditions and of all relevant investment projects planned for implementation up to 1970. It includes an allowance for corrections to be made in the location and distribution of individual investment projects in the interest of national economic efficiency. Work on the second part of the national spatial projection, that is on the preparation of a prospective projection of settlement within the whole economy of Czechoslovakia, is currently in progress.

The system of spatial documentation should provide reliable information for spatial planning to facilitate the selection of the best possible location of individual plants and to ensure that the construction of plants harmonizes with the natural environment, including the living conditions of the population.

The documentation of all parts of a spatial projection provides information necessary for the solution of problems concerning natural, technical and economic conditions. These three groups are linked by objective interrelationships. The development of these relationships and their quantitative and qualitative changes depend primarily on the degree of the concentration of economic activity. This concentration is expressed in the production capacity, working opportunities, total population, provision of housing and services and the like within a given area.

Demands for technical infrastructural facilities change in proportion to the degree of concentration of economic activity in the area. These changes are of a non-linear nature. The investment and operational costs of technical facilities have a lower limit of economic feasibility, determined by the minimum concentration, and an upper limit, determined by the full technical use of economically feasible natural resources and by the infrastructure of the area (for example, water, power, transport). Between these lower and upper limits, there are certain critical points for individual factors, where costs for one unit of facilities begin to grow progressively. The concentration of economic activity and the costs of technical facilities within the spatial unit in question have a certain optimal relationship. The optimum is determined by the

most effective economical exploitation of an area's natural potential for a certain concentration of economic activity. The system of comprehensive documentation is intended specifically to ascertain such an optimum.

The relations between production and a given area, that is, the relations between economic activity and the costs of constructing and operating the technical facilities of the area (infrastructure), are not limited by the framework of a town, residential district or any other agglomeration unit, although the weight lies within that framework. The national economy shows that these relations are projected into broader connexions of towns and residential districts, and that they become parts of the economy of a subregion, region and of the entire country. The system of relations of one town must be compared to similar systems of other towns and of places not yet inhabited.

The system of spatial documentation may be divided into four categories, namely: (a) plot construction spatial planning; (b) town and village (and/or other agglomeration units) spatial planning; (c) regional and/or subregional spatial planning; and (d) general spatial planning of an entire country. In the graphic illustration different scales are used for individual projects; degrees of documentation and differing quantities of detailed information are provided. The common unifying aspect of all this spatial planning is the urbanization solution, that is the expression of the conditions of the space in relation to the production orientation of the plant, to the size of the population and its housing and service requirements, including the best possible use of natural conditions for the technical facilities of the area.

Plot construction spatial planning for plants, housing sites and the like is intended to aid in the placement of individual constructions and groups in the terrain, in the architectural composition of the dwelling area in the entire town organism and in its linkages to the system of technical facilities. A scale of 1:2,000 and/or 1:1,000 is used for this purpose. This type of planning corresponds to the specific nature of the solution of the synthesis of space and building which directly determines the rational and technical standard efficiency and social quality of the utilization of space in general. This part of spatial planning belongs, in fact, to the problems to be solved in industrial plant planning and in the planning of housing and other functional constructions.

Town and village spatial planning represents the basic instrument for the distribution of investments, as the town constitutes the basic technical, economic and organizational unit of settlement that has gradually developed into a fully built-up area.

A spatial town plan provides for the integration of a town and its area into the landscape and for the internal division of the space into functional, specific tracts and technical facilities. The currently used scale of graphic part solutions is 1:5,000. This scale makes it possible to delimit with sufficient precision the area of the town and its internal division into functional tracts. It also affords sufficient technical and economic background material for the location of groups of buildings.

Binding together the various parts of a spatial plan of a town are the prospective size, relevant argumentation for the functional division of space, design schemes of technical facilities systems of transport, water and power and telecommunication networks and resources. The motivation of the functional division of space and schemes of technical facilities are dealt with in separate technical, economic and qualitative sections. The prospective size of the town is considered from the long-term aspect. The 20- to 25-year plan is subdivided into shorter periods, usually of five years. Individual stages are harmonized with the time necessary for the expansion of building plots and for the construction of utility networks for the technical facilities of the functional areas.

Progressive classification methods reckon with different extents of spatial plans for towns having more than 100,000 inhabitants, for those with a population of from 30 to 100 thousand and for small towns with 10 to 30 thousand inhabitants. The differences in the extent of documentation also depend on the functions of individual towns within the system of settlement (metropolitan area, regional centres, towns). Village planning is usually the simplest.

The fundamental function of regional spatial planning is to provide solutions to spatial and technical relationships between two or possibly more towns, or to relationships arising from the exploitation of natural resources and from the infrastructure of the area. From this function it follows that there is a certain lack of uniformity in delimiting the extent of space of the region.

The development of regional and/or subregional spatial planning was once determined by economic development, primarily that of industry. Spatial aspects were taken into consideration only after serious spatial problems emerged. In this way special spatial plans came into existence. In Czechoslovakia, for example, most of the existing spatial plans are those for coal basins, centres of metallurgical and chemical production, water economy and so on. Plans to develop special areas as centres of manufacturing industries were limited.

The delimitation of the extent of the area of a region must proceed from the assumption that, in addition to changes in the development of production, the life of a town will be much more strongly affected by other changes, among which are the impact of the construction and reconstruction of the transport system, the envisaged acceleration of the speed of traffic, and the impact of the changes in the living standard (increasing number of cars, more time for leisure) and in the way of life (more time to be spent in the open air).

The methods applied so far for delimiting the area of a region do not meet these requirements. For example, Czechoslovakia is considering increasing the area of a given region from the present radius of 15 to 20 kilometres by 2 to 2.5 times, depending on the size of the towns and the extent of their interrelationships. The basic scale used is 1:20,000. Such delimitation of space naturally presupposes that there will be a close link between the spatial and technical aspects of the problem. The spatial plan of a region and/or subregion provides a broader framework for town and village planning and, moreover, it is linked to the adjacent regions or subregions which, in turn, are delimited and co-ordinated within a plan for the whole area of a country.

The elaboration of a coherent system of spatial documentation of the whole area of a country is an urgent problem both in industrially advanced and developing countries. Industrially advanced countries, having a long tradition of industrial production and construction, must undertake wide structural reconstruction of industry and agriculture in connexion with the intensification of the development of the entire economy. Structural reconstruction should facilitate the accelerated introduction of the fundamental trends of the industrial, scientific and technical revolution. The problems of structural reconstruction grow in proportion to the growth of export industries, for this growth increases the need for flexibility and adaptability of industry to changes in foreign and domestic markets. Such an adaptability cannot be secured without certain technical reserves.

The concentration of industry in traditionally highly developed productive regions and towns, where at present the natural and labour resources are exhausted, considerably diminishes the operational possibilities of industry. Therefore, in the interest of accelerating structural changes in industry, the concept of urbanism must reflect new basic development trends, that is, modernization and reconstruction of existing capacities, mostly in traditional regions, and new construction in less developed areas.

The aim of modernizing and reconstructing industrial plants is to raise the volume and the quality of production and, simultaneously, to release workers for employment in the service and construction sectors. The construction of new plants should accelerate the economic development of the less developed regions without violating the principles of housing, the development of services and the technical facilities of the area. The population must have good conditions for its work, living, education and for an all-round development of physical and mental capacities; at the same time, conditions must be adequate for economic development.

These development trends support the concentration of settlement in towns. The degree of urbanization, however, must correspond to the attained level of industrial development. A widespread network of villages and communities causes considerable dispersion of investments over the entire area of the country. Effective utilization necessitates the purposeful concentration of investment in selected towns and villages.

The urbanistic trends mentioned above can be properly channelled, the highest possible efficiency of construction attained and the standard of housing and services secured only by following the methodology of macro-planning based on scientific knowledge. The spatial planning of a country is one of the instruments that may facilitate the solution of these problems.

Spatial planning of a country is a form of documentation of the area under conditions where space is increasingly recognized as an economic factor. It changes the role and position of the whole system of spatial projection and its relationship with economic planning.

In Czechoslovakia the physical planning of towns, villages and regions was mainly static and passive. Planning was restricted to final solutions to problems arising in connexion with production targets and investments approved

by the economic development plan. With frequent changes in planning, such physical plans became rapidly obsolete. Serious disproportions arose between the requirements of production units and the production opportunities offered by the area in question. Natural conditions of the area, and even the requirements of the population, were not sufficiently taken into account, particularly in the traditional industrial centres.

From the beginning over-all spatial planning has made corrections of national development possible by taking account of actual needs, especially investment requirements, and by covering all levels of organizational management. At the same time, it creates prerequisites for an effective implementation of planned construction, mainly for the efficient functioning of new productive capacities and other constructions such as housing, public services, schools, health and recreation facilities and tourism. Spatial planning provides new concepts and data for the up-dating of physical plans for individual towns and areas from a social point of view. In this way the spatial projection of a country enlivens the whole system of regional planning. It influences, in advance, the decisions on investment distribution, provides objective assessments of technology and economy, and harmonizes local and social interests. The active role of a spatial projection of a country develops in full scale only after its counterpart, that is, the projection of settlement of the country, documenting the efficient concept of the urbanization of settlements, has been completed.

According to the new concept of macro-planning, the whole system of the national economy development plans in Czechoslovakia has done away with details on technical, economic and social conditions. The attention of the central planning authority is focused on improving methods and procedures aimed at determining the principal directions of development and the fundamental proportions of national economy, both within industrial sectors and within the regions. The planning system is based on massive data, background information and concepts that must be documented by technical and economic studies, projections and other information. The spatial projection of a country makes it possible for the central planning authorities to view the level of various areas and towns from the standpoints of individual productive and non-productive branches and fields; it also provides information for sectoral and spatial synthesis at the national level. Spatial planning is a flexible instrument for alternative and

variable solutions according to the efficiency of prospective development. The concept of settlement, which forms part of the spatial projection of a country, provides one of the key systems of documentation for long-term economic development and is a guide towards rendering capital construction more effective. Spatial projection becomes a significant starting point, as well as one of the main instruments, for placing national economic planning, particularly its regional and investment aspects, on a scientific basis.

Typical examples of technical problems that must be solved by economic reconstruction are to be found in the location of crude oil refineries, nitrogen plants and atomic power plants. The location of these plants depends upon the solution of a number of spatial and technical problems resulting from an unbalanced distribution of industry, scattered, congested settlements, limited and unevenly located water resources and so on. For example, in Czechoslovakia when the location of refineries was considered, there were only three alternatives within the whole area of the country. A number of variants (in one case 17) had to be considered for each alternative. Complicated problems arose in planning the networks of oil and gas pipelines and product pipelines for the entire country.

Similar problems arise in the distribution and location of nitrogen plants, atomic power plants and large thermal power stations. The development of a progressive power industry and of a material base gives rise to problems in the traditional fuel and ore extraction regions, where many plants may have to be closed down because of exhaustion of resources or economic inefficiency of extraction.

The concentration of manufacturing industries in traditional areas also poses problems for spatial planning. The interests of the engineering and consumer industries often clash with those of the key industries (fuel, metallurgical and chemical industries), particularly in the recruitment of experts, the provision of housing facilities and in demand for water and transport facilities. The distribution of chemical, metallurgical, power and manufacturing industries to new and industrially less developed regions should help to avoid this clash of interests. Such a step, however, necessitates a coherent classification of spatial and technical conditions in the entire area of the country.

In planning the new industrial areas and regions, Czechoslovak authorities made use of experiences gained in the traditional regions in order to avoid the negative effects of industry on the landscape and on settlements. Attention was paid to coherent urban solutions in the framework of town planning, although construction of some plants was envisaged for the distant future. For example, areas were reserved for future water-economy constructions, for roads, gas and oil pipelines, group water mains, airports and the building of new residential quarters and for the construction of plants with high demands on space. This solution seems particularly desirable for the developing countries, as it offers them an opportunity to take advantage of experience and to avoid mistakes that later may require supplementary investments and cause unnecessary losses through inefficient construction and slowed economic development.

Even during the preparatory and drafting stage of the spatial projection of Czechoslovakia, it became necessary to find practical solutions for some of the problems that had received varied theoretical interpretations. This applied mainly to the concept of coherence of investments and basic funds, and the concept of methods applied in the spatial projection system. The principles of the dynamic and coherent concept of investments and basic funds and the principle of continuous up-dating of the entire system of documentation of space were formulated, and their correctness was confirmed by the actual draft of the first part of the spatial projection of the country.

It was found that the preferential treatment given to the construction of industrial capacities in some towns, at the expense of housing and utility facilities, had a negative effect on the utilization of the productive capacities as well as on living conditions. In some regions, heavy concentrations of industry caused water and air pollution and upset the natural biological equilibrium, thus making excessive supplementary investments necessary.

It has likewise been confirmed that when investments are allocated to coherent housing construction, a knowledge of specific conditions of the area and the possibilities for utilities in individual towns are of fundamental importance. Experience has shown that a small number of high quality, fully equipped flats is more valuable, both socially and economically, than a large number of flats without these amenities.

The conclusions drawn from the elaboration of the projection underline the necessity of respecting the criterion of the dynamic development of towns and

villages. Capital construction must simultaneously take care of the reconstruction of towns and villages. One-sided orientation towards the construction of housing on virgin sites at the boundaries of towns causes a lagging behind of the older housing areas and may cause a disharmony of appearance and function between the "old" and the "new" town. In addition, construction on new plots means increasing the demand for additional land and investments in the infrastructural utilities. The relation between construction and reconstruction depends primarily on the development rate of a town, on the urgency of the housing problem, and on investment demands for new construction compared to those for reconstruction.

The data collected confirm the tendency towards structural reconstruction of areas. The prospective division of space follows the trend of the formation of functional groups within the built-up area (for housing, production, utilities). In town planning, areas are reserved for recreation facilities to serve as social and cultural centres of the town and adjacent areas. The above trends in the spatial and technical solutions should help to expand the historic administrative boundaries of towns which, especially when town development is not understood as a dynamic process, often impede progressive and effective urbanization solutions.

An integrated approach in any urbanization plan is generally valid for and applicable to developing countries and regions. Urbanization schemes must be all-embracing, even in cases where investment funds are limited and part of the planned construction must be postponed. In these cases, the purpose of integrated urbanization schemes is to organize space in such a way as to reserve areas for future construction. Should these areas be built up haphazardly, extra expenditure connected with the demolition of constructions built at unsuitable or ill-considered locations will be necessary. These conclusions hold true both for the delimitation of industrial and housing sites and for the determination of sites and tracts of land for engineering networks, mainly transport ways and water-economy installations.

Spontaneous changes and those that are planned beforehand, must be projected in the whole system of spatial documentation by continuous up-dating. Background material can thus be obtained for the delimitation of the area to serve the modernization and reconstruction of basic funds and sanitary conditions, and the purposeful preparation of the area for new construction.

The Czechoslovak authorities gradually prepared the organizational prerequisites for carrying out the general spatial projection of the country. A number of country-wide technical and economic projects and other documents were prepared which applied uniform methods for working out the natural, technical and economic development potentialities of individual areas and regions. The most significant of these may serve as examples.

The Czechoslovak Central Institute for Geology made a systematic assessment of a geological survey of deposits of raw materials and of hydrological, seismic and landslip zones. The state hydrometeorological service and both state and regional sanitation experts worked out documents on climatic conditions, air pollution, purity of watercourses and main sources of water. The Ministry of Agriculture and Forestry, in co-operation with national committees and the administrative bodies of communities, districts and regions, worked out a nation-wide zoning plan for agricultural production according to production regions, including specifications for irrigation and drainage. Data for the balance-sheets of the land and forest fund were also specified. At the request of the State Planning Commission, the State Institute for Regional Planning worked out a national balance-sheet of labour according to districts and selected villages earmarked for development, and drafted technical and economic maps for the spatial distribution of industry. The Institute also established a spatial scheme for the tourist industry. From the periodical censuses the Central Commission of People's Control and Statistics collected data on the number of inhabitants, flats and houses (housing fund) and made a demographic projection of the development of the population, its economic activities and age composition within spatial divisions. National bodies in charge of technical utilities for the whole country accumulated data on the national transport and resource systems such as selected network of roads, railway network, airports, power-circuit network and state water-economy plan.

Most of these documents were elaborated as government schemes with the co-operation of sectoral research planning institutes and other specialized bodies. These documents represent a systematic collection and classification of data and background material corresponding to the various aspects of natural, technical, economic and social conditions, to processes of economic and social development and to the possibilities for their exploitation in view of the changing requirements of modern society.

This collection, however, provided no analysis of mutual technical and economic linkage and no synthesis of general social aspects. The missing links were provided by the general spatial projection. The projection was elaborated by state authorities, dealing with regional planning, in collaboration with urbanization centres established in the regional planning institutes.

During the ten years of their existence, the state institutes for regional planning in Prague and Bratislava worked out more than 70 spatial projections and studies, and several nation-wide spatio-technical documents on selected productive and non-productive branches. Individual planning institutes worked out spatial master plans for most of the towns and villages within their own regions. The establishment of urbanization centres as parts of the regional planning institutes constituted organizational and financial prerequisites for recruitment of qualified architects and engineers, specialized in urbanization, to work out maps on the spatio-technical conditions of the individual regions. In addition to these expert groups, boards of architects were established in the capitals of Bohemia and Slovakia (Prague and Bratislava) and in other towns and important centres of tourism (Brno, Ostrava, Košice, Plzeň, Ústí, Karlovy Vary, Vysoké Tatry). This highly organized professional machinery completed the work within eighteen months. The short time needed to complete the task, and the high professional and technical standard, confirmed not only the correct selection of experts working on the project, but also the suitability of the organizational procedures. The main merits of this set-up lie in the fact that it ensures continuous up-dating of the whole system of documentation and data.

Scope, formulation and up-dating of the classification system

The general spatial projection of a country consists of three basic parts: descriptive text, tables and graphs, with each part providing information on natural, technical and economic-social conditions. As these three groups of conditions create the prerequisites for economic and social activity, the text, the tables and graphs of the spatial projection form an interrelated system of documentation of the whole country. Thus, any commentary on the system of documentation begins with the classification of conditions into types and elements, and proceeds in the three interrelated parts of documentation.

Natural conditions

The group of natural conditions of an area in the documentation system covers five main categories: geology, land fund, climatology, hygiene and biology. The criteria determining the choice of factors in these categories are parameters that characterize them from the point of view of the requirements of the population and the suitability or non-suitability of the area for building purposes. Simultaneously, documentation is made of the characteristics of the area according to its suitability for the development of primary production (extraction industry, agricultural and forest production).

With regard to geology and land fund, the choice of parameters is made by the elimination method. Maps are made of deposits of fuels, ores, minerals, peat, other raw materials, seismic and landslip zones, water resources and mineral and thermal springs. All these specified areas are eliminated from the fund of building sites for general construction; they may even fall under a special land protection scheme. They may, however, provide locations for plants connected with the extraction and exploitation of deposits. The documentation of the land and forest fund is made in a similar way. Records are kept on the characteristic features of the natural conditions of production regions and specialized areas, the irrigation and drainage systems, the balance-sheet of the land fund according to background materials used in the zoning of agricultural production. The working out of background materials concentrates mainly on the protection of the land fund against expanding building activities and on the possibilities of using the land fund for agricultural production. The choice of parameters documenting the other branches of the group of natural conditions - climatology, hygiene and biology - is determined mainly by their influence on the set-up and use of building sites. Among the climatic parameters, the most important ones are the movements of winds and inverse positions. Directions and velocity of prevailing winds are compiled in tables and, for characteristic areas, marked by wind roses.

Important data on spatial hygiene are those concerning the purity of atmosphere, watercourses and water resources, main sources and types of pollution, affecting mainly towns and their neighbourhoods. Pollution is caused mainly by combustion processes of solid fuels (ashes, oxide, sulphur and arsenic), basic chemical plants, cellulose and paper industries, fuel and ore processing plants, and effluence from municipal sewerage.

Biology is of importance as a factor balancing the negative impact of human activities on hygiene. By protection of selected areas (special forests, nature reserves, national parks, historical beauty spots etc.) and the recultivation of devastated regions, biology provides an active approach to the creation of prerequisites for the equilibrium of natural surroundings and productive activities.

Technical conditions and utilities

The utilities of an area are the core of the problem in planning industrial location and the location of other functional establishments. They cover four categories of resources, equipment and networks, namely: water, power, communications transport and telecommunications.

The factors to be studied and to be included on the spatial projection maps must be characteristic of the natural resources of the relevant area and the level of their technical exploitation. This arrangement provides data on natural resource reserves and technical reserves and/or the overburdening of specific types and elements of engineering networks and sources. Areas still having unutilized resources are marked and sites are reserved for future use, including housing and plant installations.

In Czechoslovakia - the watershed of Central Europe - water resources in the river basins of the main watercourses are of key importance to technical conditions. The clarification system includes data on their minimum rates of flow (for 364 and 355 days) and flood rates of flow (for 1, 20 and 100 years). Specifications are made of: supply of water to and consumption of water by the population, irrigation systems, agriculture and industry; sources of water pollution; classification plants; system of water mains and sewers; reservoirs and dams. These estimates are used for establishing water balance-sheets for 37 river basins. Underground sources of water and protection of land against contaminated water are also recorded.

Balance sheets of water according to river basins and specifications of current and future spatially bound supplies (for drinking, for irrigation and other purposes) make it possible to obtain figures on water resources for industry. Water resources conditioned by investments are mapped (potential construction of reservoirs and dams), along with specifications of investment costs.

The significance of the transport system increases with the progress of the present scientific and technical revolution and its impact of production and on society. The complex system of transport under prevailing conditions (distance between working place and residence) has assumed a new economic and social role. For the majority of the population and the industrial sectors an efficient network of roads and streets is of key importance. The mapping covers constructional and technical conditions of the network with regard to transport, its capacity, utilization and prospective development based on various studies. The degree of motorization, the intensity and structure of road transport, and public facilities for personal and freight traffic are also assessed.

For railway transport, the significant factors for spatial documentation are the network, shunting stations, centres for the loading and unloading of freight cars, efficiency and quantity of trackage. Mapping of civilian airports contains technical data, their percentage of use and indication of specially protected zones. For shipping traffic, mapping is done of ports, navigable waterways, shipping tracks and channels. The general development of shipping traffic is covered by separate studies. Maps on the network of long-distance conduit systems include markings of tracks according to dimensions of media, and of control centres and stations.

With regard to power utility, data are collected on the various types of power: electrical, thermal and gas. The characteristics proceed from the concept of central heat deliveries for housing and production zones of towns based on the development of the basic structure. As to electrical power, information is collected on current and future supply and consumption patterns. Maps are made recording the location of thermal power stations and thermal stations, the condition of the power transmission systems and the condition of important distributing stations and major supplies exceeding one million kWh per year. The data provide a survey of the distribution, size and use of thermal stations and the mapping covers the system of basic heat conduit networks. Data on the gas supplies of individual areas cover the situation in the resources of coking, crude oil, carbon and generator gas, tracks of high-pressure pipelines, consumption and short-term prospects. The telecommunications network is marked according to individual types of equipment (wireless, television, telephone exchange and cables).

Data concerning transport and power industry are classified so as to provide background information on technical reserves of basic resources in individual areas, both of the current and the expected development conditioned by investments. Such data are important for the construction and development of industrial plants and for housing construction and the development of services, that is, for the development of towns as balanced organisms.

Socio-economic conditions

Information is compiled on the current socio-economic situation and the possible development of the population in relation to basic funds. Documentation is provided for basic data on industrial plants, housing, services and the like, and the system of settlement is characterized in general. Towns and villages are classified as: typical town settlements, settlements suitable for village population, and other settlements.

Industrial intensity is analysed according to individual centres (above 500 employees). For these centres, the spatial documentation lists data on characteristics of plants, location and types of plants according to their prospects for further development (plants capable of future expansion, stabilized and viable plants and those earmarked for liquidation), utility requirements, possible expansion of industrial development, and the negative effects of industry on settlements. The synthesis is made on the basis of value, age structure of basic funds and the number of jobs in general and specifically for women.

A relatively more detailed documentation is made of the housing fund and the population. In these cases it is necessary to proceed on the assumption that the location and distribution of housing construction and public amenities should reflect the active role of spatial projection and its impact on the location and distribution of industry.

With regard to demographic development, attention must be paid to those elements that substantially influence the location of flats and service facilities and also to data on the present employment structure which are important for the location of industry and services. Documentation should include population figures in general and figures broken down according to sex, age structure; the development of the number and structure of households requiring housing; and facilities necessary for personal and public services. The data

covering the development of the population and households form the basis for determining the fundamental relationships to be considered in the location of production and other investments as a uniform whole within the area of individual towns and villages. Attention must also be paid to the development of housing and service facilities for the population.

In addition to current data on the number of houses, flats, density of built-up areas and the structure of the housing fund according to the nature of communities, the qualitative aspects should also be analysed.

For the qualitative indices, analyses are made particularly of the housing standard, the average number of rooms per flat, the age structure of houses and flats, and the types of material used for construction and equipment of basic fittings. The relation between the number of flats and the number of households during the last twenty years is documented by the final number of households having no flat of their own according to types of apartment houses.

In harmony with the trend towards solving the housing problem, documentation is made of the current situation in public amenities covering the following sectors:

(a) Educational facilities (universities, secondary schools, schools of general education, secondary vocational schools);

(b) Cultural facilities (theatres, cultural establishments);

(c) Medical care (hospitals, maternity hospitals, polyclinics, facilities for specialized treatment);

(d) Services (establishments where several types of services are concentrated, laundries and dry-cleaning, wholesale warehouses);

(e) Sport (open-air and winter stadia, gymnasiums, swimming pools);

(f) Social welfare (homes for retired people).

The facilities under documentation represent a set of amenities exceeding local scale and are analysed according to sectors and areas. Synthetical assessment is made of their location from the point of view of the concentration of settlements and regional distribution.

In recent years Czechoslovakia has increasingly come to regard recreation as an independent economic sector and the documentation of this sector follows and supports this trend. Three phenomena are under observation: recreation, tourism, and spas. Suitable areas are marked and divided into appropriate sections according to their characteristics. Areas suitable for tourism and

the development of spas are analysed in greater detail. According to the degree of their attraction and their importance, they are classified into local, regional, national and international categories.

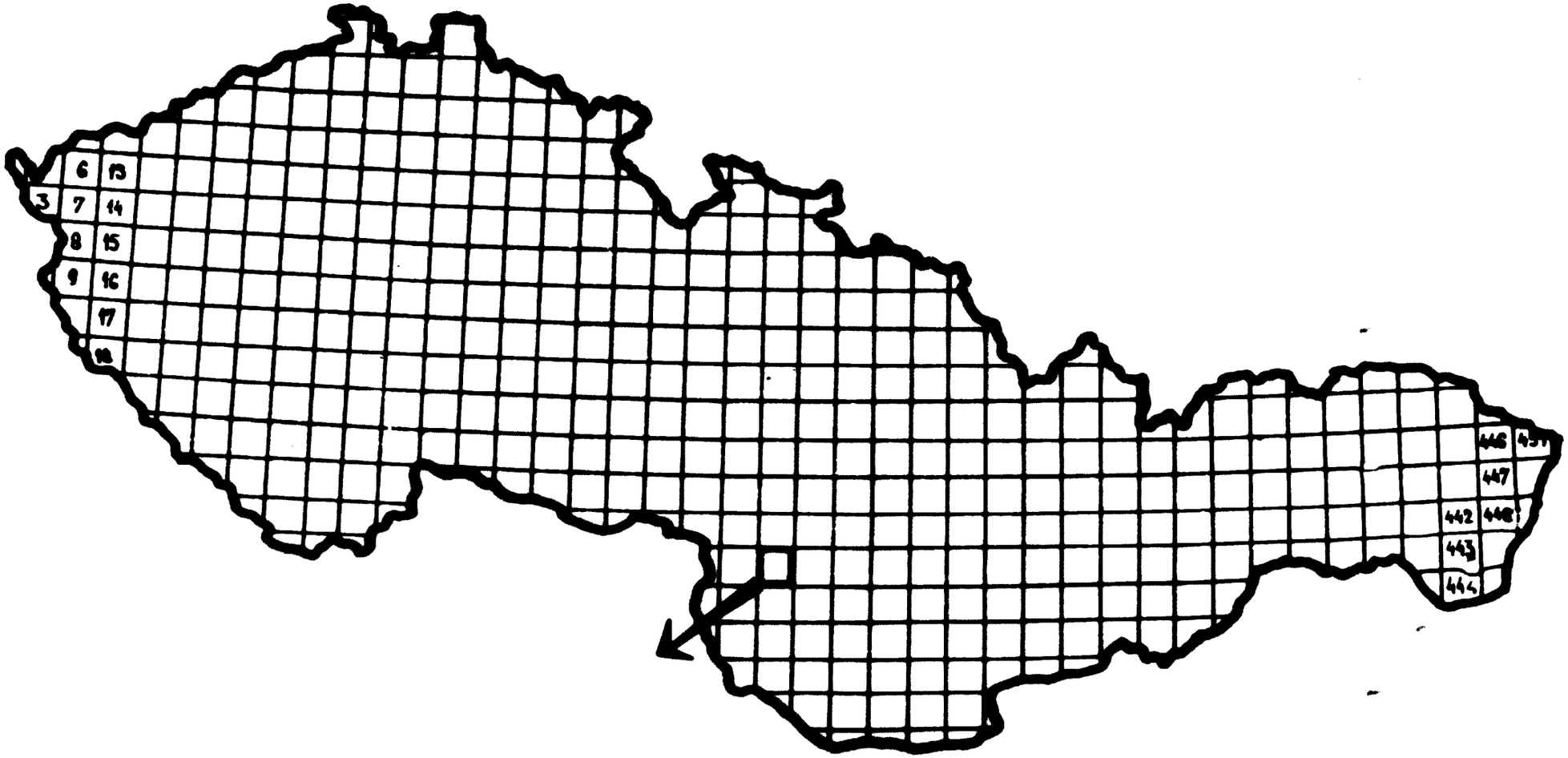
Classification of documentation and methodology of its up-dating

The documentation of the general spatial projection of the entire country is composed of text, tables and graphs. As the projection is a document in which spatio-technical data are compiled, the emphasis is on the graphic and tabular parts. The text outlines the objectives and significance of documentation and the process of elaboration. It lists the co-operating organizations and the applied materials and documents. Explanations are given on the division of the tabular and graphic parts of spatial documentation and methods and indices applied.

The graphic part forms the basis of the entire documentation; its main component is a set of maps on a scale of 1:50,000. The area of the country is divided into sections; for Czechoslovakia there are 454 sections. Each map covers one section and contains all factors under observation that can be expressed graphically according to a uniform key. Each sectional map provides an analysis of all characteristic factors found in the area. Thus a synthesis is provided of all conditions for the area represented by the map which gives a realistic picture of the degree of coherence and disproportion. If appropriate maps are combined, they give a picture of individual regions. They may be used for composing a picture of the entire country, a picture of selected spatial entities within the framework of the country, and also within regions. The following figure is an example of such a map.

The country-wide synthesis of individual sections and types of spatio-technical conditions and their analytic distribution into administrative units (regions, districts) are documented in maps on a scale of 1:500,000. Each of these maps covers the whole area of the country and indicates certain types and factors of natural, technical and economic conditions. For example, natural conditions are represented graphically in twelve maps, of which five deal with the land fund, two with hygienic conditions and three with geology (mineral reserves, hydro-geologic zones, seismic and landslip areas). Economic conditions are included in eighteen maps, the characteristics of the housing fund in seven maps and the demographic development of the population in five.

Map of Czechoslovakia divided into 454 sections



The grid indicates the area of Czechoslovakia divided into 454 sections. Each section is covered by a corresponding section map (scale 1:50,000) which contains basic information on natural conditions, facilities and economic conditions, expressed in a uniform key valid for the whole system of general spatial projection of the country.

Moreover, the housing fund is depicted qualitatively in twelve charts and the demographic development in fourteen charts.

Details of selected data are given in maps on a scale of 1:200,000. These include relationships between population and housing facilities broken down by towns and villages, the quality of the land fund according to local land registers, and information on basic water-economy according to river basins.

The documentation of the factors under observation in maps and charts on a scale of 1:500,000 and the more detailed documentation of selected factors in maps on a scale of 1:200,000 serve primarily as tools for orientation. They express the degree of difference in the types and factors of conditions between individual areas. They provide a good basis for assessing the distribution of the factors and facilities over the entire country, signal the newly emerging disproportions in spatial units and the absolute and relative differences between them (in per capita relation).

The tabular part complements the system of graphic documentation. It contains basic spatio-technical data on the quantitative and qualitative factors under observation. These data permit an analytic as well as a synthetic numerical survey of individual elements and their groups. They provide information for alternative and variable distribution of industries and for housing facilities according to individual areas, for total, vertical and horizontal analyses of the current situation and also for current and future solutions of spatial problems. (For models of such tables, see appendix.)

The problem of continuous up-dating of the whole system of spatial documentation has both organizational and technical aspects. As far as organization is concerned, the up-dating is entrusted to the responsible bodies for spatial projections (State Institute for Regional Planning or the town planning centres in regions). All investors are legally obliged to obtain approval of the individual stages of project documentation of an envisaged construction in co-operation with urbanization centres. They are obliged to request the respective national committees for permission to put the construction into operation. Thus, data on constructions needed for the up-dating of the spatial documentation are systematically and continuously acquired.

The technical aspect of up-dating is solved by a system of watermarks attached to the original maps. The watermarks register data on actual development and on the development of economy and investment, and are placed on

background materials of individual stages of approved documentation of buildings. Corresponding tables are supplemented as well as the graphic registration. After about four or five years the complete set of maps and tables are reprinted and the old ones deposited in the archives to be kept as significant documents of their time.

Possibilities and ways of using the documentation

An advantage of general spatial projection is that it provides an all-embracing system of documentation on the characteristics of the country, classified according to branches (vertically) and regions (horizontally); it contains data on the factors and spatial units under observation and is continuously up-dated. The uniformity of the system, its classification and up-dating make it useful both in theory and in practice.

The adjustment of the system of documentation to countries with differing conditions does not lie in the changes of the system, but primarily in the results it yields. For example, in the documentation of developing countries, the system will largely cover data on natural conditions, the distribution of these data within characteristic areas and zones, data on the population and its distribution according to regions, and data on the patterns of settlement. The methodical documentation of these data within a uniform system of tables and maps is of great benefit. It provides government authorities, both national and local, with uniform information on current and prospective activities within the framework of their investment policies. Whenever decisions have to be taken on any important investment project, this system makes it possible to assess the suitability of its location in the light of national considerations, and specifically, to formulate the technical and economic problems to be solved in the choice of location.

It represents a system of data and technical documents for the formulation of future construction of engineering networks, transport systems (roads, railways, airports, ports), water economy networks, networks of power supply and their trackings in regard to the needs of the national economy as well as of individual areas.

The system provides important background material for the introduction of economic and financial measures by the state and the local administration,

[illegible] contributions of enterprises towards the construction of engineering facilities, charges for their use, assessment of building sites. It offers concepts for the elaboration of partial spatial projects (towns, regions), and for their up-dating. At the same time, it provides an objective view of territorial, urban and economic problems awaiting solution within these spatial projects.

This classification system in the hands of the government bodies and local administration authorities can become an effective tool for locating productive as well as non-productive investments and for manifesting a social interest in all such investments.

The classification system provides industry with the technical and economic information necessary for the optimum location and establishment of new plants with regard to the country as a whole. At the same time, industries must, in their investment intentions, fully respect social and public interests and take into consideration the possibilities of utilizing the resources and technical amenities of the area subject to the investment plan.

The above possibilities for using the classification system of documentation of space indicate its potential applicability to countries in different stages of industrial development, particularly when spatial dispersion in the regions and the entire country is uneven. In the least developed regions documentation will be made particularly of natural conditions, technical possibilities and their current utilization according to completed technical documentation (schemes) and development projects (power networks, networks of water economy constructions, roads, railways, ports and the like) and population data. In regions with industrial centres, data on technical and economic conditions of areas will predominate. Documentation will primarily concentrate on the types and capacities of existing and projected engineering constructions, the size and location of production capacities, the size of towns and villages and their development according to their spatial plans and so on. At this stage it is the co-ordinating function of the classification system that steps [illegible] programmed. There is the need to co-ordinate the timing in technical [illegible] between production engineering constructions and the building of [illegible]. Generally, regions with intensive development of industry [illegible] in addition to the above documentation, spatial planning of towns [illegible] spatial planning of greater areas of common interest which [illegible] urbanization concept and thus [illegible] multi-[illegible] stage development.

Appendix

MODELS OF SELECTED TABLES

Utilities

Water Economy

The set of tables on water economy covers the various spatio-technical factors under observation and their interrelationships. These tables contain data on water resources, the degree of utilization, and the pollution of water courses. Specifically, the set of tables includes data on the natural rates of flow of water courses; the underground water resources (both under observation and utilized); the degree of utilization for agricultural irrigation, industrial uses, and drinking water; the current situation of water economy; and the operations of reservoirs and purification plants (both currently in operation and planned). Such a numerical presentation facilitates an analysis of the reserves of water outside the water courses and underground sources, and sources requiring investments, such as the preliminary technical and economic parameters of the feasibility of construction of reservoirs. There is a set of such tables for each of the 34 river basins in the general spatial plan of Czechoslovakia.

The system of indicators is graphically expressed in maps on a scale of 1:500,000. These maps also show the basic network of water mains and sewers.

Models are shown here for three of the tables on water economy.

Table 1

Natural rates of flow

River basin	Water course	Profile	Q 355 [a]	Q 364 [a]	Q 1 [b]	Q 20 [b]	Q 100 [b]
			m^3/s				

a/ Q 355, Q 364 = minimum rates of flow during 355 and 364 days respectively.

b/ Q 1, Q 20, Q 100 = flood rates of flow in 1, 20, 100 years.

Table 2

Water economy balance-sheet - Current situation

No.	Course	Profile	Requirement m^3/s	Consumption m^3/s	Q 355 m^3/s	Q 355 Cons. m^3/s 6 - 5	Q 364 m^3/s	Qn m^3/s	Difference m^3/s 9 - 5 + 6	Qn - Cons. 9 - 5
1	2	3	4	5	6	7	8	9	10	11

Table 3

Purification plants (current and planned)

No.	Settlement	No. of inhabitants		Quantity of effluent		Inflow Q 355	Index of purity (5:7)	Purification plant		Utilization of plant		Remarks
		total	with access to sewer facilities	total	of which industry			type	capacity	current (5:10)	1970	
				m^3/day		m^3/s	%	M[a]/MB[b]	m^3/day	%	%	
1	2	3	4	5	6	7	8	9	10	11	12	13

a/ Mechanical system.

b/ Mechanical and biological system.

Economic conditions

Industrial plants

Table 4 includes a set of factors which must be currently checked in industrial plants with more than ten workers. Plants are observed and documented according to individual districts for which population and labour balance sheets are also made. A complete regional set of tables covers all the districts that are parts of the region in question. The set of factors on individual plants do not contain water supplies. These are covered by tables concerning water economy. The supplies and resources of power are observed by a similar method.

Fund of houses and flats

Table 5 contains a set of housing and settlement factors. Such tables are worked out also according to districts and form a part of separate sets covering individual regions. By their classification according to items, they are closely linked with the system of industrial labour balance sheets industry.

Table 4

Industrial plants

1	2	3	4	5	6	7	8	9	10

Key:
1 - name of administrative community
2 - name of plant
3 - number of plant
4 - sector to which it belongs
5 - category of industrial plants according to the classification of sector
R - plant capable of future expansion
S - stabilized plant
L - carmarked for liquidation
J - plant proposed for other use
6 - location of industrial
x - within the built-up area of a settlement
- - outside the built-up area of a settlement
7 - area of industrial plant in hectares, and/or other operation grounds outside railing
8 - number of employees
x - pre-1963 data; not marked = data for 1963
9 - access by railway
x - link to free track
- - link to station
10 - remarks

Table 5

Fund of houses and flats - basic data (as of March 1961)

Area	Number of						Total number of houses		Total number of flats	
	houses	flats	rooms for living	living area in m^2	households covered by census	inhabitants	in towns	in villages	in towns	in villages
1	2	3	4	5	6	7	8	9	10	11

5. METHODS OF ACHIEVING CONSISTENCY BETWEEN NATIONAL AND REGIONAL LOCATION PLANS

by D. Schejbal[1] and O. Žurek[2]

Consistency of the aims and efforts expressed in programmes and plans for the development of a national economy and purposeful regional arrangement are an inseparable part of national economic planning and programming. They are the most substantial part of regional planning. Production location concerned with the branch viewpoints and needs as well as the conditions of individual regions is a complicated and exigent economic activity. The correct execution of this work can benefit the producer and society as a whole. It is necessary to follow all relations induced by a newly located production plant in each region and to evaluate these relations objectively.

The theory and practice of national economic planning are continuously facing new problems and tasks. The following study presents the basic criteria used to approach the solution of such problems in national economic planning in the Czechoslovak Socialist Republic. The main objective of this paper is to contribute to a mutual recognition of efforts for the development of planning methods and management activity in the economic life of various countries with different socio-economic orders.

The relation of the national economic plan to the development of economy in regions

General conception of the problem

The economic development of a country involves problems related to the location of the economy. The degree of solution of location differs considerably in individual countries and in groups of countries. In various socio-economic orders economic laws operate in different ways and their influence on the production process as a whole also varies.

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2/ Ministry for Economic Planning, Prague.

In centrally planned economies the possibilities for the solution of questions related to the location of the economy are favourable because the government controls the planned management of the entire economy and employs it for the benefit and satisfaction of society as a whole. In market economies there is a vast scope of interests and goals which cannot always be harmonized.

The solution to problems related to the achievement of consistency between a national plan and regional location plans depends on the character of the development of the national economy of a country; that is whether planned management of national economy is involved or not.

A scientifically planned economy is one that develops according to a programme drawn up in advance, rationally utilizing all available possibilities and means. A scientifically planned economy not only considers all spheres of the production process such as manufacturing, distribution, exchange and consumption, but also all aspects of material, labour, costs, sectorial and territorial planning as well as the time aspect.

The criteria for a planned economy must then have these features:

(a) Proportional development on the basis of socially conscious planned activity of the people;

(b) Consideration of all spheres of the production process;

(c) Developments for the interest of society as a whole with an aim to raise living standards continuously - both material and cultural.

Regional location of production is an inseparable part of economic planning in the development of a national economy. The position of regional planning in the complex system of the development of a national economy, especially the location of industry - technically and economically the most progressive sector of a national economy - becomes an inseparable part of a national economic plan and one of its most important aspects. The degree of consistency between a national economic plan and regional location plans - especially where industry is concerned - is dependent upon the degree of planned management of the production process.

The necessary starting point is the development of production. Changes of proportions in the national economy as a whole are reflected in the proportions of various groups, branches and industries in one region or another, and in the proportions among individual regions of the country. Correct relations between branches and industries within each region and the creation of

missing links or the fortification of backward links in regions is of extraordinary importance not only for the development of a given region but for the economy of the entire country.

The proper regional location of production means the harmonized development of all branches of national economy in the regions and the creation of correct proportions in the development of the whole economy and culture. Correct proportions contribute greatly to the effective development of the national economy and help to create conditions necessary for the development of higher living standards. To achieve such proportions it is first necessary to consider the possibilities and needs of the national economy and the possibilities of rational exploitation of the natural and economic conditions of each region. This information becomes the basis for regional economic planning and within its framework regional location plans are formed.

Proportional development of all regions of a country does not mean a simple arithmetical balance, for example, of the rate of growth of industrial production, the structure of industrial production and the level of per capita income. Proportional development of all regions signifies a proper division of labour among individual regions and a purposeful harmonized development of individual branches in the regions. This is achieved by preferential development of those branches and industries of national economy in regions that have optimal conditions for their development. These conditions can be of a natural or economic character. To ensure the most purposeful growth of national economy, each region must utilize to a maximum degree - but rationally from the point of view of society - all its available resources. The economy of all regions can then develop in a rising curve, even if it is not possible - or even purposeful - to develop at a uniform pace. At the same time it is necessary to continue efforts to eliminate substantial economic differences among regions.

Regional proportionality in the development of a national economy is not only a matter of proportion in the economic development of the regions themselves, but of proportion that will bring about the purposeful exploitation of natural and economic conditions for all regions by the exploitation of national wealth, natural and financial resources, the labour force, and all other resources and interrelationships.

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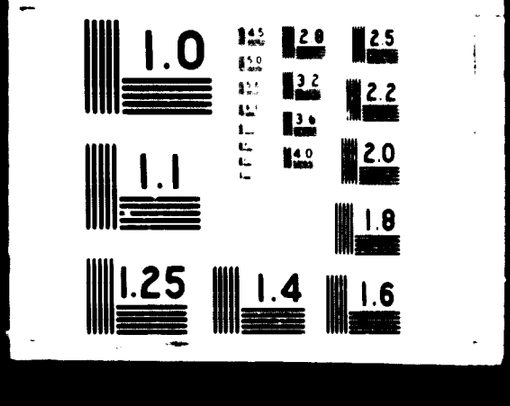

The principal relationship between a national plan and regional location plans is one of basic proportions of national economy in the territorial aspect of individual regions and among the regions mutually. This implies comprehensive plans for the economic development of regions with a mutually harmonized development of industrial and agricultural production, transportation and building, trade and commerce, cultural, educational and sanitary facilities and housing projects and the solution of such problems as water supply.

The location of production, one of the substantial factors of economic development in regions, must be examined comprehensively from the viewpoint of development of production in regions and their territorial relationships. Such an examination will express the conditions and costs connected with the implementation of regional location plans.

These considerations lead to the term, complex economic development of regions, which is often theoretically overvalued but only partially understood.

Complex economic development of regions can be understood as the proportional development of: (a) a complex of branches of a national economy, that is, certain parts of the productive sphere; and (b) the necessary complex of branches of the non-produotive sphere.

The complex economic development of a region has individual links forming the base of the proportional development of its economy. It is possible to analyse these links and to determine the proportions of development of a region and the position of its economy in the national economic system.

Experience has shown that certain general principles are valid for practical application in proper location of production. Economic activity may be subordinated to practical application according to specific conditions in each country. These principles are generally valid, though only one of them may be accentuated in each country at certain stages of development.

The general principles have been developed from the fact that the rational location of production in the regions of a country is reasonable only if favourable conditions are created for:

(a) The growth of social productivity of labour;

(b) The national exploitation of all resources of a country such as natural wealth, labour and financial resources;

(c) The solution of socio-political problems connected with overcoming economic backwardness and conspicuous differences in

living standards. (The backwardness of certain territorial entities must be solved by the government through an effective regional policy.)

These general principles for the location of production express not only the goals of practical activity but also the point of departure for the achievement of consistency between the national economic plan and regional location plans.

The branch principle in national economic planning and the ensuring of regional proportionality

Consistency between the national economic plan and regional industry location plans from the viewpoint of the principles and criteria mentioned above requires an organizational structure of national economy as a whole, and managing and planning authorities. Working together they serve this purpose to the best advantage.

Economic proportionality in the development of a national economy requires:

(a) A development plan for all economic branches of the national economy, evaluation of the role of sectors, plans for the utilization of labour, and other detailed planning prepared by a state planning commission;

(b) Development plans for individual branches and industries worked out by central organizations (ministries) and their subordinate organizations;

(c) Development plans for the economic activities of regional, district, municipal and local administrations.

The comprehensive development plan of a national economy is thus formed, apart from the basic economic balances, by a combination of comprehensive development plans for all economic branches and industries according to their organizational structure and according to the development plans of the regional branches.

In practice the organizational structure is expressed in the so-called two lines of planning (even if several planning levels are involved):

(a) Planning of economic activity by central organizations (branch planning bodies);

(b) Planning of economic activity by regional organizations (local, municipal, district and regional).

In the system of national economic planning the branch principle prevails and will continue to do so. This principle does not offer a true image of its

feasibility because the verification of regional possibilities cannot be realized; for this reason an examination of the regional aspects of the development of individual branches and industries must be made. Consistency of purpose of a national economic plan and regional location plans may be assured by:

(a) Profitable division of labour, to ensure regional proportionality of economic plans on all levels of management and planning; and to ensure close mutual co-operation to determine the duties and liabilities for procuring basic data;

(b) Establishing specific responsibilities for subordinated organizational units such as branch managements, branch enterprises and research and project institutes;

(c) The creation of a system of methods by means of indices, of economic and financial instruments of planning documentation to study economic phenomena, to establish production location and ensure economic and cultural development of the regions in accordance with their specific conditions;

(d) The determination of appropriate economic and financial instruments to ensure regional proportionality.

Economic territorial division of the country

To ensure advantageous location of industry in accordance with the national economic plan, it is necessary to divide the state into units in which the planned management of national economy from the territorial viewpoint would be possible. These territorial units should correspond to the requirements of the study and the expression of economic and natural phenomena.

Such a division of the country into regions according to economic and natural conditions determines the participation of the regions in the division of labour and creates favourable preconditions for the planned establishment of proportions on the basis of rational exploitation of resources.

Natural and economic conditions in individual parts of the state vary greatly, resulting in substantially different regional units linked by a rational division of labour.

The division of the country into regions can then be carried out as follows:

(a) Economic regions are created according to economic and natural conditions and are used exclusively for the solution of questions related to the implementation of regional plans of production location. These regions usually have no directive organs and the activity concerning their development is carried out centrally. The regional location plans are then worked out according to these economic regions;

(b) The regional location plans can be based on the administrative division of the country (regions, districts, municipalities etc.). The advantage of using the administrative division of the state for regional planning lies in the fact that many directive and planning bodies are organized according to the regional aspect of the development of national economy so it is possible to organize co-operation among lower planning bodies. For example, the division of public administration of the CSSR as created in 1960 became the basis for the development of works connected with regional proportionality of national economic plans. This administrative division of the country into ten regions and the capital, Prague, and within these regional 108 districts, is practical for regional planning. In creating this regional organization attention was paid to the decisive economic conditions of separate regions as well as to the possibilities of effective development of the economic-organizational function of the state in regions.

The division of the state into smaller units making possible the examination of all areas of operation is one of the conditions needed for the achievement of consistency between the national plan and regional location plans. Such a territorial division not only helps to solve economic problems effectively but brings about a comprehensive cultural development of all regions.

The merger of centres into larger territorial units differs according to their problems. It is difficult to solve the balances and distribution of manpower, but such balances must be worked out not only for districts and regions but in relation to principal economic centres and transportation facilities.

To ensure the regional aspect of the development of a national economy, it is useful to examine a whole system of basic data and analyses according to chosen territorial units (regions) which will differ from each other in the extent and intensity of their natural and economic conditions.

The economic region is therefore a general denomination of various types of territorial units. In the Czechoslovak Socialist Republic the public administration division of the state has created the basic regions for which economic plans are drafted. Slovakia represents a territorial unit within the framework of a united Czechoslovak economy in which there are specific economic and political aims and a national development and historical background different from the regions of Bohemia and Moravia.

Consistency between regional location plans and the national economic plan

The achievement of consistency between regional location plans and the national economic plan as an inseparable part of the whole process of planned management of national economy is realized in five basic phases:

(a) Collection of data;

(b) Analysis of data collected;

(c) Decision-making: setting of tasks, determination of instruments and conditions;

(d) Fulfilment of tasks under operational management;

(e) Final control.

Collection of data

The beginning of the process of planned management is the collection of such data as the condition of the national economy, the level of productive forces, the state of exploitation of natural resources of the country and the influence of national and international political factors on the development of the national economy. The collection of such data from the regional aspect has a decisive influence on the determination of a starting basis, and for the estimation of basic trends and tendencies of development in regional location.

Analysis of data

The analysis of this regional data is the second phase of the process of management. Careful analyses contribute to:

(a) Qualitative examination of individual phenomena and their individual components in regions;

(b) Determination of the decisive links and activities, and interrelations among individual phenomena in the regions;

(c) Formulation of conclusions about factors influencing the development of the phenomena examined, and measures to be taken in accordance with the aim of the analysis.

From the regional aspect, thorough scientific analyses of the state of location and of the natural and economic conditions of individual regions are important fundamental tasks at this phase of management.

These analyses should be elaborated at the beginning of the work on a long-term prognosis of the development of a national economy. They are of a twofold character and are worked out along two lines - branch and regional.

Central branch organs work out, with the help of their research and project institutes, the analyses of present development, the state of production location in individual industries, development tendencies, the scientific and technical developments of industries and their influence on the further development of production location.

The regional organs work out summary analyses of the achieved degree of development and the exploitation of natural and economic conditions of individual regions.

On the basis of these analyses and its own data, information and studies, the planning centre determines:

(a) The possibilities of further exploitation of natural and economic conditions of individual regions;

(b) The factors which can accelerate, decelerate or even limit the development of production in the regions;

(c) The main changes in production location which may be expected in the coming years as a consequence of present or already-started development and as a consequence of the development of new techniques or other development tendencies or targets;

(d) The problems to be solved.

The basic data for these analyses can be divided into such categories as: data about natural conditions, raw materials and emergency resources (the possibilities of their exploitation and the probable time when exploitation can begin); data about demographic development and structure of the population; the location of industrial and agricultural production; production and consumption relations within each region and among regions; and transportation data.

The data should be suitable for perspective plans, the material clear, of simple construction and with graphic and cartographic annexes. This basic material must be available to the decisive branch and regional planning bodies.

The development and the predetermination of industrial location in the Czechoslovak Socialist Republic and the basic tendencies of influence must be respected to a large extent in further plans of regional location of production. That is the case of the Czechoslovak Socialist Republic at present, where a long-term projection for fifteen to twenty years is being prepared. The conclusions arrived at, on the basis of the analyses, are applicable to a number of industrially developed countries; they are:

(a) The present development of Czechoslovak economy demands exploitation of conditions and resources and the utilization of already

existing productive fixed assets for the achievement of a more regular location of production, so that the future development of national economy and, with it, production location will be influenced by the degree of exploitation of these conditions for economic development. Economic relations within the regions and among them have increased, becoming significantly more intricate;

(b) The necessity to increase economic effectiveness through intensification and through the realization of necessary structural changes, especially in manufacturing industries, tends to lead to a situation under which the increase of production will be further concentrated in key plants, branches and industries;

(c) The location of new productive capacities in a number of branches, especially in manufacturing industries, has to be secured - while observing the principles of social effectiveness - in a manner that utilizes manpower resources available in certain regions;

(d) The necessary process of reconstruction and modernization of productive fixed assets of a number of branches will have an outstanding regional character. The need for complex development of the regions will be an important condition in decisions on the order and significance of reconstruction and modernization of existing productive fixed assets (the problem of the reconstruction of productive fixed assets in Bohemian regions in districts and branches industrialized in the epoch of the primary industrial revolution);

(e) The process of production concentration and specialization already begun in many industries (engineering, textile and garments, and foodstuffs) brings new regional problems in the full exploitation of new productive fixed assets, in the growth of new and more complicated inter-industry relations and in the problems of reserve labour opportunities in localities where old productive capacities have been liquidated;

(f) Development of agriculture requires not only selection of land suitable for intensive development in individual regions, but the solution of a whole set of problems of outstanding regional character brought to life by the introduction of wholesale production in this sector;

(g) The organization of cargo transport in national economy as a whole will require a strict observation of regional aspects in the location of productive forces;

(h) The direction of the flow of supplies resulting from the developed international socialistic division of labour (coal, iron ore, oil, gas) became a new factor in the rational and effective location of productive forces. This led to the creation of new industrial regions (Bratislava, Košice) where extensive construction of new productive capacities of a series of basic industries is under way (metalworking, chemistry and engineering);

(i) The development of production occurs under continuously deteriorating conditions as far as water supply for industry, agriculture and population is concerned. The maintenance of water in a region requires good care of forests and the avoidance of pollution;

(j) It is necessary, more now than ever, to link the gradual solution of housing problems with the elimination of backwardness in technical and civic undertakings.

The preceding survey, which should serve for basic orientation only, shows that these and other circumstances have their influence on the development of the economy as a whole and urgently require a sensitive solution to regional distribution and location.

Decision-making: setting of tasks, determination of instruments and conditions

The third principal phase of planned management of national economy and its regional aspect of development is decision-making: setting of tasks, determination of instruments and conditions for their implementation.

Economic decision-making depends upon the analyses and studies carried out, the goals of economic development, the determination of direction and pace of this development, the basic proportions of the development and the determination of means for its realization. The basic instrument of management and thus of decision-making is the national economic plan as a general conception of economic development, giving the proper orientation to each enterprise as a part of the national economy. The plan must represent the binding framework of the economic policy of the state, specially through centrally directed financial credit, income and price policies. The national economic plan and measures taken by the state in this respect will determine the concrete tasks of the units of economic activity.

Decision-making should be considered the main phase of the process of management in the field of regional planning and the choice of indicators and instruments should be subject to it.

Fulfilment of tasks and operational management

The fulfilment of the plan and the realization of economic tasks occur under ever changing conditions. In the fulfilment of the plan itself unforeseen circumstances, unsatisfactory work, the influence of foreign trade, and changes in international relations, can alter the economic relations of future development and, consequently, influence investment activity and the development of the labour supply.

It is therefore necessary to adjust or to modify the set economic tasks according to influences, and to do so on the basis of influences on operational management of economic administration.

Final control

The control of the fulfilment of the tasks by the managing organs which closes the process of management is important. While controlling the fulfilment of the development plan of national economy from the regional viewpoint, it is necessary to concentrate on the principle of the main link, to direct attention to the main link of the national economic plan, to regions and tasks which can influence in a decisive manner the goals and development of the national economy.

For this purpose it is necessary to establish a system of indicators and controls. Individual changes occurring in the regional production location usually have a long cycle; it is therefore not necessary to execute the control of the fulfilment of the plan in this field in short-term intervals; semi-annual and annual controls are usually sufficient. In some economic activities the time period can be longer.

Control should be based on the data of statistical services, whioh should organize their work in relation to regional problems.

Organizational forms of planned management

The solution of problems related to the realization of economic plans from the regional viewpoint demands effective organization.

In the system of planned management of national economy, the basic condition for the solution of the regional aspect of the development of national economy is the creation of relations of the planning centre with central branch and industrial organs and regional organs.[3/] Thus, it is necessary to create the conditions for the elaboration of the draft of the plan in individual

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3/ In the CSSR the law emphasizes the highly responsible role of national committees - organs of popular administration - in securing the harmonious complex development of national economy in regions administered by them, irrespective of the subordination of economic activities in the regions. In this sense the term "regional organs" is used in the text.

branches of the national economy (the co-operation of central branch and industrial organs and enterprises with regional organs). These relations create the organizational conditions for the estimation of proportions in the development of economy managed by the centre and economies managed by regional units.

The basic proportions in the economic development of regions, the proportions among regions and the use of economic instruments must be determined by central authorities. The regional aspect of the development of a national economy is, therefore, directed and centrally co-ordinated by the planning centre (in the CSSR the State Planning Commission). For this purpose it elaborates the analysis and evaluation of the existing state of exploitation of natural and economic conditions of individual regions, and works out basic proposals for effective exploitation.

On the basis of these analyses and considered lines of development of the national economy, it proposes basic long-term directions and aims for the development of individual regions consistent with the needs of further development of productive and non-productive spheres, and presents these proposals to the Government for approval as part of a comprehensive draft of the national plan. Ministries and other central units, branch managements and association enterprises, and regions are informed of these directions and aims. The proposals of the centre are then compared with the technical-economic studies worked out for the development of individual branches from the viewpoint of economic needs and requirements. On the basis of these comparisons, basic long-term directives and aims are set.

The planning centre has a special department of regional proportionality which elaborates and applies appropriate economic and financial instruments. These form part of the whole economic system which ensures regional proportionality.

The planning centre then proposes a general system for: co-ordinating the participation of ministries, central units, branch managements and regional units for material and organizational problems of production location and economic development; the co-operation of central statistical units to determine the required accounting and statistics and to present suggestions for scientific research concerning these problems.

It is therefore necessary to adjust or to modify the set economic tasks according to influences, and to do so on the basis of influences on operational management of economic administration.

Final control

The control of the fulfilment of the tasks by the managing organs which closes the process of management is important. While controlling the fulfilment of the development plan of national economy from the regional viewpoint, it is necessary to concentrate on the principle of the main link, to direct attention to the main link of the national economic plan, to regions and tasks which can influence in a decisive manner the goals and development of the national economy.

For this purpose it is necessary to establish a system of indicators and controls. Individual changes occurring in the regional production location usually have a long cycle; it is therefore not necessary to execute the control of the fulfilment of the plan in this field in short-term intervals; semi-annual and annual controls are usually sufficient. In some economic activities the time period can be longer.

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Central and branch units work out calculations and analyses for development and changes in location of the economy with which they are concerned from the viewpoint of the location of production, fixed assets and basic co-operative relationships.

The development of branch industries in regions usually is determined by:

(a) The conception of location on a productive-technical and development-research basis based on existing location and maximum exploitation of existing capacities;

(b) Classification of organizational units, enterprises, plants, works in regions, that is, the division of individual enterprises, plants and works into categories of development units, stabilized units, units for liquidation, expected changes in the utilization of productive capacities, and the like;

(c) The conception of the organization of the production of the branch in the region, that is especially the problems of concentration, specialization and combination of productions with respect to customer-supplier relations and co-operative relations and the conception of the development of technical level of production;

(d) The conception of the development of the production of individual regional branches and industries on the basis of economic needs;

(e) The utilization of economic instruments for ensuring long-term development of production of individual branches and industries consistent with regional proportionality.

Regional units are the necessary organizational components to solve regional problems in the development of the national economy, and they should ensure the full economic development of the regions.

In accordance with the needs of the national economy on the basis of instructions from the planning centre and the Government, regional units can ensure the most purposeful use of natural and economic regional resources and the consistent development and location of the economy, administered and planned by local organs, with the location and development of the centrally managed economy. They must estimate the development of proportions and relations in the complex economic development of regions, smaller territorial units, industrial agglomerations and large cities.

Regional units must work out comprehensive draft plans for economic development of the regions on the basis of: directives from the planning centre, their own basic data, data from branch and industrial managing organs and their subordinated units, from communities, municipalities and districts

for enterprises administered by them, and present these drafts to the planning centre. A comprehensive draft then becomes a basic document for the management of economic activity.

The suggestions of regional units for better utilization of their natural and economic resources, for achieving interregional proportions, and for utilizing economic instruments become a part of the draft of the over-all plan.

The regional aspect of national economy and planning documentation

The system of national economic indicators, economic instruments, planning methods and procedures and documentation help to develop the regional aspect of a national economy. To fulfil its mission the system must respect individual conditions of branches, industries and regions so that specific features are observed and unified activity achieved.

System of indicators

Economic indicators in the field of regional planning are the verbal expression and numerical determination of the quantitative contents and qualitative relations of one aspect of the production process - the regional aspect. This system should:

(a) Determine the basic relations and the degree of utilization of natural and economic conditions of the regions;

(b) Estimate and determine the main changes in production location and the basic proportions of the economic development of regions, mainly the proportions in the development of productive and non-productive spheres, between the development of industry and agriculture, between the need for construction work and the capacity of building industries, between the resources and need of manpower, and between incomes and expenditures of the population;

(c) Estimate and determine interregional proportions in the development of production, transportation and housing;

(d) Carry out, balance and unify work needed to ensure proper regional proportions of manpower, investment construction, water supply administration, transport and incomes and expenditures of the population;

(e) Estimate the economic effectiveness of proposed solutions;

(f) Create conditions for organizations at the branch and regional management levels to collect data on responsibilities.

The system of indicators can be divided into two basic groups:

(a) Indicators which become the subject of co-ordination in individual regions such as the indicators of the plan of labour, investment

activity, construction work, transport, water supply administration, housing projects, educational, cultural and recreational facilities;

(c) Indicators that estimate and determine the pace of development of the economy in regions, the development of living standards, the state and degree of the utilization of natural wealth and the state and development of the location of production branches and industries. Together with the first group, these indicators estimate basic regional proportions.

Both groups of regional indicators are an inseparable part of the method of instructions issued by the planning centre for drawing up plans for regional and branch organizations.

The indicators listed in the annex are used in national economic plans (especially for the five-year period) for the examination and determination of regional proportionality in the Czechoslovak Socialist Republic.

Economic instruments

Economic instruments are also an important factor in the system of methods. Following the basic principle, economic and financial instruments do not work against the major requirements of society in production location.

The basic instrument of the management of the regional aspect of the development of a national economy is the plan with its basic goals, ways and means; however, another instrument of management can be the purposeful connexion of the plan with the market mechanism.

Economic instruments must be used either as a stimulant or a limitation. The choice of these instruments must respect the fact that economic processes in regions and localities demand the expenditure of national resources (induced investment).

The basis for the determination of economic instruments to ensure the regional aspect of the development of a national economy is the analysis of the development of the economy in regions. It is determined by a long-term (five-year) plan indicating problem areas and basic goals.

Economic (financial) instruments can be divided into positively stimulating economic instruments, and limiting economic instruments. Some examples are given below.

Positively stimulating economic instruments:

(a) Subsidies from the Government for partial coverage of investment costs of the investors. The subsidies can be a fixed per cent of the budget cost of the investment (e.g. 15 per cent of the total budget cost) or a per cent limit (e.g. 5 to 25 per cent of budget investment cost when giving preference to certain industries), that is, for regions and localities determined by the Government for a longer planning period, such as a five-year period;

(b) Reduction in the per cent of contributions (taxes) payable from the productive and non-productive fixed assets to level out the increased operational costs of the enterprises in special cases and regions determined by the Government. The enterprises and plants would pay the contribution (tax) from fixed assets in specified regions or specified branches according to a reduced percentage rate (reduction by one third) and for a certain period after being put into operation (3 to 5 years) or for the period of the necessary trial-run of the production;

(c) Credit preference and eventually a reduced interest rate on the credit granted - a certain percentage cut determined in advance for investment operations in selected regions, industries and activities.

Limiting economic instruments influence organizations which plan the development of production and investment activity in regions with intricate technical and territorial problems, especially manufacturing industries that do not require a location related to a raw material or some specific natural condition.

Limiting economic instruments:

(a) The increase of the rates of contribution (taxes) from the fixed assets of newly constructed production capacities for a certain time after the start of production (one third of the rate). The resources gained in this manner can be used for the administration in districts, municipalities and localities or for subsidies for the promotion of economically less developed regions;

(b) The determination of additional contributions (taxes) from gross income or profit for a certain period after the start of the operation of production organizations which can be passed to the state budget or to local administration budgets;

(c) The determination of fees in the case of new constructions, where the basis would be a percentage from the price of the realized investment to the state budget or to the local administration budget;

(d) The introduction of an economic instrument to direct the development and proportions in regional distribution and utilization of manpower resources. The utilization of this instrument can be bound to the extent of the total of wages paid out by enterprises and plants (e.g. 2 per cent) in relation to the increment of

workers in comparison with the preceding period (that is, a year). This additional fee (tax) can be determined only for regions and localities where there are large differences between the resources and demands for manpower, eventually differentiated to ensure a purposeful development of the structure of labour in relation to resources (men-women) and where the society does not have any interest in further concentration of production and population into a few industrial agglomerations, but wants to solve further location of industry from the political-social aspects. The aim of the application of this instrument is to lead the producers of the given region to use progressive technical solutions in production to save labour and thus to ensure the planned result in production increase.

The use of economic instruments for ensuring the regional goals of the development of a national economy is an important link in the achievement of consistency between the national economic plan and the regional industrial production location plans.

Kinds of plans

A long-term perspective plan for the development of a country covering a period of ten or even fifteen to twenty years can deal fully with the problems of production location. Based on the evaluation of natural conditions, the perspective plan can call for: the solution of complex economic problems in regions, the preparation of large territories for industry or agriculture, the exploitation of natural resources such as mineral wealth, the orientation of agricultural production, and the creation of preconditions for industrial processing. The long-term plan can assess in the best manner the need for and the consistency of activity in the non-productive sphere, the conception of housing construction and the construction of civic and technical facilities. The regional location of production (enterprises or plants) depending on the state of production location in individual regions is preceded by basic studies from the planning centre.

In preliminary technical-economic studies for the development of branches, it is possible to assess the effectiveness, needs and demands of the branches to be located in regions. The determination of technology for the development of industries is one of the basic factors connected with regional problems.

Perspective plans worked out, for example, for a five-year period must gradually bring to a realization the production locations contained in a long-term plan. Five-year plans include a more detailed consideration of regions than is possible in a long-term plan. They estimate the demands for production

in relation to space and time and include a selection of location variants. They estimate in detail the relationship between primary industries and manufacturing industries.

Perspective plans are worked out for each year of a given period in a manner which enables mutual co-ordination of time and planned action in regions.

In annual plans the questions of regional development and production location are only mentioned. One-year plans are important instruments for the realization of regional intentions and for disclosing existing or future partial disproportions in regions which have not yet been recognized in detail.

The system of national economic plans used at present in the Czechoslovak Socialist Republic provides every opportunity for achieving consistency between the interests of the economy as a whole and the interests of regional production location. The tasks of individual plans of this system are expressed in their specific methodology, so that the solution of regional problems may be worked out gradually and concretely.

Mutual co-operation of planning bodies

If a plan is to realize its objectives for the development of the economy, the managing units must co-operate at all stages of the national economic plan (irrespective of its kind) in a time continuity that enables all units to fulfil their functions.

After the determination and issuance of directives for the drawing up of a plan by the planning centre (Government) or, during the period of preparation of perspective conceptions, the branch units (ministries, association enterprises and branch managements) must present their projects within the determined scope of regional indicators both to the planning centre and to regional units.

The regional units should participate directly in the preparation of the plan. On the basis of their own data and the data of the branches, they work out the drafts for the development of the economy and culture in regions and present these drafts to the regional units of the planning centre. The results of negotiations between branch and regional organs are an inseparable part of the planning documentation.

The planning centre then has at its disposal the drafts of the plan of the branch units, with certain basic data about the regional location of production, and the regional complex drafts of the development of the whole economy in the territory of the regions, including the results of negotiations between these units. The planning centre should be informed of the details of contradictions between units. It is at this moment in the process of the creation of a national economic plan that the closest consistency with the regional aspects of realization is reached from the methodological point of view.

On the basis of the data mentioned and its own material, the planning centre should discuss the contradiction of aims between branch and regional units, work out the final draft of the plan of regional location of the economy as an inseparable part of the national economic plan, and determine the basic goals and tasks in this field.

The comprehensive national economic plan (including its regional aspect) must be approved by the Government. In the Czechoslovak Socialist Republic the Government and the National Assembly must approve the basic goals and tasks for the development of the national economy to become a law.

The regional aspect of development

The method of the main link is a basic method used in the field of regional problems. Usually, the whole complex of economy in regions, the specialization and portion of regions in the national economy are examined by this method.

The decisive factor in complex economic development of regions is represented by the fields of production which establish the position of a region and its specialization. These are the specializations which will bring about the most rapid development of the productive forces of the entire state from the most effective utilization of local conditions, material and manpower.

The degree of specialization of production can be expressed by the share of the total production of all branches in the regions, by the share in state production of respective branches, and by the share of production in the coverage of the needs of other regions of the country. The extent and direction of the relations among individual regions is determined by the concentration of production and the peculiarities of structure.

The level of the development of productive forces in individual regions is, first, dependent on the scope and pace of development of specialized industries. The economic complex of a region is formed around one or several industries. The complex of industries has to be examined, therefore, in relation to the leading industries.

Recent experience in Czechoslovakia shows that in a number of regions it is not possible to realize an all-round development of industrial production. Because of economic reasons, some industries, enterprises or plants receive "preference". This means that a longer-term process of more distinctive specialization, in accordance with the needs of the national economy, begins to appear.

For the future, the problem rests in determining the main lines of regional specialization, the main links of development, and in the subordination of all other goals to the development of the regional economic structure in these decisive directions.

The development level of production fields and future possibilities consistent with the uninterrupted development of the specialized regional production are taken into account when using the method of the main link.

To increase the level and possibilities of these fields is not only important to mobilize the resources in each region, but also to accelerate the production process, to decrease production costs and to create effective management of production.

Industries and enterprises connected with the production of goods for local consumption are an important consideration, especially the production of construction materials, the consumer and foodstuffs industries and agricultural production. Proportional unity of these three groups is important to ensure the complex development of the economy of regions and the correct regional location of production in general.

There is a certain dependency between technical progress and regional location of productive forces which cannot be omitted in using the method of the main link. Technical progress alters the criteria for production location, liberates production from local borders and enables a more regular location of industry and agriculture throughout the country. The achievements of technical progress can be applied best under the conditions of rational production location, that is, under the most purposeful utilization of natural and economic conditions of individual regions.

The influences of technical progress and regional location of production can be briefly characterized as follows:

(a) Improvement of technology of production changes the demands on production location and the criteria for location;

(b) Mechanization and automation leads to a considerable increase in productivity of labour and growth of production and a decrease in production costs;

(c) Development of techniques enlarges and enriches the raw material basis of an industry; new sorts of raw materials appear, and research helps to discover new natural resources;

(d) Concentration of production increases the specialization of the regions and their share in total production;

(e) Increase of the efficiency of technological methods has a direct influence on the growth and proportionality of the economic development of the region;

(f) Changes in structure occur, such as combined enterprises which completely utilize raw materials and waste materials;

(g) Economies in raw materials made possible by general technical progress of the industry cause changes in the needs of regions;

(h) Changes in transport utilities either heighten the efficiency or change the mode of transportation as an important factor of rational transportation.

A final group in the complex economic development of regions is formed by those branches of national economy which create the conditions for the activity of the mentioned groups of production (transport, water supply, energy and the like).

Investment activity

Preparation and creation of investment plan

Investment activity, especially the construction of new productive capacities, has a decisive influence on changes in production location and on the pace and structure of the development of production in regions. The reconstruction of existing capacities, their modernization and completion have a significant regional importance. The plan of investment construction has become the most important instrument in the regional aspect for the development of a national economy.

The preparation of investment construction can be divided into several time-limited stages according to their character. The initial stage has the character of planning preparation, while the following stages assume gradually

the character of project preparation, that is, technical-economic and technical projects and territorial-technical basic data.

The construction of new industrial capacities (enterprises and plants) comes from the fulfilment of development plans of the national economy. Long-term perspectives can solve the complicated questions related to production location, preparation of new sites for the construction of industrial bases, the construction of hydroelectric power stations, railway networks, and the preparation of the territory for the development of agriculture.

By their character, regional schemes emerge from national economic plans and make precise demands on time, material and total investment. Therefore, the result of such a complicated activity is the project for a certain territory which is then decisive in the construction and reconstruction of productive capacities, as well as of the other related objects either induced or conditionally bound to such a construction.

According to the character of the territory and the character of the problems to be solved by the projects, solutions can be brought about by regional schemes for large territories or development plans for settlements, towns, agglomerations or villages.

Territorial projects serve as a basis for the issuance of building permits for the realization of an investment in the territory. The issuance of a building permit concludes basically the site of location. The unit issuing the building permit (usually district, municipal or local administration) controls, before its issuance, the conditions that determine the stages of the preparation of the investment.

Regional schemes are advantageous for the construction of large areas which call for vast and complicated changes in the surroundings, reconstruction of territories, and the construction and reconstruction of cities.

Technical-economic motivation

An important part of the planning preparation of investment construction is an elaboration of technical-economic motivation of the investment to estimate and determine the main economic and technical indicators.

Technical-economic motivation is usually a part of long-term perspective plans of investment construction and is the basic for working out project and budget documentation.

The technical-economic motivation of industrial construction usually consists of such information as calculations to determine the production capacity or the structure of a production programme, the economic motivation of raw material, the fuel and energy basis, calculations on the relation of the production of the enterprise to the regions of consumption, water supply data, transport information and manpower requirements.

The economic motivation of the site of construction in regional variants requires a separate analysis of investment for the construction of the production capacity and the inducement to invest.

The construction of industrial capacities, especially with large demands on labour, calls for considerable costs for the development of the municipality; such costs influence significantly the total economy of the investment location. Under these conditions the investor has to cover, in substance, the investment required for the development of the municipality. He must also examine the possibility of location in economically less developed regions with manpower resources.

For economically less developed regions, the planning centre must carry out the following:

(a) Make a selection of economically less developed regions, evaluate their possibilities and determine a programme for the preparation of these territories for economic development;

(b) Exercise "pressure" for the organization of production programmes in industrial agglomerations for the best possible conditions to stress production specialization in these regions;

(c) Contribute to the organization of aid to industrial agglomerations for economically less exploited regions where industrial development is planned. (Training of experts on the spot for the realization of construction and taking over newly constructed production capacities).

The complex evaluation of all conditions of the regional location of production capacities and their location in specific territories is a vast activity involving not only the quantification of branch conditions, but the evaluation of individual regional, territorial solutions; correct decision-making and utilization of the time factor. Each final solution in regional territorial location of new plants requires the analysis of a number of factors which help to create conditions for effective production and an improvement of the social and economic life.

Association of investment in regions

Association of investments refers to investors joined by a common interest in the development of certain utilities. This has considerable significance in the construction of infrastructure in a territory. It is to the benefit of the national economy to issue a binding rule which solves in detail the procedure of association of investments, including financing.

Association of investments in one common investment brings considerable savings to all participants, especially in costs connected with operation.

A well chosen participation of regional units of administration results in savings and it is in their material interest to ensure the whole process of association, according to the following principles:

(a) Association of investments should be carried out in regions by economic organizations administered by the branches and by the administrative units or enterprises of production co-operatives, regardless of whether the investment is of a productive or non-productive character;

(b) The association should be voluntary, modified by economic pressure in cases where the effectiveness of an associated investment is doubtful (that is in the form of refusal of investment credit or its limitation);

(c) The position of regional organs of people's administration is strengthened at all levels by the association of investments, especially their active role and initiative in proposing association, in the approval of the main investor, in determination of the participation of partial investors, not only for the construction but for the utilization of associated investment as well, in solving difficulties in financing and realization of associated investments, and in the division of savings achieved;

(d) It is purposeful to determine the participation of the units of people's administration on the use of savings up to the level of 50 per cent of total savings which go to the reserve fund for the development of the economy of these units;

(e) An active role by the state bank is important in decision-making for an associated investment.

Contemporary tendencies in the improvement of regional planning in the Czechoslovak Socialist Republic

The foregoing explanation of the methods of achieving consistency between a national economic plan and regional production location is based on the practices and experience of the Czechoslovak Socialist Republic. During the period of development of planning of national economy in the CSSR extensive

attention was given to the development of regions and to planning methods which would achieve such development.

Economic development in the last fifteen years has resulted in more than a quadruple increase in industrial production. At all stages of this development considerable emphasis was given to the role of industrial agglomerations; a large part of the effort for the total growth of economy concerned such centres.

This economic development brought about the construction and growth of production in economically less developed regions, and gave birth to new industrial centres so that no economically less developed territories remain. The preparation of a long-term perspective (up to 1980) presently under way will increase efforts for the solution of regional proportionality.

The Government has increased the role of national committees at all levels - regional, district, municipal and local - to ensure complex economic development in the territory administered by each organization. The fulfilment of this task will ensure a harmonious development of the economy of the territory administered by national committees, whether the production units are managed centrally or by local units (Law on National Committees No.65/1966). The modifications of The National Committees Law cover to a large extent tasks entrusted to the national committees as organs of the people's administration, especially with regard to the necessity to give greater attention to living conditions in respective regions.

The intricate conditions governing the location of productive forces in the CSSR have called for scientific examination and research, especially from the point of view of perspective planning. These requirements have led to a new evaluation of the role of scientific organizations. The Czechoslovak Academy of Sciences and the Economic Institute of the Slovak Academy of Sciences are examining the theoretical problems of the location of production forces. The extent of regional problems in the CSSR has recently led to the founding of a special research institute for regional planning. This research centre will analyse and evaluate scientific methods for the development of the Czechoslovak economy in regions and will examine possibilities in the regions to determine their role in the economy of the country as a whole.

Conclusion

This paper has endeavoured to present an explanation of basic criteria, preconditions, methods and organization of regional planning as an inseparable part of national economic planning. The growing exigency for a solution of production location and a harmonious development of the economy in regions consistent with their natural and economic conditions have been pointed out.

The solution of the problem requires a counterbalance between the application of the branch principle in the planning and management of the economy; and the ever-growing complexities of the methods of regional planning. The preparation of draft plans and their realization require organizational conditions. In this field the problems of management should be connected with economic regionalization of the country. The CSSR uses for this purpose the administrative divisions of the state.

All activity related to the regional aspect of a national economic plan must be based on detailed facts about the regions and a recognition of the demands of branches and industries on the "absorption" of existing possibilities in regions.

Methods for this work are based on the system of indicators, on economic instruments - limiting the development in certain regions - and on the application of measures to regulate regional economic development.

For the proper functioning of the whole system of regional planning, it is necessary to ensure that branch managing organs deal with the regional aspect of the development of their production. It is necessary to authorize the appropriate units in individual regions to organize activity to ensure all-round co-ordination, especially concerning the intentions of various participants in the development of economy in regions.

Technical-economic motivation of the location of productive investment, all-round preparation and implementation of investment programmes, and the evaluation of variants of location of new production in regions aid in the exploitation of investment activity as an important factor in production location.

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Appendix

INDICATORS USED IN THE CZECHOSLOVAK SOCIALIST REPUBLIC FOR ECONOMIC PLANNING

Below are listed the indicators used in the Czechoslovak Socialist Republic for preparing the development of economic complexes in regions, selected districts and agglomerations, for the Five-Year Plan of 1966-1970.

	Unit
1. Industrial production	
Volume of industrial production (Gross production in comparable prices)	million Korunas
Selected indicators in material units	
2. Agricultural production	
(per selected districts and per region as a whole)	
(a) Areas under cultivation	hectares
Agricultural land	
Arable land	
Hop fields	
Orchards	
Vineyards	
(b) Areas under crops	hectares
Grains	
Technical crops, total	
sugar beet	
potatoes	
fodder on arable land	
permanent pastures	
(c) Number of domestic animals	head
Cattle, total	
dairy cows	
(d) Market production for state funds, total	
Vegetable produce	tons
grains, total - mercantile	
technical sugar beet	
potatoes - mercantile	
Animal produce	
meat	tons
milk	1,000 litres
eggs	100 pieces

(e) Labour

Full time workers required	number
Full time workers available	
Women	

3. Forestry

Forest area	hectares
Timber production	

4. Transport development

Transportation of goods per main substrata and type of transport	tons
Road transport of persons (only state bus company) total of persons transported	1,000 persons

5. Retail turnover, total — million Korunas

Enterprises of public nutrition — million Korunas

Number of beds

6. Education and culture

Number of new students at day high schools and specialized high schools, total

Total number of students

in high schools
in specialized high schools

Total number of apprentices

in agricultural and forest schools
in specialized schools
in apprentice schools

Kindergartens, number of children

School clubs, number of members

Boarding homes, number of boarders

Children's homes, number of children

7. Health and social care

Health establishments, number of beds

Homes for retired, number of places

8. Local enterprises and co-operatives

Incomes from the population — million Korunas

9. Investment construction[a/]

Total volume of investment construction	million Korunas
in building works	
Total housing construction, number of apartments	
state	
in family houses	
Volume of building works carried out by construction organizations with the site of the enterprise within the region (irrespective of the site of construction)	million Korunas
enterprises of local building trade	
others	

10. Labour[a/]

Total number of workers as per regional balances (without apprentices)	
Yearly average	
Final number on 31 December (physical)	
Wage fund in the same classification	million Korunas
Total number of apprentices	
in specialized schools	
in apprenticeship	

11. Water administration

Need of water	m^3/sec.
Consumption of water	m^3
Unpurified refuse waters	m^3
Number of inhabitants using public water supply system	1,000 inhabitants
Number of inhabitants in flats with public sewerage system	1,000 inhabitants

12. Domestic consumption of gas

Number of inhabitants in flats connected with public gas system	1,000 inhabitants

13. Nominal Lists

Newly-started investment projects

Plants and works newly put into operation

Projects under construction

Plants and works to be shut down

Location of useful mineral deposits, indicating deposits worked

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a/ Presented by all branch and industrial organizations within the region.

6. CARTOGRAPHIC METHODS APPLIED TO REGIONAL PLANNING

by E. Alaev and S. Jack[1]

Planning and location policy

The two main objectives of a location policy are to achieve optimum distribution of economic activity throughout a country; and to provide rational development of all economic regions, provinces and municipalities in the country.

These two goals take different approaches. The first approach seeks the optimum location for a given project or group of projects, from among several possible locations ("where to locate the project").

The second approach determines the most feasible methods for economic and social development of a given region according to its natural resources, manpower, geographic situation and so on ("what to locate in the region").

The first approach is based on a location policy translated into location planning, the results of which reflect the existing location of productive forces.

The second approach is based on a regional development policy translated into regional planning, the results of which constitute a stage in the development of the economic regions of the country.

Thus, a distinction should be made between policy, planning and results. The policy-maker fixes the main targets and the criteria for evaluation of the results ("what is to be achieved"). The policy is then translated into a plan ("how and when the targets are to be reached"). The results serve as a basis for future plans. Clearly a defective policy will lead to defective planning and consequently, to poor results. Unfortunately, however, the reverse does not hold good, since a well thought out policy can be converted into an inferior plan, or a good plan poorly implemented.

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Location policy and planning are mainly - but not exclusively - the domain of national planning authorities. Regional development policy and planning are mainly - but again, not exclusively - the domain of regional planning authorities.

Neither policy can be carried out in isolation. Each project whose location is based on national considerations has its impact on regional development, while a regional development plan must dovetail with over-all national targets. The co-ordination of the two policies depends to a marked degree on the working relations between the central and local planning authorities.

Location policy is, by its very nature, subordinate to the over-all policy of economic and social development. What can be called independent are the methods used for analysis, calculation and implementation. These require a specially trained team within the planning body.

The aims and methods of a location policy should not run counter to those of a general development policy, but should serve to promote the achievement of approved general goals. Consequently, the decisive factors in a location policy are the same as those in a general development policy.

The aim of any economic policy should be to achieve the maximum results at minimum expense. In the case of a location policy, the method will be a rational distribution of resources throughout a given territory. Indeed, a location policy may be defined as the territorial aspect of a general development policy.

The rational distribution of activities - or the rational location of productive forces - implies that the location pattern was selected in accordance with a fixed criterion of optimization.

In many cases the word rational may mean the economic optimum (minimum capital outlay and current expenditure), or the social optimum (maximum employment in a given region). The equalization of economic regions, the national interest, commercial profitability and so on, may serve as criteria of rational development. Sometimes multi-national factors may influence rational planning of location patterns. Unless otherwise specified, the word rational implies that the location pattern was planned with a view to promoting both the economic and social welfare of the nation as a whole.

Like any of the countless planning and programming methods, the rational location of productive forces may be regarded as another way of saving resources and increasing national labour productivity. It does, however, have certain special features of its own, thus:

(a) More concrete and detailed plans and projects, since any decision as to location requires not merely general economic calculations, but also solutions to various technological and managerial problems, in accordance with the particular features of the region concerned. Thus, a distinction should be made between location (for example, the city of Mombasa) and site (northern suburbs of Mombasa, distance from port or railway station, and so on). For the location, all that need be known are the economic situation and the social conditions. When selecting a site, however, account must be taken of geological, engineering and other factors;

(b) The merits and demerits of a location policy are usually implicit. The planners can generally foresee the primary side effects, but the secondary and tertiary ones are a more difficult matter. The higher the level of locational planning, the easier it is to foresee the side effects of a project and take them into account when preparing the plan;

(c) Errors in location policy have one outstanding feature - once the policy is implemented, they are almost irreversible. Control targets in sectoral programmes, fiscal policies, or management patterns can be changed quickly when a mistake has been discovered, but a factory cannot be dismantled without heavy loss. Thus, a badly located project may be regarded as a permanent monument to defective location planning.

In all developing countries, regardless of their level of economic development, territorial distribution of activities is vitally important because the existing pattern of distribution is always unequal. Industrial and infrastructural activities tend to be concentrated in capitals or ports to the neglect of other areas. Because of unemployment in the neglected areas, the labour force - especially the young people - drift from those areas to the relatively prosperous cities, where unemployment soon increases, since even the rapid industrial development in cities cannot provide jobs for all immigrants. Moreover, the undeveloped areas cannot provide markets for the new industries, so that development of the advanced areas is hampered. If this imbalance afflicts regions with different races, political instability and chaos may result.

In the final analysis, both aspects - national and regional - are equally important. Nevertheless, it is obvious that more attention should be devoted to the aspect which has been previously neglected, and prompt remedial action taken.

Location policy and cartography

Methods for the analysis of statistical data and other information in planning include: data tabulation, graphic representation and processing in electronic computers. In locational and regional planning, however, maps can be an additional aid to analysis and decision-making.

Generally speaking, location policy and cartography go hand in hand. Files, catalogues and textual descriptions cannot take the place of a good map. Moreover, an ordinary map can, by special methods, be transformed into a tool for calculations and decision-making.

This paper deals mainly with cartographic methods that can be used in regional planning; some reservations, however, should be mentioned.

First, cartographic methods must be applied in conjunction with other methods. Although maps are essential in planning, they cannot be expected to provide solutions to all planning problems.

Second, the application of cartographic methods, although essentially simple, calls for special training. It is necessary to know how to read maps and to be familiar with "cartographic language".

Third, cartographic methods are no different from any other methods in their treatment of statistical information. In cartographic analysis, the data used should be:

(a) Geographical, that is, related to a given area, city, village or the like;

(b) Contemporaneous, that is, collected for a given period common to the entire mapped area;

(c) Homogeneous, that is, collected in the same form or units. For example, different power plants should not be shown on the same energy map with some indicated according to capacity (MW) and others according to production (kWh);

(d) Chorological, that is, varying from one region to another. If rainfall has the same value all over the country, there is no point in showing it on a national map, since the regions will not be differentiated. The same applies to all national data (Gross National Product, *per capita* income, etc.), unless broken down by regions. Chorological data can be used as guides in the selection of cartographic scales. The symbols can be divided into two groups: those marking the areas where the indicator is above the national average, and those marking the areas where the indicator is below (see appendix 7).

The main indicators used in the formulation of a location policy are locational factors, locational determinants and locational characteristics. Locational factors are those economic, natural and human resources of a country which constitute, as it were, the framework of a project or enterprise[2/] and thus determine its location. The main locational factors are manpower, raw materials, energy, water, transportation and the natural conditions of the locality in question.

Mention should be made of certain economic and technological factors which, while they cannot be called locational, nevertheless influence a location policy: economies of scale, technology patterns and produce specifications (bulk or liquid, transportable over long distances or otherwise).

Locational factors must always be taken into account though each project is influenced by these factors in different degrees. An aluminium plant would be sensitive to the "energy" factor but not a printing house. The indicators of the quantitative and qualitative relationships between projects and locational factors are called locational determinants.

Project	Total manpower requirements	Engineers and technicians	Skilled workers	Unskilled and semi-skilled workers	Remarks
Iron and steel works	2,000	170	830	1,000	Approximately 75 per cent men
Engineering plant	800	350	250	200	
Textile mill	500	50	100	350	Approximately 75 per cent women
Sugar mill	500	40	100	360	Full employment 6 months after the harvest season, otherwise 40-50 per cent.

2/ Generally speaking, an enterprise is something that is already in operation, while a project is still at the blueprint stage, or, at most, under construction.

The locational determinants of a project or enterprise are those technical-economic data which determine the selection of the most rational location.[3/] The dependence of four typical enterprises - iron and steel works, engineering plant, textile mill, and sugar mill - on the manpower factor is obvious. The precise manpower requirements of each enterprise are shown above.

The wide variations in these locational determinants and their influence on the selection of a location are clearly shown in the above table.

Every project has a large number of locational determinants. Some are of minor importance, while others play a decisive role and may be called critical locational determinants. For example, the critical locational determinants of a sugar mill are sugar cane and water; any area where these are not available in sufficient quantities can be excluded from investigation.

Locational characteristics, which, like locational determinants, must be calculated, are the qualitative and quantitative expression of the availability of locational factors in a given area. It is not enough to know, for example, that an area has adequate or limited water resources; it is also necessary to ascertain precisely how many cubic metres per second (per day, per year) can be obtained for the project in question, the cost of a cubic metre, the seasonal fluctuations, and so on. Again like locational determinants, some locational characteristics can be called critical. The critical locational characteristic of an area is, in most cases, a shortage of some factor of production.

What can and should be mapped for regional planning purposes? Generally speaking, anything that plays an important role in social and economic life and which presents a problem that can be solved best with the aid of cartography. This paper is mainly concerned with projects in which maps are an essential, or at any rate, a useful tool.

Cartographic methods

Before approaching the specific cartographic methods used in planning, a knowledge of "cartographic language" is essential.

3/ The technical-economic characteristics of a project which are not germane to the choice of location cannot be called locational determinants (e.g., technical specifications of buildings, internal transport, structure of shops, management patterns etc.).

The first stage in all cases is to prepare an outline map with a grid system of meridians and parallels, showing the general planimetric features of the territory. These include physical features (rivers, sea coasts, lakes, swamps) and national and administrative boundaries. Fixed social and economic features, such as inhabited localities and transport routes, can also be shown.

Although all general planimetric objects can be shown on a single cliché and in a single colour (black or dark grey), it is better to use two colours: rivers, lakes and sea coasts in blue, everything else in black. A sample outline map is shown in appendix 1 (map of Zambia); appendices 6 and 7 show how this outline map can be used in cartographic exercises. Each regional planning unit should have a sufficient stock of printed outline maps as they will be needed frequently. These maps should be printed on bond paper suitable for ink drafting.

With the aid of various standard methods, outline maps can be converted into economic maps for use in planning. Some methods of presenting economic and social phenomena are described below.

Symbols

For economic maps symbols are widely used because of their simplicity and geographical precision. Each object is indicated by a symbol at the proper place on the map. Symbols are used to portray population settlements, transport routes (appendix 2), mines and power plants (appendix 3), factories (appendix 4), and so on.

Because of their pictorial character, symbols are easy to read. Thus, a small aircraft inside a circle can only mean an airport, while an anchor denotes a harbour. Mineral deposits and mines are usually shown by the chemical symbols of the particular elements. There are of course some features for which it is impossible to devise pictorial symbols.

It is essential that symbols be drawn according to the proper scale in order, first, not to overload the map, and second, to make them truly representative. There are two types of scale: class interval and absolute.

In the class interval scale, the classes of a phenomenon are portrayed. For example, the following classes can be used for power plants: less than 25 MW; 25 to 50 MW; 50 to 100 MW, and so on (see appendix 3, figures (a),

(b), (c)). Here, the larger symbol corresponds to the larger object, but not proportionally: the 100 MW symbol is not necessarily twice as big as the 50 MW symbol.

In the absolute scale, on the other hand, the differences between objects are shown proportionally: the symbol for a 100 MW power plant is four times as large as that for a 25 MW plant (see appendix 3, figures (d), (e), (f), and also appendix 6).

The choice of scale depends on the phenomenon and on the difference between the extreme quantities. If, for example, the biggest object is a hundred times larger than the smallest, the use of the absolute scale is not feasible.

The quantitative and qualitative characteristics of a phenomenon can be combined in the same symbol. Thus, the size of a symbol will represent the capacity of a power plant, and the shading or colour represents the primary energy source. In appendix 3, figures (a), (b) and (c) denote coal-consuming power plants, and figures (d), (e) and (f) oil-consuming ones.

Non-quantitative areal distribution

This method is suitable for the presentation of spatial phenomena such as land under cultivation or scattered mineral deposits; briefly, any area with special characteristics distinguishing it from the rest of the territory. The areas where a given phenomenon has been observed are shaded or coloured, or merely marked off by a conventional boundary. The map shows the approximate distribution of the phenomenon, but not its density or intensiveness (see appendix 5, map (a)). These maps are ideal for those occasions when the planner only wants to know where a given phenomenon occurs (such as tse-tse areas, national parks and game reserves; map (b)).

The non-quantitative areal distribution method is often used to demarcate potential development areas. Map (c) shows areas where sugar cane could be grown, given the right agronomic conditions. This method can also be used negatively, marking off those areas where a phenomenon does not exist or where its location would be impossible for one or another reason. Map (d) in appendix 5 shows areas unsuitable for agriculture (swamps, rocky ground, dry areas) and restricted areas (national parks), so that only the unmarked portion of the territory can be a basis for agricultural planning.

Dot method

The areal distribution method is purely qualitative, separating the areas where a given spatial phenomenon occurs from those where it does not. The dot method, on the other hand, provides a quantitative picture of the distribution of spatial phenomena, each dot representing a specific quantity. Areas where the phenomenon is dense are shown on the map by a greater density of points. This method is illustrated in appendix 12, where the dots represent the distribution of agricultural produce and consumption centres; and in appendix 13, where they denote population.

Choropleth maps

Variations in the intensity of an economic phenomenon from one area (province, district, municipality) to another can be indicated by shading or colouring these areas in such a way that the intensity of the phenomenon is shown by the corresponding intensity of the shading or colour. As a general rule, this method is used to portray relative data: population density, per capita income, capital/output ratios and others. Choropleth maps are never used for absolute data.

The administrative subdivisions of a country constitute the most convenient framework for choropleth maps, since statistical data usually pertain to provinces, districts, townships and so on. If, however, other subdivisions are used, the work of data collection must be organized accordingly.

For sample choropleth maps, see appendices 14 and 15.

Diagrammatic maps

The structural and historical nature of phenomena in their regional context can be indicated on a diagrammatic map. In this method a diagram is prepared for each subdivision of the country (province, district, municipality). The map in appendix 6 shows the structure of gross domestic product in Zambia by province in 1964. The diameter of each circle corresponds to total GDP, while the sectors show the contributions of agriculture, industry and services.

This method can be used to portray two or more phenomena simultaneously, or to show various aspects of a single phenomenon. In appendix 7 a choropleth map (planned growth rate of GDP by provinces, 1964-1970) is combined with a diagrammatic map (planned growth of GDP 1964-1970). The diagrams for each

province show GDP in the base year 1964 (left-hand column) and in the end year 1970 (right-hand column).

Another illustration of the diagram method is given in appendix 8 - map (a) (industrial centres). As in appendix 6, the diameter of the circle shows the size of the industrial centre (the criterion being the number of manufacturing enterprises), while the sectors indicate the shares of the various industries.

Isograms

Isograms (sometimes called isolines) are lines on a map which connect points of equal density or value for a given phenomenon; they are often used in population maps, and also in equal-cost distance maps which show how far goods can be transported from a given point at the same cost. These maps are frequently used in locational exercises. (See appendix 10, map (b) (rainfall), and appendices 11 and 12 (equal-cost distance maps).)

Epures

These are used to portray dynamic phenomena such as migration or transportation. On a transport map epures are those stripes which follow the transport routes and show the direction of traffic,[4/] and the volume and structure of the commodity flow (see appendix 8, map (b)).

The various techniques described in this paper are the principal methods for portraying statistical data on maps; they can be used in various combinations. The following are the main problems encountered:

(a) To choose the most appropriate method for portraying a given phenomenon;

(b) To choose the right scale in order to prevent visual distortion;

(c) To eliminate secondary phenomena in order to avoid overloading the map;

(d) To choose the territorial subdivision (province, district, etc.) which is best suited for the particular phenomenon or problem under investigation.

4/ The direction of traffic on a map should be related to the driving habits of the particular country: thus, in right-hand drive countries the stripes on the right-hand side of the road indicate "forward" flow, and on the left "backward" flow.

Appendix 9 shows how to avoid overloading a map through the judicious selection of scales for the symbols. One type of map does have to be overloaded - a general economic map, which shows all the economic phenomena existing in the mapped territory. Such a map, however, is used only for information purposes, not in cartographic exercises.

Elementary cartographic exercises

Experience can be gained by applying some of the ordinary cartographic methods in the preparation of simple maps that can be used subsequently for complex application.

The method of elimination

In the initial stage of analysis, areas unsuitable for the location of the project are eliminated (see appendix 5, map (d)). The criteria used in elimination are the locational factors, locational determinants and locational characteristics discussed earlier. The example chosen here is a nitrogen fertilizer plant in which production is to be based on natural gas:

Locational factors		Locational determinants
Workers	skilled	98
	unskilled	85
	total	183
Production	ammonia	150,000 t/year
	nitric acid	280,000 t/year
	ammonium nitrate	345,000 t/year
Gas		240 million m^3/year
Energy		344 million kWh/year
Water		113,850,000 m^3/year (or 3.6 m^3/sec)

Even when a country offers many possibilities for the location of a project, the process of elimination is still used to make a final selection. The first areas to be eliminated are those lacking sufficient water resources, natural gas and energy reserves, as well as those which cannot be reached by gas pipeline; all these areas could be marked off by the non-quantitative

areal distribution method. After further elimination the final location of the project can be determined by direct calculations.

The process of elimination should not, however, begin until the critical locational determinants of the project have been identified and a thorough study made of the locational characteristics of the country's economic regions; otherwise the task of finding a location for the project will be considerably more difficult.

Cartographic calculation of surface water resources

Three maps are required: relief, surface water network and rainfall. The first two can be combined into one map. The sequence is as follows (see appendix 10):

(a) Delimitation of the catchment area of the river on a contoured relief map (map (a)).

(b) The rainfall map, prepared on transparent paper (map (b)), is superimposed on the relief map.

(c) A squared graph sheet is then superimposed on the combined map (for convenience of calculation, each square is 100 km^2 or 100,000,000 m^2).

(d) Calculation of annual precipitation per square:
Thus, the average in a zone of 1,000-1,100 mm annual rainfall will be 1.05 m/year. 1.05 x 100,000,000 gives 105 million m^3/year of precipitation per square.

As a general rule, surface water flow is measured in cubic metres per second. 105,000,000 ÷ 31,536,000 (number of seconds in a year) gives 3.3 m^3/sec total precipitation per square.

(e) The water from precipitation is distributed in three main directions: evaporation (back into the atmosphere), infiltration (into the soil) and run-off (into rivers). Data on run-off are of especial interest to planners since they provide an indication of the available water resources and of the requisite construction parameters of the hydropower plants or other enterprises which are to be established in the area.

Data on evaporation, infiltration and run-off, which in any case will be needed in the later calculations, can be obtained from meteorological and hydrological services.

Let is be supposed that in the present example evaporation accounts for 94 per cent of precipitation, and infiltration and run-off 3 per cent each.

In the 1,000-1,100 mm/year rainfall zone the run-off per square will be 0.1 m^3/sec (3 per cent of 3.3 m^3); in the 900-1,000 mm zone the figure will be 0.09 m^3/sec.

The figure for one square should then be multiplied by the number of squares in the catchment area. Since the squares do not coincide with the catchment area, recourse must be had to the auxiliary square grid rule: add up, first, the squares lying completely inside the 1,000-1,100 mm zone of the catchment area (in map (c) marked by crosses - 11 in all), then those which are only partly within this zone (marked by dots - 24 in all). The total acreage is equal to all the squares of the first type plus half the total of the second: $11 + \frac{24}{2} = 23$. Twenty-three multiplied by 0.1 gives 2.3 m^3/sec run-off for the 1,000-1,100 mm zone.

The corresponding figures for the 900-1,000 mm zone are: $(10 + \frac{20}{2}) \times 0.09 = 1.80$ m^3/sec. Thus, total run-off at point "A" will be: $2.3 + 1.80 = 4.1$ m^3/sec.

Equal-cost distance maps

These maps are a useful aid in locational problems. The big disadvantage is that each map has only one datum point. Transport costs can be determined only to and from that point. Thus, if ten big cities are involved in a locational exercise, ten separate ECD maps have to be prepared.

In map (a) (appendix 11) city "A" is the datum point. The transport rates are 2.5 cents/t/km for main roads, and 5 cents for secondary.

First, the points on the roads with the same rates for transport to and from "A" are marked with the aid of a divider. The $1 mark will be 40 km on the main road (4 cm on map (a)) and 20 km on secondary roads (2 cm). The points with the same transport rates are connected by isolines (here called isovalents). The map is then shaded.

In map (b) (appendix 11) city "B" is the datum point.

Following are some examples of the application of equal-cost distance maps.

Delimitation of transport gravity zones (hinterlands)

If the ECD maps for cities "A" and "B" are combined, the line of economic equidistance between the two cities can be determined. Everything west of this line (C-D in map (c), appendix 11) gravitates, in terms of transport costs, to "A" (that is, the provision of commodities and services would be more economical if organized from "A"), and east of it to "B". In addition, these maps will show to what extent administrative subdivisions correspond to transport gravity zones; however, it should not be forgotten that administrative boundaries usually derive from historical or even racial factors, rather than economic ones.

Transport cost location

Let it be supposed that a location has to be found for a food processing plant, the two locational determinants being: (a) it must collect and process 44 tons of local agricultural produce; and (b) distribute 22 tons of processed goods among consumers in the same area.

There are two possible locations: city "A" and city "B" (see appendix 12).

Map (a) (same area as in ECD map of city "A") shows the respective locations of agricultural production (one black dot = 1 ton) and processed goods consumption (1 white dot = 1 ton).

City "A"

Transport zone ($/ton)	Production centres (black dots)	Total transport costs from zone	Transport zone ($/ton)	Consumption centres (white dots)	Total transport costs to zone
1	8	8	1	7	7
2	12	24	2	5	10
3	13	39	3	6	18
4	7	28	4	2	8
5	4	20	5	2	10
		119			53

Thus, for city "A" the grand total (cost of collecting agricultural produce and delivering processed goods) is 119 + 53 = $172.

In the case of city "B" (map (b)) the corresponding figure is $158. From the standpoint of transport costs, therefore, city "B" would be the better location.

Regionalization and zonal delimitation

Basic concepts

A location policy embraces numerous spatial phenomena, as does the science of cartography. As a general rule, the location can be an economic region, economic area, economic zone, industrial centre, or agro-industrial centre. These subdivisions are defined below.

An economic region has the following features:

(a) Economic - specialization and a certain level of economic development;

(b) Territorial - a centre of economic gravity, whose influence permeates the entire economic region (there may be several centres, but one of them will be dominant);

(c) Managerial - there must be local authorities responsible for planning, plan implementation and over-all management; for this reason economic regions usually coincide with administrative subdivisions.

The network of economic regions must cover the entire country.

An economic region is the basic unit in regionalization of national plans and, naturally enough, in regional development plans. It is also the main unit in cartographic exercises for planning purposes.

An economic area is a territory which, due to the lack of some of the features listed above, cannot be given the status of an economic region, but nevertheless has an economic structure of sorts, or, in some cases, common economic and social goals. The Copper Belt in Zambia, with its special characteristics, is a case in point. Another instance is the territory comprising the southern part of Central Province, the northern part of Southern Province, and the area of the proposed Kafue Dam project.

Unlike economic regions, economic areas do not cover the entire territory of a country.

An industrial centre is usually a city or town. It has some features in common with an economic region (specialization, economic viability, availability of managerial skills); in addition, however, it possesses the advantages of agglomeration.

An agro-industrial complex is a territory in which agriculture and the food-processing industry are closely integrated. It consists of an agricultural area, and a centre where the agricultural produce is processed. The processing capacity usually coincides with the crop capacity. These complexes have one special feature: manpower can be moved from field to processing plant and vice versa, depending on the intensity of work. Often the periods of intensity in agriculture do not coincide with those in the processing industry.

Zonal delimitation

This entails identification of the economic zones and determination of their boundaries; it is a simple procedure since usually only one indicator is needed (very occasionally, two or perhaps three).

To prepare a map of surface water resources, the calculations by cartographic means described earlier in this paper are used; to these may be added direct measurement data if available. The various data on surface water resources are entered on the map, and points with equal amounts are connected by isolines; in this way uniform zones are delimited. These can be classified as follows:

Zone A = good (more than 5 m^3/sec of fresh water)
Zone B = medium (1-5 m^3/sec)
Zone C = meagre (less than 1 m^3/sec)
Zone D = dry

The localities within each zone need not be interrelated economically and, indeed, may have nothing in common save being endowed with the same quantity of water for a given project.

An economic zone has a uniform locational characteristic. For example, all areas with a rainfall exceeding 400 mm/year constitute an irrigationless agriculture zone (other things being equal). The hinterland around a port or railway station is also an economic zone: its most economical connexion with the outside world is through that port or railway station. The definition and identification of an economic zone depends entirely on the particular planning goal.

Regionalization

Regionalization[1/] is an essential element in the formulation of a locational policy. Each region has distinctive natural, economic and social conditions which have to be taken into account in planning.

Economic regions can vary in size and class. A country can be divided into large regions (corresponding to the largest administrative subdivision, for example, a province). These main economic regions can, in their turn, consist of several medium-size economic regions, with their own centres of gravity and other relevant features.

The country can also be divided into the smallest viable economic units - primary economic regions (PER's), which make it possible to carry out any regional planning exercise with a relatively high degree of precision.

The criteria underlying regionalization in the Northwestern Province of Zambia are set forth below:

(a) Population. It was assumed that each PER should have at least 10,000 inhabitants, as being the minimum needed for the smallest economic unit to develop by means of its own labour force, and also the minimum that, according to the plan, could be provided with some social institutions (one health centre; five primary schools, upper level; ten primary schools, lower level);

(b) Compactness and economic viability. Each region has a centre of economic gravity. These centres should contain all the economic enterprises, social institutions and administrative offices which cater to the surrounding territory. Usually, provincial or district centres were chosen - or, failing these, the largest villages. Naturally, the centres of economic gravity must be reasonably accessible and also be situated at or near the geographical centre of the regions;

(c) Economic and social base. Each PER must have an existing structure of economic enterprises and social institutions as a base for future development. Note was also taken of proposed or provisionally approved projects;

(d) Natural resources. The available water resources, fertile land, mineral deposits and the like were taken into account. These natural features also helped to determine the boundaries of the regions with greater precision.

[1/] Regionalization of a territory means dividing a country into economic regions; regionalization of a plan entails distributing the various elements (investment, projects etc.) among the existing economic regions or provinces.

The process of regionalization in the Northwestern Province of Zambia is shown cartographically in appendix 13, the sequence being as follows:

Map (a). The probable locations of the PER centres can be estimated from a map of population and industry (Legend: 1 - various economic enterprises and social institutions; 2 - probable locations of PER centres).

Map (b). Map (a) is combined with a map of population (dots, map (f)) each centre receiving an approximately equal number of dots (Legend: 3 - population, one dot = 500 inhabitants; 4 - PER centres after elimination; 5 - PER boundaries, first rough delimination). Incidentally, localities D and E, previously earmarked as potential centres, have now decreased in importance.

Map (c). First adjustment, a road map being used. The boundaries are now more precise in terms of accessibility (Legend: 5 - preliminary boundaries; 6 - main and secondary roads; 7 - adjusted boundaries).

Map (d). Use is made of a map of agro-industrial complexes. The zones of the food-processing enterprises do not coincide with the PER's. The supply zones of the enterprises should, if possible, be in the same region as the enterprises themselves. Thus, a second adjustment is called for. (Legend: 7 - boundaries after first adjustment; 8 - food-processing enterprises; 9 - boundaries after second adjustment).

Map (e). Third adjustment (Legend: 10).

Map (f). Final PER boundaries (Legend: 11 - after three adjustments). The results should be checked against the population map in order to calculate the population in each region.

The application of the criteria listed above eliminated certain areas from the PER framework. These should be regarded as reserved territories; they include national parks and game reserves.

Regionalization prepares the ground for another stage in cartographic analysis - the evaluation of the economic potentials of each region, in other words an estimate of locational characteristics.

Maps of locational characteristics

These maps are of crucial importance in the evaluation of development potentials and in the determination of development priorities.

The main object here is to estimate more or less precisely, in quantitative terms, the natural, economic and social potentials of the PER's. These quantities can serve as a basis for the calculations which must precede any economic decision as to project location, regional development, and so on.

This method is illustrated in appendix 14, which shows six PER's, together with evaluations of their potentials: water resources, forests, manpower, external marketing, internal marketing. Owing to the lack of adequate statistical data, these factors can often only be evaluated qualitatively in terms of very good, good, mediocre, unsatisfactory and bad.

Map (a) clearly indicates that, for any project requiring large quantities of water, region "a" is the best, followed by region "b". As regards forests, the best conditions are in region "d" (see map (b)).

Map (f) presents the combined evaluation of all five factors. The following conclusions can be drawn:

- Region "a" is suitable for those projects which require large quantities of water, only a limited number of workers and not much timber, and are oriented mainly to the local market;
- Region "b" can accommodate a project which requires a moderate amount of water, no timber, a limited number of workers, and is oriented to the local market;
- Region "c" is the best location for a project requiring a large number of workers;
- Region "d" can accommodate a project based on forest resources;
- Region "e" is the best from the standpoint of external marketing;
- The worst conditions are in region "f". It should not be forgotten, however, that this conclusion is based only on the five factors listed above; the "mineral resources" factor might alter the picture.

The map of locational characteristics can be regarded as the last in the series of cartographic exercises which must precede any preliminary decision as to project location and regional development.

Cartographic analysis of the agricultural sector

The principles and practical implications of regionalization and zonal delimitation can be illustrated through an analysis of the agricultural sector.

Analysis of productivity

The first stage is to prepare maps of agricultural productivity by areas - for instance, by primary economic regions. The indicators of productivity are many and varied: crop yield per hectare, crop yield per worker, or income per hectare as used in the example below.

After the productivity map, the next step is to prepare, for purposes of comparison, maps of the various factors governing agricultural income, including, inter alia: marketing facilities (transport accessibility); investment per hectare of cultivated land; fertilizer supply per hectare; tractorization per 1,000 hectares; and electrification of agricultural processes (kWh per worker).

Appendix 15 contains maps of the same PER's ("a", "b", "c", "d", "e", "f") as shown in appendix 14, together with indicators of agricultural development (the higher the indicator, the darker the shading on the maps). Map (a) shows income per hectare, map (b) marketing conditions, and so on. It is assumed that all six PER's have similar climatic conditions.

Two observations can be made from this cartographic analysis. First, map (a) shows that income per hectare and productivity in region "b" are higher than in region "a". Why? The transport accessibility (marketing facilities) is the same in both regions so this element cannot cause the difference in income.

Investment per hectare is likewise the same in both regions; they also receive the same quantity of fertilizers per hectare. As regards tractorization, region "a" is in an even better position than "b".

A study of map (f), however, shows that, in the electrification of agricultural processes, "a" as far behind "b", and thus the difference in income per hectare.

The conclusion drawn from the analysis is: in order to increase productivity in region "a", steps must be taken to raise the level of electrification of the various agricultural processes.

A second observation reveals that income per hectare in region "c" is much greater than in "e", although transport accessibility is the same in both. The cause can be seen in map (c): low investment in region "e". Map (c), in its turn, shows that "c" is also well ahead of "e" in tractorization; its lead in fertilizer supply and electrification, however, is somewhat smaller. Thus, the analyst may recommend, for region "e", that priority be given to increasing investment and raising the level of tractorization.

Cartographic analyses, though very useful for purposes of demonstration, will not, however, provide any indication of the specific sums required for

investment in the various elements of productivity; this can only be done by direct calculations.

Central objects

A central object has five main features:

(a) Location at a single point;

(b) A given area serves the central object, or is served by it[6/];

(c) The capacity of the object determines the size of the surrounding area (the greater the capacity, the larger the area);

(d) Elements directly connected with the object (the greater the density of distribution of these elements, the smaller the area);

(e) Accessibility of the various elements in the surrounding area to the central object. This determines both the configuration of the area and the effectiveness of inter-communication within it.

A tobacco barn with a capacity of 500 t/year can serve 500 acres of tobacco plantations, while one with a capacity of 1,000 t/year can serve twice that area. In the former case, if the plantations account for only 50 per cent of the cultivated area, the size of the area attached to the tobacco barn will be 1,000 acres. Thus, central objects with the same capacity can serve areas different in size, depending on the density of the elements.

The configuration of the surrounding area, though roughly circular, tends to reflect the indivdual features of the particular territory; these surrounding areas will therefore be extended along roads (the better the road, the greater the extension) or curtailed by physical obstacles such as mountains or swamps.

Central objects are legion: anything possessing the features listed above can be called a central object. The following are typical instances in agriculture: a tractor and mechanization unit, an oxen unit, a marketing office, a training centre. In industry there are food-processing plants, sawmills and other enterprises whose suppliers are scattered throughout a given territory. Social institutions such as hospitals and schools can also be regarded as central objects.

6/ "To serve" means that the economic activity is directed towards the central object (raw tobacco sent from area to tobacco barn), while "to be served" implies that the activity is directed from the central object (fertilizers sent to growers from fertilizer store).

It should be pointed out that the surrounding area - in other words, the zone of accessibility - has certain clearly defined limits. Thus, the configuration of the area surrounding a dairy-products processing plant should be such that milk can be transported from one point to another in less than six hours (unless special refrigerated vehicles are available). The area served by a primary school should lie within a radius of not more than three miles in regions where the pupils have to walk.7/

So, armed with data on: the capacity of the central object; the density of distribution of attached elements; transport conditions within the surrounding area; and the limits of the accessibility zone, the planner can begin his cartographic analysis of the central objects.

Here, the exercises often pertain to the location of agro-industrial complexes and the concomitant regionalization, when the processing plant (primary element of the complex) is closely linked to the surrounding area (secondary element).

The following are typical of the problems which arise in connexion with central objects:

(a) After the distribution of the secondary elements in a tobacco-growing area, locations have to be found for the primary elements (tobacco barns);

(b) After locations have been found for the tobacco barns, the most economical gravity zones must be determined for each tobacco barn;

(c) Combination of (a) and (b): some central objects are already present, together with their secondary elements, but locations must be found for new central objects with a view to increased efficiency in the area.

The process of cartographic analysis has much in common with that of regionalization. The planner, with the aid of auxiliary maps (transport, locations of suppliers and consumers), must choose the optimum scheme of zonal delimitation from among several variants.

The subsequent marketing operations must also be taken into account. For example, the location of a tobacco barn should be governed not merely by the distribution of the tobacco plantations, but also by the site of the nearest market for dried tobacco (a tobacco curing plant or tobacco marketing office).

7/ Strictly speaking, primary schools, cinemas, bars, restaurants and the like, which serve a very restricted area, should not be called central objects, but rather local objects. This does not mean, however, that their location does not require thorough study.

Technical recommendations

Mapping procedures

To illustrate this report, only black and white maps have been prepared. This considerably limits the range of variations for mapping and "reading". Coloured maps provide a wider range of variation, but they are more expensive and more difficult to print. Since all planning maps are generally prepared in a single copy, the use of colours is strongly recommended. Coloured maps can be photographed and then projected on a screen for demonstrations.

The importance of transparent maps (overlays) cannot be too strongly emphasized. A set of overlays, each devoted to a single locational factor, can simplify the task of analysis. The planner can join together various overlays in the particular combination required for a given exercise, and each overlay can be used many times over in different exercises. If special tracing paper is used, up to four overlays can be combined, with the bottom one still visible.

In exercises with overlays, the use of a sheet of cardboard with two hinges is advised: each overlay must be stuck to a strip of hard paper with two holes coinciding with the hinges. The hinges and holes must be so centred that all the features on the overlays coincide. This technique saves time.

In the drafting of symbols, the standard printed or photographed samples are recommended. The symbols are printed in many copies on sheets of gummed paper, after which the draftsman cuts them out separately and sticks them on the map.

Stencils are another very useful aid. A hole in the shape of a symbol is cut in a celluloid sheet. By placing the stencil on the map and applying a brush or stamp, one can quickly obtain the desired print.

Map operations room

Cartographic procedures require special rooms. The main room should be devoted to demonstrations and operations, and should be at least 8 x 5 metres (25 x 16 feet). One of the narrow walls should be windowless, so that maps can be hung on it. This wall must be covered with dark fabric, preferably dark green.

The main room should contain: a conference table and chairs; mobile stands for maps; a vertical tracing table with lighting for demonstration of overlays; a slide projector and screen; and dark curtains on the windows, for use when slides are projected during the day.

A fully equipped drafting room is also required for the technical work of map making.

General conclusions

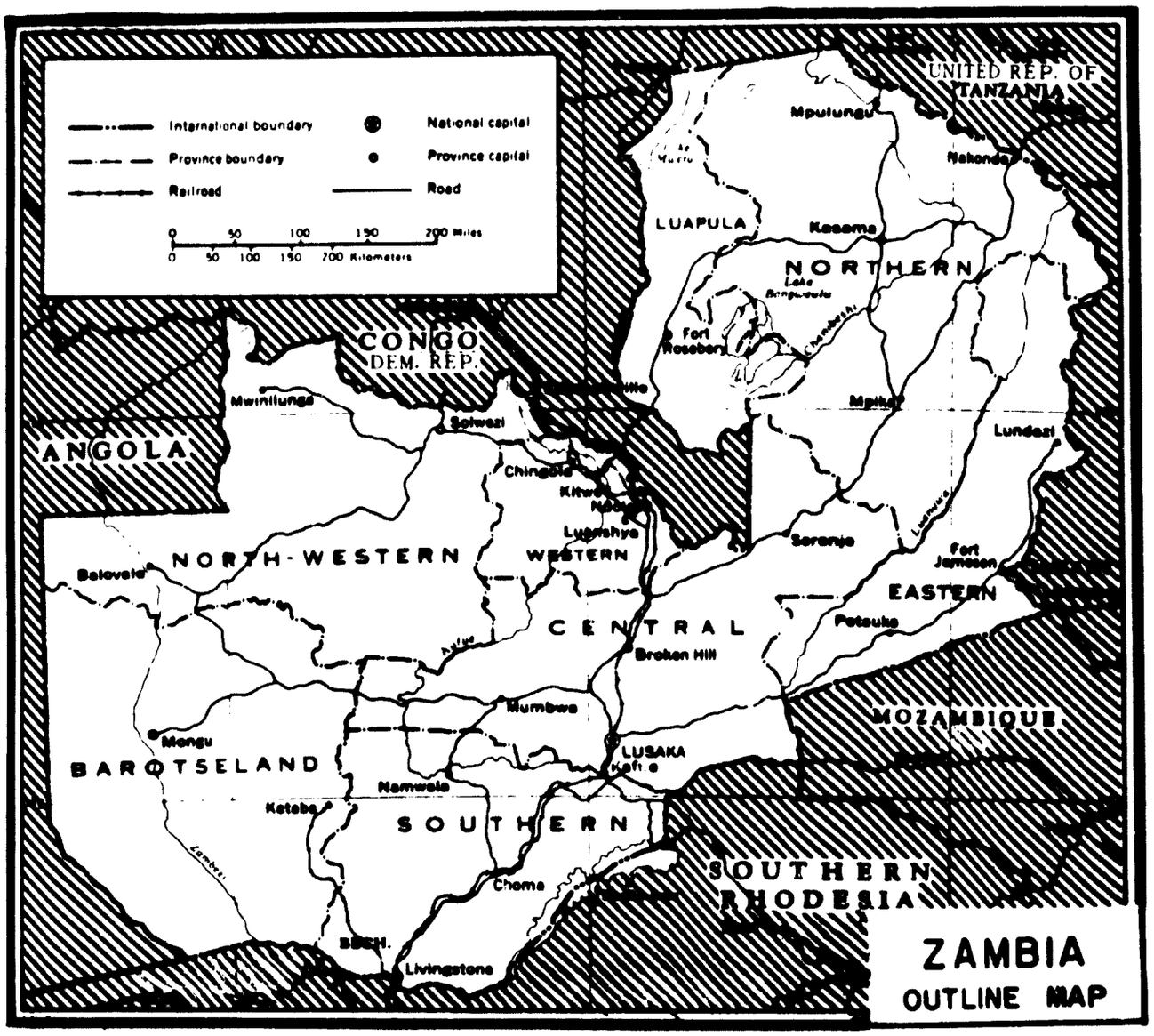
Cartography is only an aid in the implementation of an over-all planning policy. It should be used only when the broad outlines of the national development strategy are known. Cartographic conclusions and recommendations do not, as a rule, affect a development strategy; they merely indicate the most economical way of implementing that strategy.

Stress has been laid on the operational value of cartographic methods and on their importance in decision-making. However, their informational aspect should not be overlooked. Each map or overlay, besides being an aid in cartographic exercises, is a stock of information which the planner can draw upon when considering locational problems. It should not be forgotten that the first stage in cartographic analysis is to prepare a general economic map of the territory, in which all economic phenomena are shown.

Maps also have a demonstrative character. Whatever the problem, its portrayal on maps will help to clarify the main issues and, as often as not, provide pointers to a solution.

Appendix 1

OUTLINE MAP OF ZAMBIA

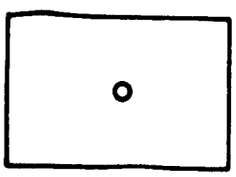


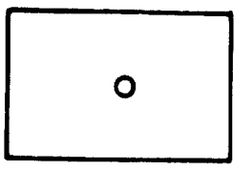
The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

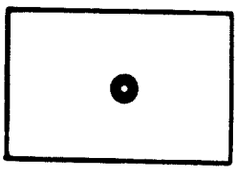
Appendix 2

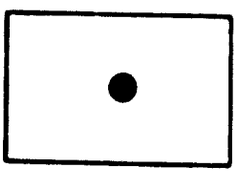
SUGGESTED SYMBOLS FOR MAPS: SETTLEMENTS AND TRANSPORTATION NETWORK

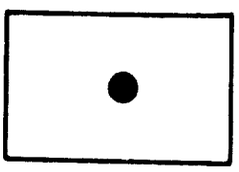
Settlements (by population)

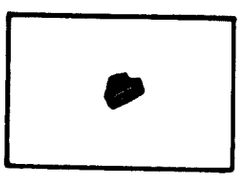

Less than 1,000

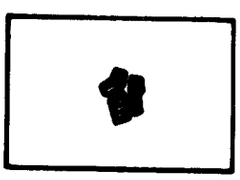

1,000-2,000


2,000-5,000

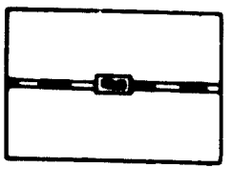

5,000-10,000

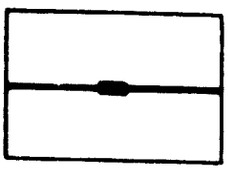

10,000-25,000

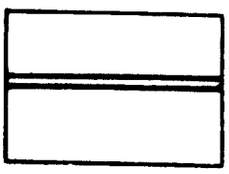

25,000-50,000

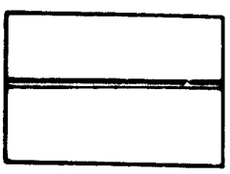

more than 50,000

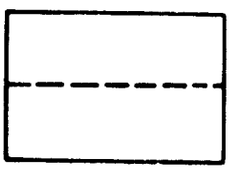
Transportation network

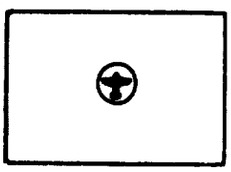

Railway and station (1st variant)

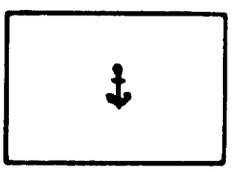

Railway and station (2nd variant)


Main road


Secondary road


Track


Airport


Harbour

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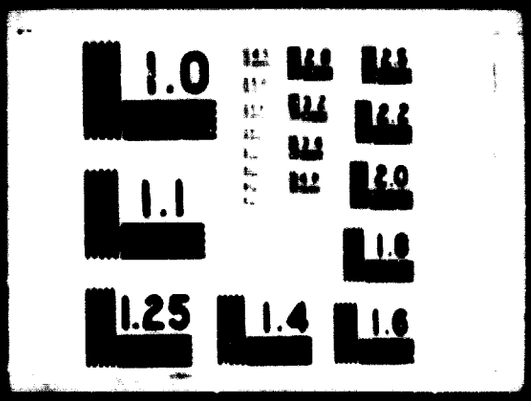
9 OF 13

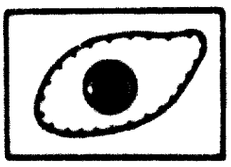
DO 2981-

DO 2986

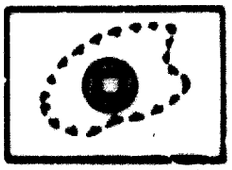


Appendix 3

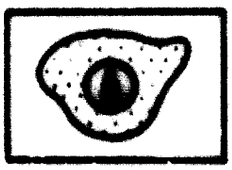
SUGGESTED SYMBOLS FOR MAPS: MINING AND POWER



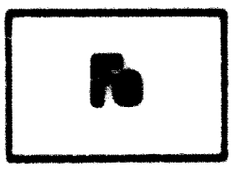
Bituminous coal basin and mine



Brown coal basin and mine

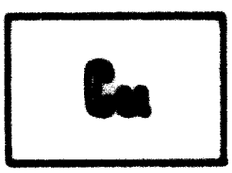


Petroleum deposits and well

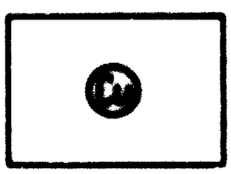


Iron ore deposits

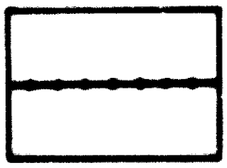
Iron ore mining



Copper deposits



Copper mining



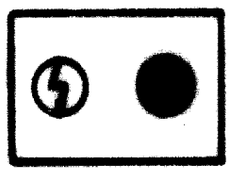
Pipeline

Class interval scale power plants

(a)

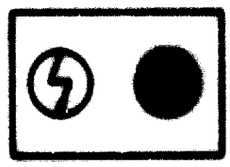
Hydrothermal (coal) up to 25 MW

(b)



25-50 MW

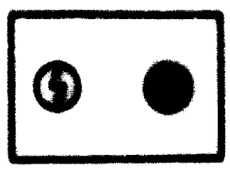
(c)



50-100 MW

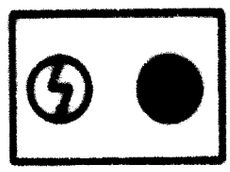
Absolute scale

(d)



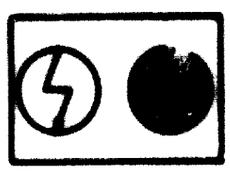
Hydrothermal (oil) 25 MW

(e)



50 MW

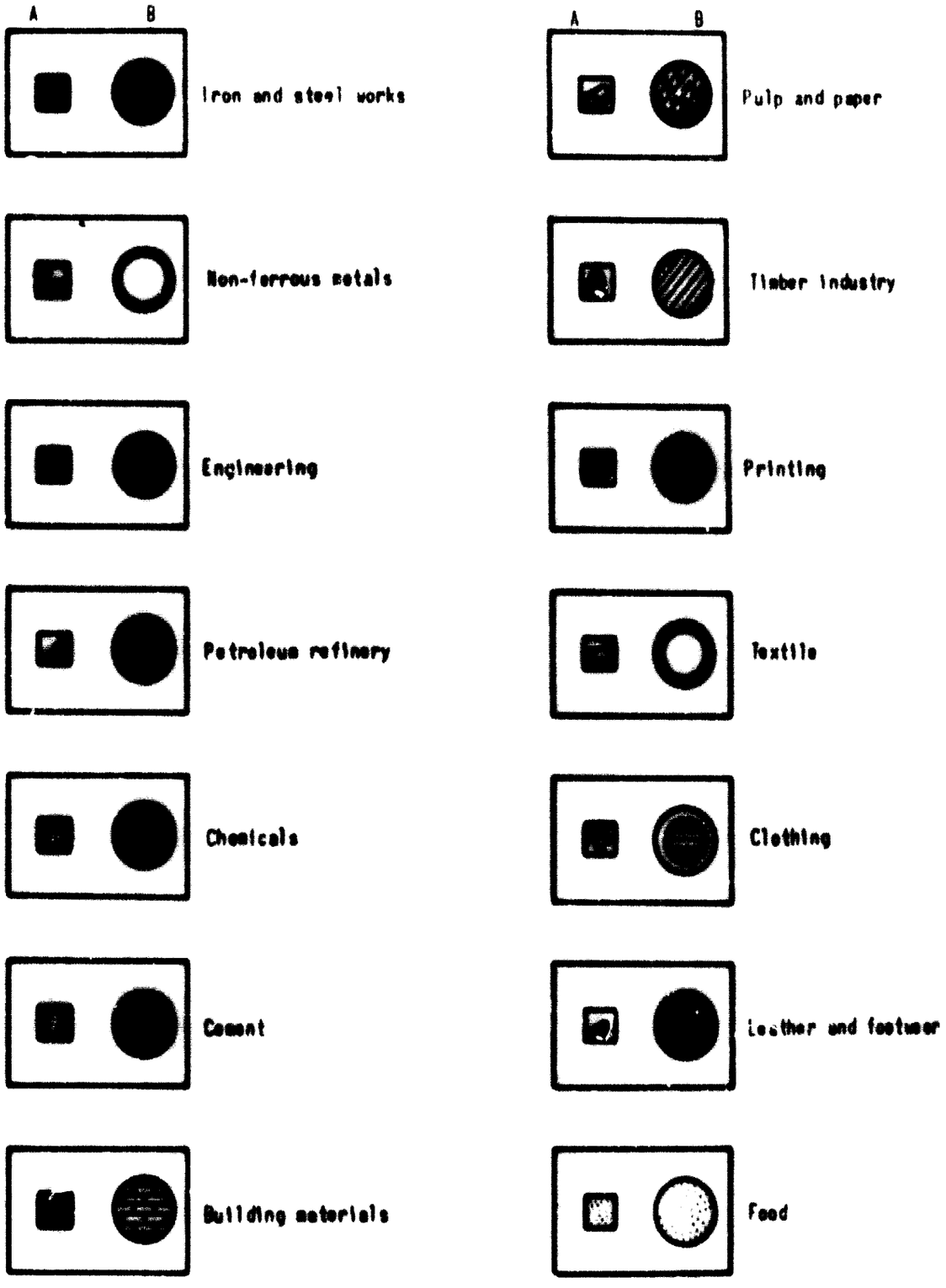
(f)



100 MW

Appendix 4

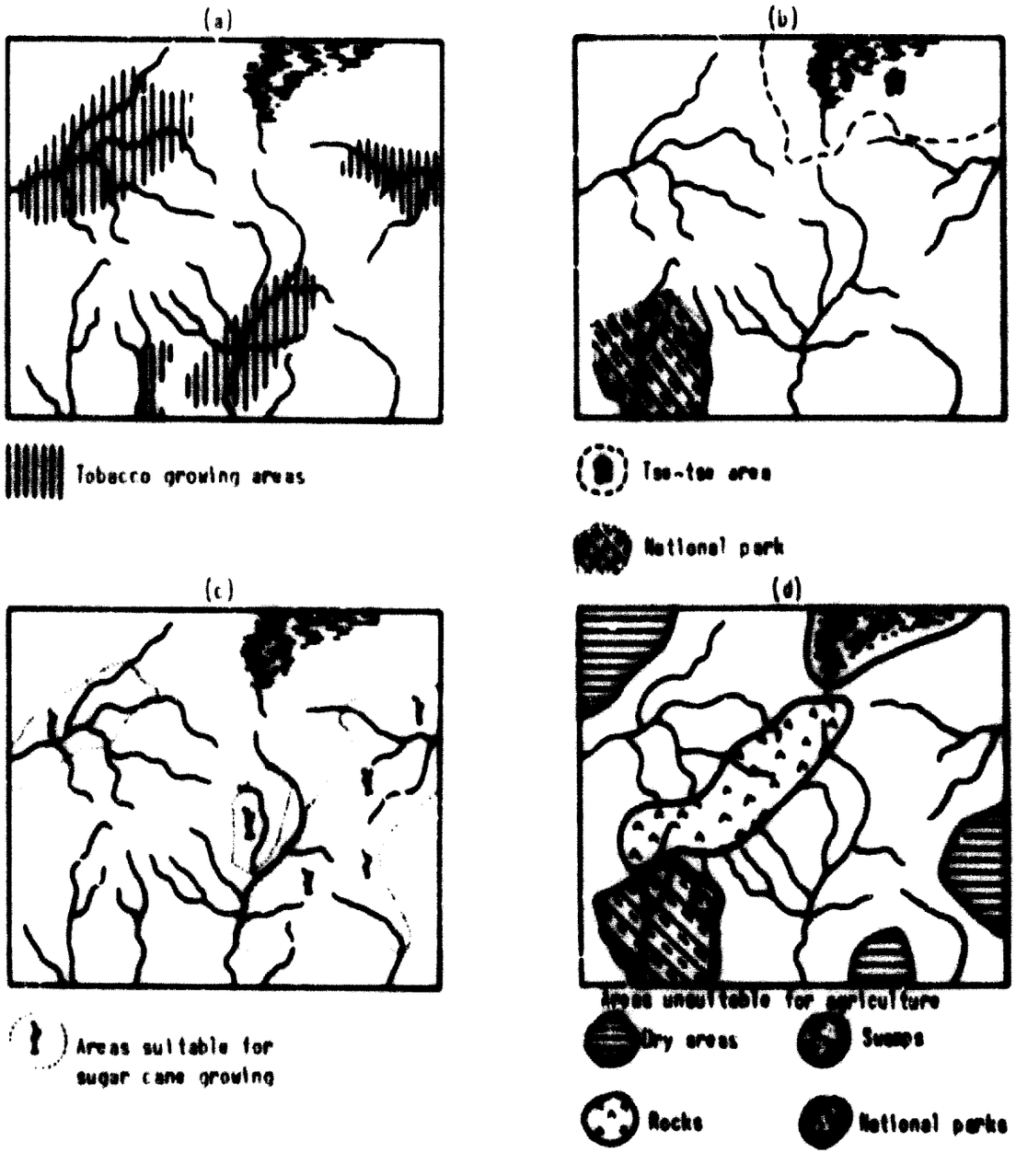
SUGGESTED SYMBOLS FOR MAPS: MANUFACTURING INDUSTRY



Key: A - single enterprise
B - several enterprises in an industrial centre

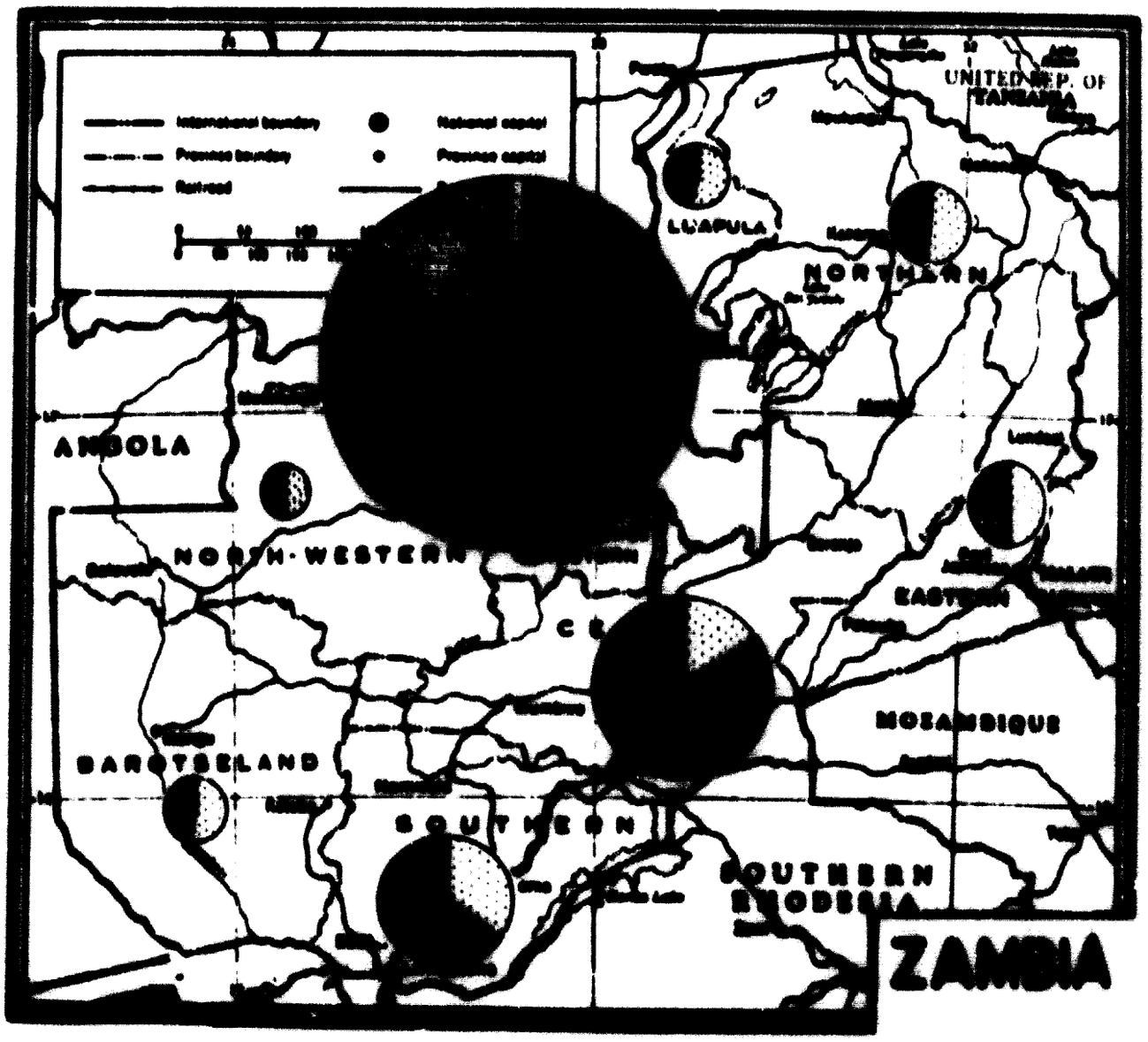
Appendix 5

NON-QUANTITATIVE AREAL DISTRIBUTION METHOD

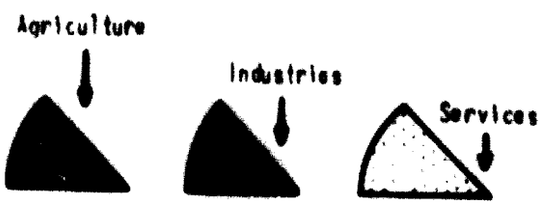


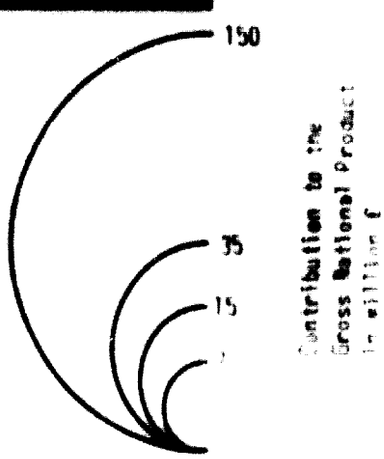
Appendix 6

STRUCTURE OF GDP BY MAJOR SECTOR AND BY PROVINCE



The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

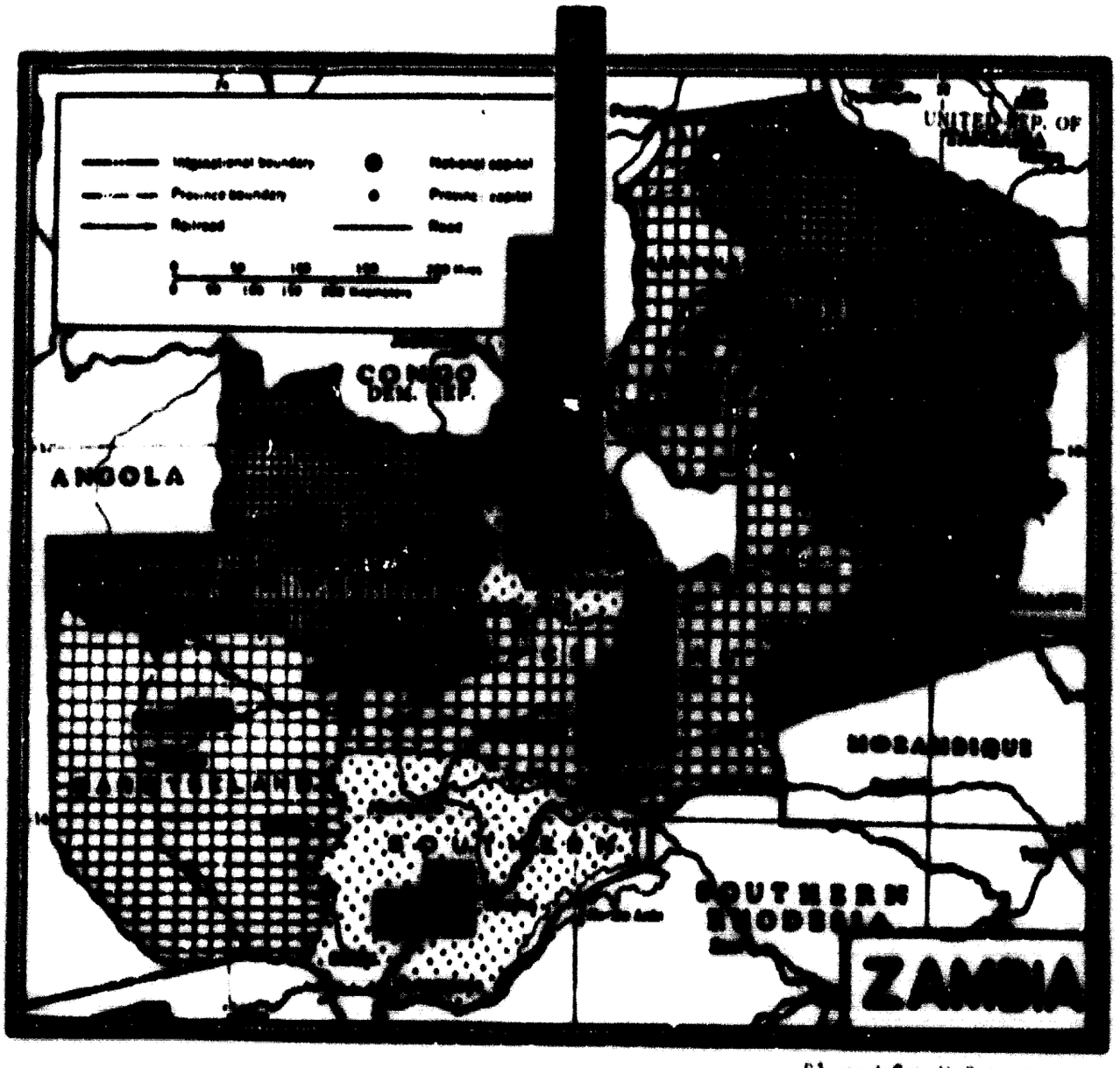




Source: Republic of Zambia, First National Development Plan 1966-1970

Appendix

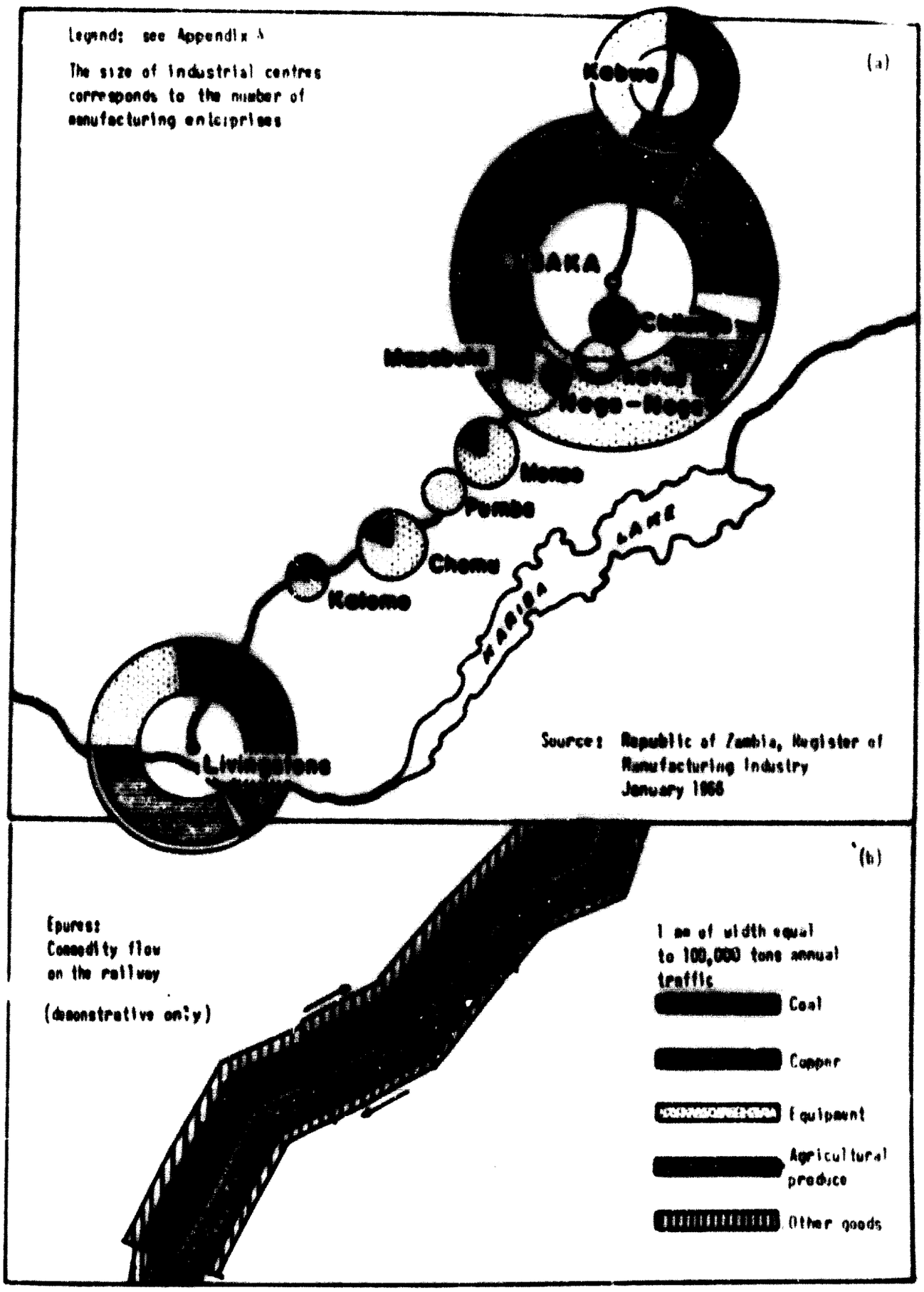
PLANNED GROWTH OF GDP 1964-1970



This publication has not been reviewed by the Department or accepted by the United Nations.

Appendix 8

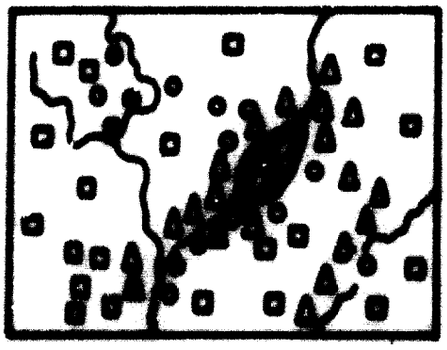
LOCATION OF MANUFACTURING INDUSTRY AND LINE-OF-RAIL REGION IN ZAMBIA



Appendix 9

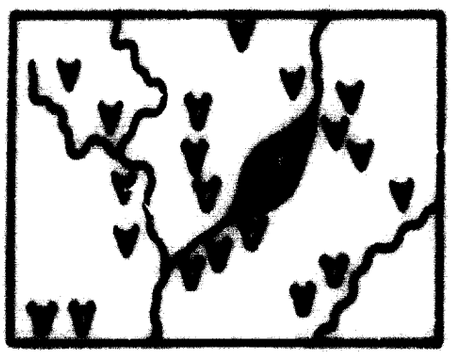
SELECTION OF THE PROPER SCALE FOR SYMBOLS
(Coding of Agriculture)

(a)



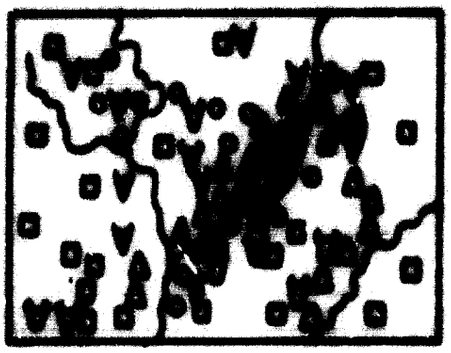
Crop map (each symbol equals 500 ha)
Crop varieties: ●a ■b ▲c

(b)



Livestock map (each symbol equals 500 heads)
Livestock varieties: ♥a ♥b

(c)



Combined crop and livestock map
Errors: the area mapped is characterized by the equal significance of both crop and livestock productions but the crop symbols are overshadowing and the map is overloaded.

(d)

Corrected map
New scale: each crop symbol equals 1,000 ha
(scale for livestock remains the same)

Appendix 10

CARTOGRAPHIC METHOD FOR CALCULATING SURFACE WATER RESOURCES

(a) Relief map delimiting catchment area

Rivers

Contours

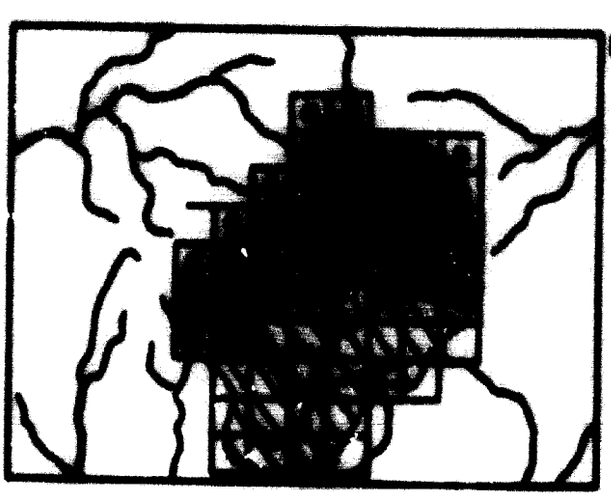
Catchment area

(b) Rainfall map
annual rainfall in mm

More than 1,100

1,000-1,100

900-1,000



(c) Combined map (relief plus precipitation) with auxiliary squares for calculation.

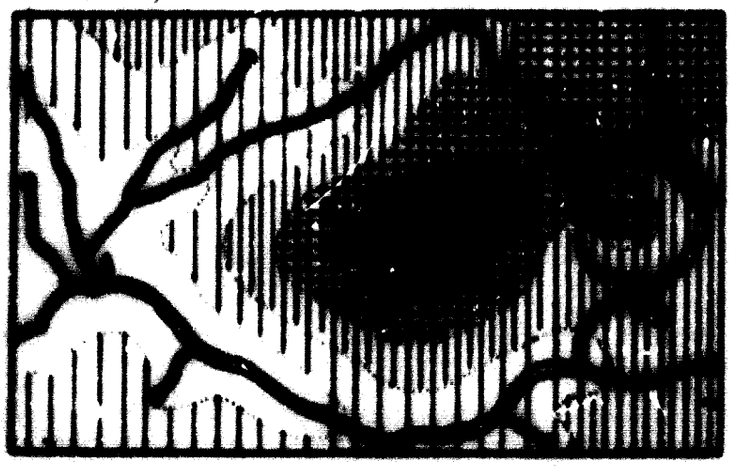
Water resources from rainfall per square (10 x 10 km) in m³/sec.

	Total	Run-off
	3.32	0.1
	3.0	0.00

Appendix II

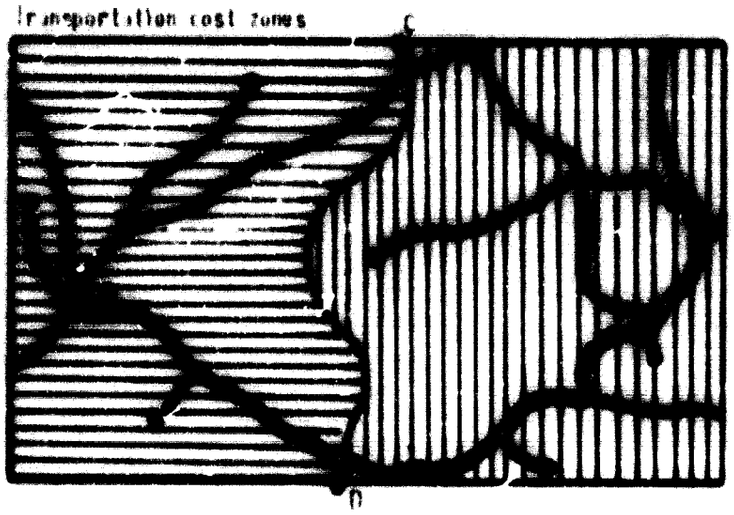
EQUAL-COST DISTANCE MAPS

(a) Based on city "A"



(b) Based on city "B"

(c) Transportation cost zones



Transport costs per ton (in $)

- less than 1
- 1-2
- 2-3
- 3-4
- More than 4

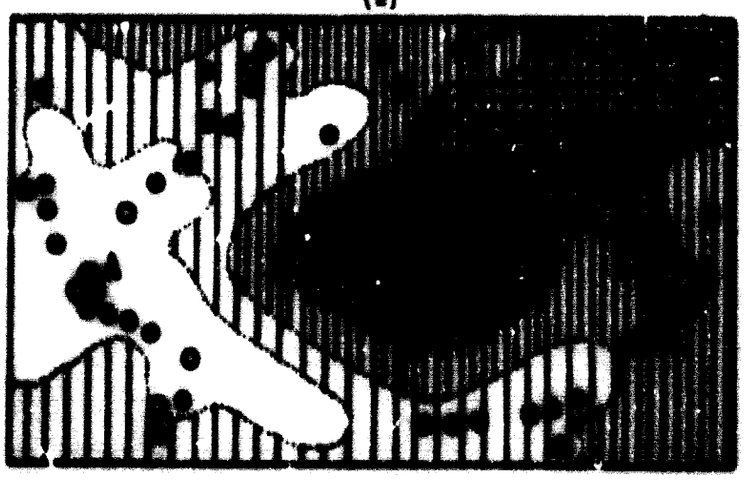
Zones gravitating to:

- city "A"
- city "B"

Appendix 12

TRANSPORT-COST METHOD OF LOCATION

(a)

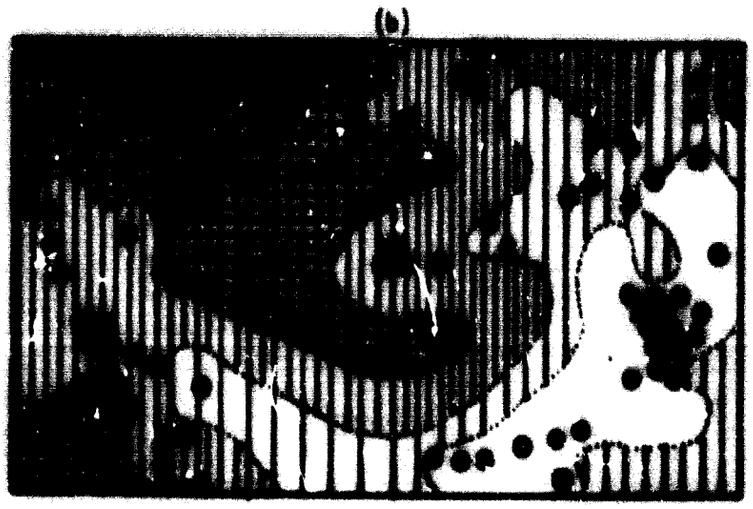


One dot = one ton of

- Production of raw materials
- Consumption of final product

Equal-cost distance map based on city "A"

(b)



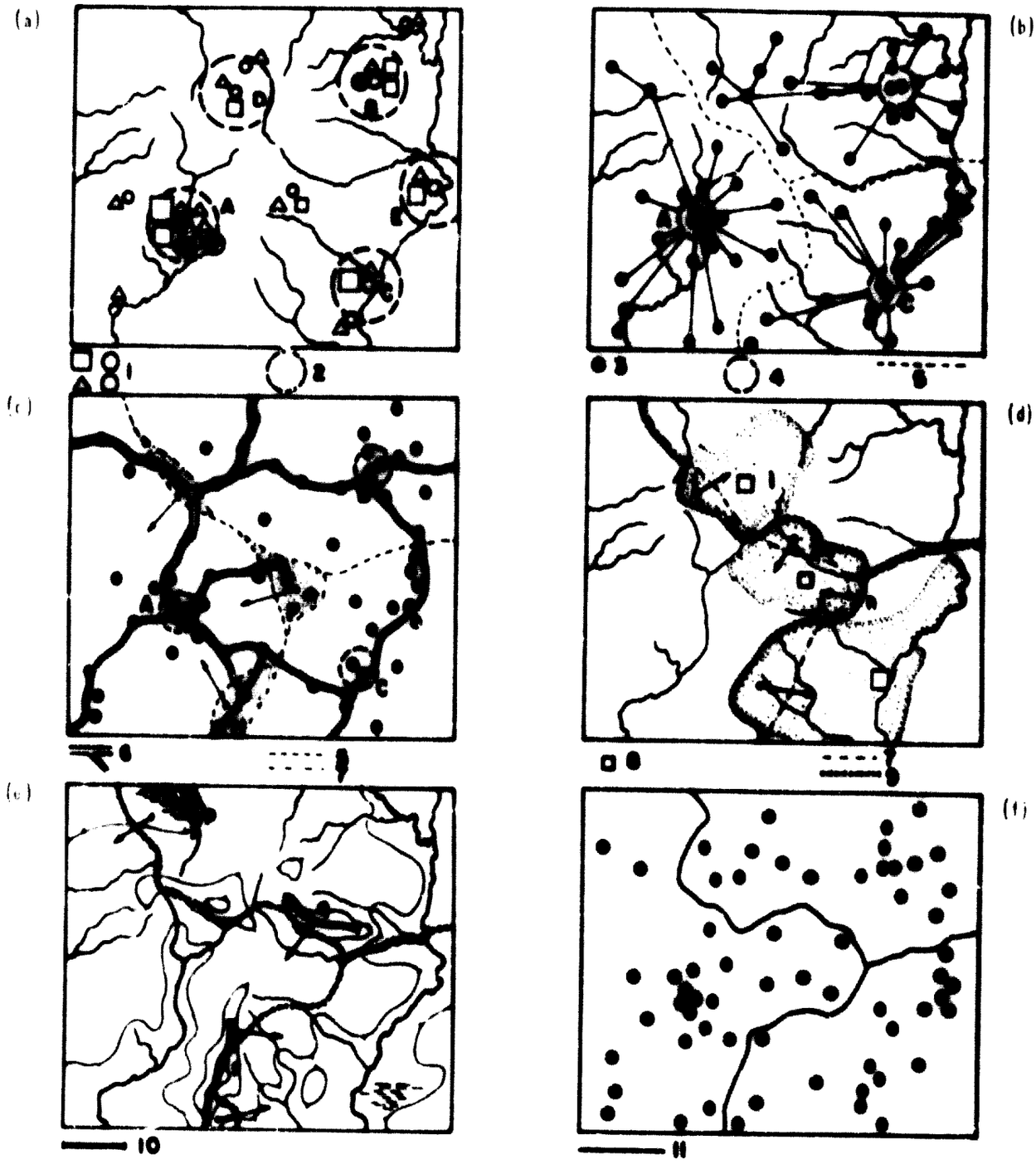
Transport costs per ton (in $)

- less than 1
- 1-2
- 2-3
- 3-4
- 5

Equal-cost distance map based on city "B"

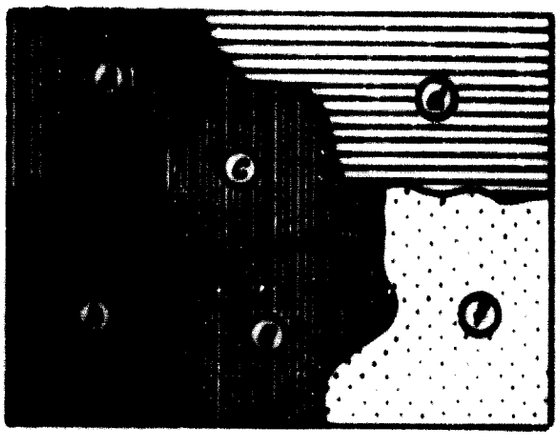
Appendix 13

PROCESS OF REGIONALIZATION



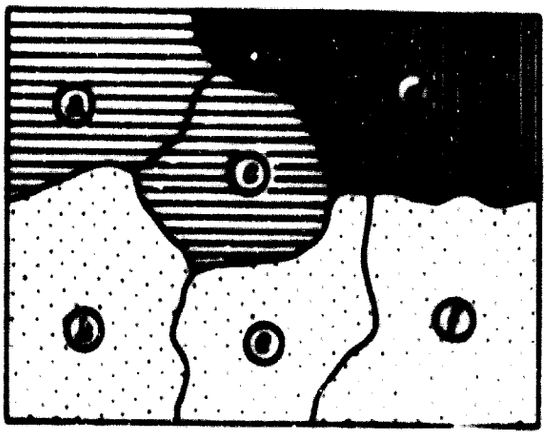
Appendix 14

LOCATIONAL CHARACTERISTICS MAPS



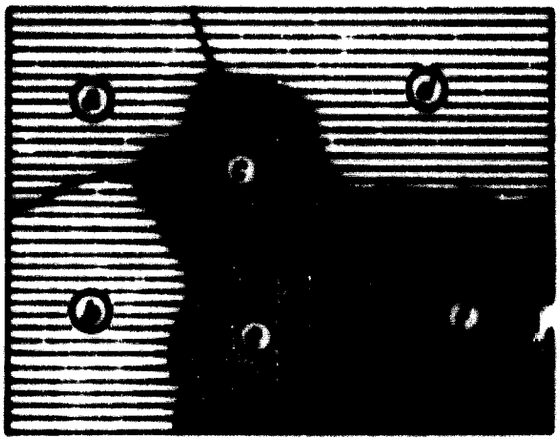
(a)

Water resources



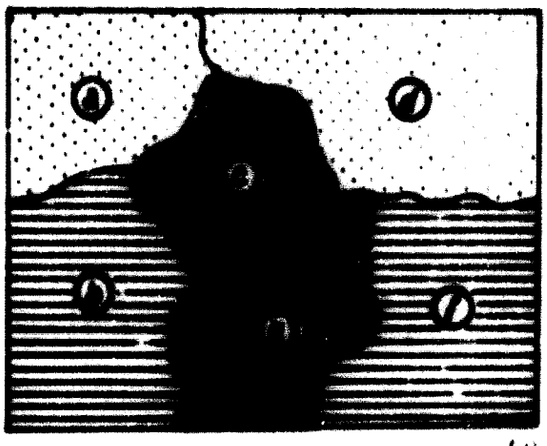
(b)

2 Forest resources



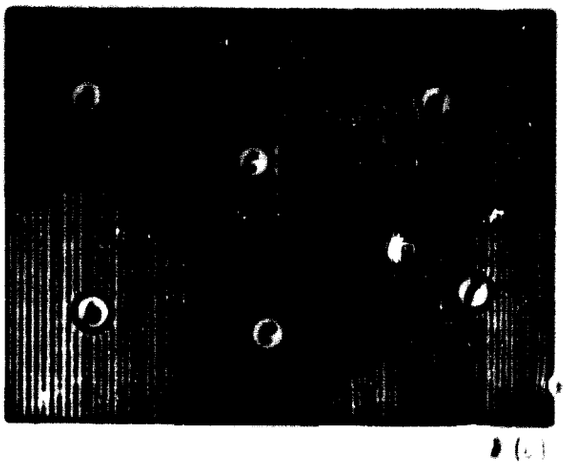
(c)

Manpower resources



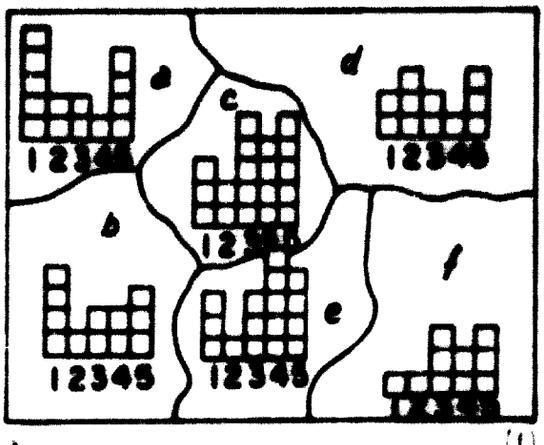
(d)

4 External marketing conditions



(e)

5 External marketing conditions

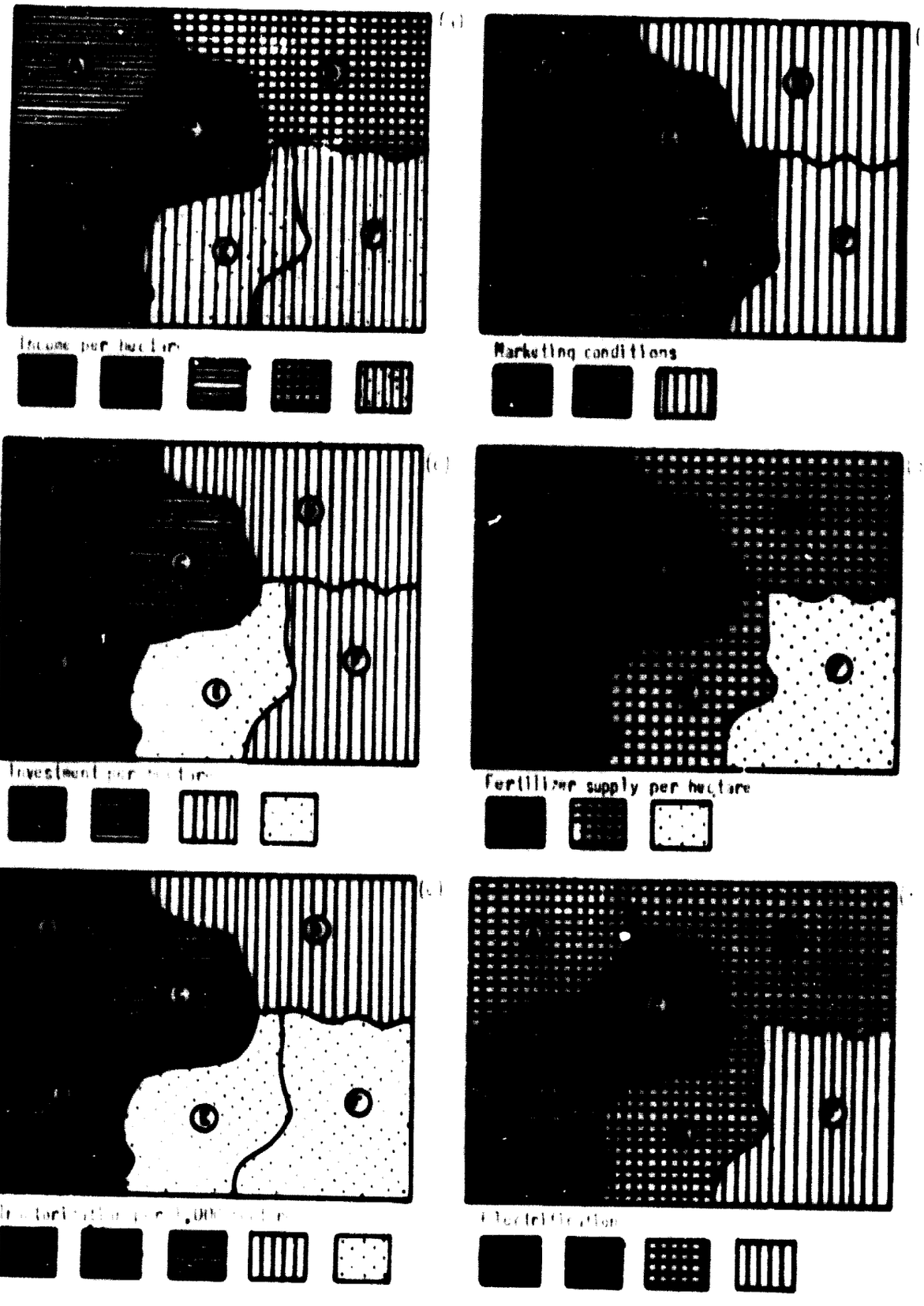


(f)

6 External marketing conditions

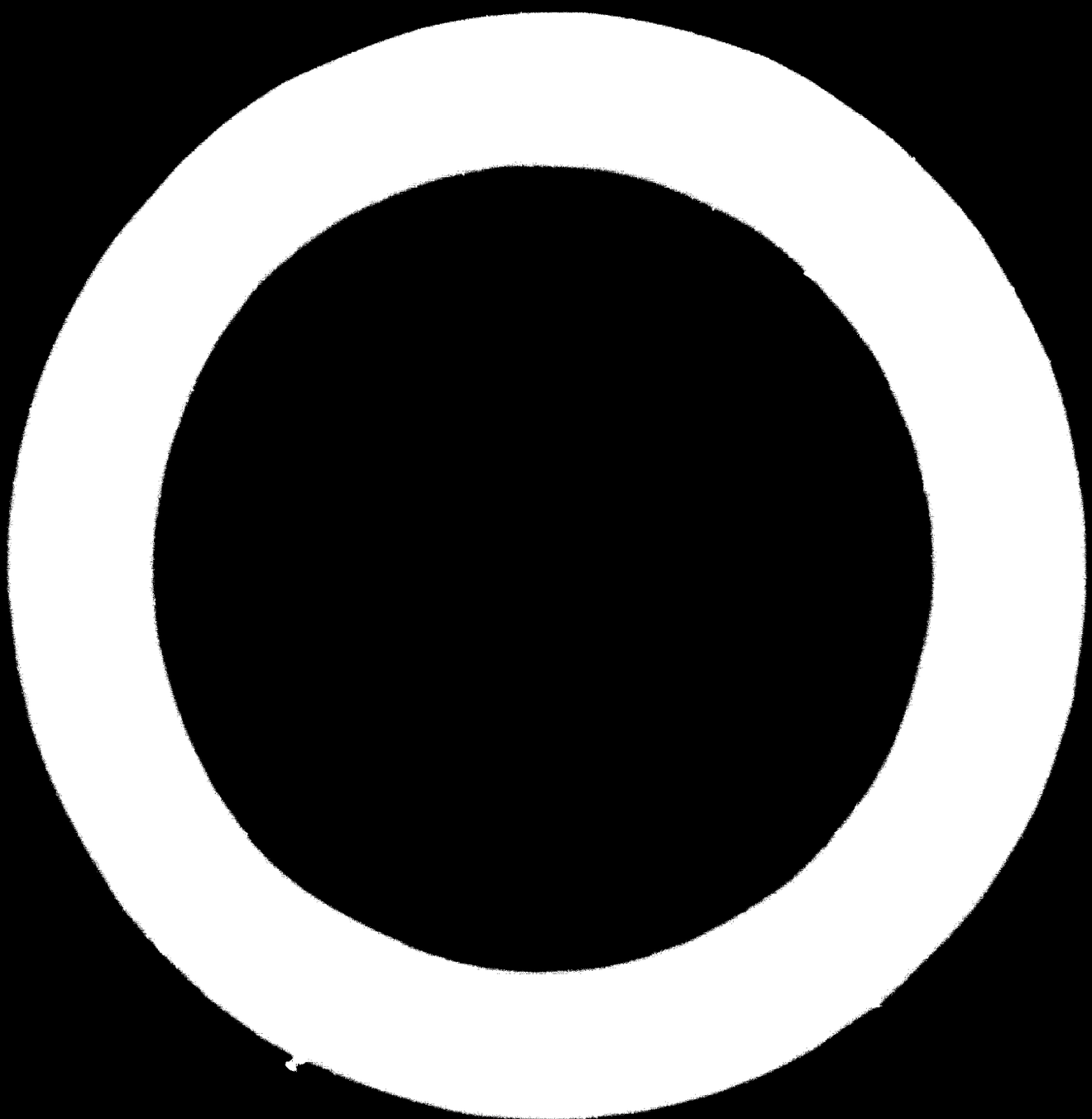
Appendix 15

CARTOGRAPHIC ANALYSIS OF AGRICULTURE BY REGIONS



PART IV INSTRUMENTS OF INDUSTRIAL LOCATION POLICY

1. Industrial location policies and measures in developing countries, by UNIDO
2. Regional development and industrial location policy in Argentina, by M. Brodersohn
3. Industrial location policy in Mexico, by A. Lamadrid



D02983

I. INDUSTRIAL LOCATION POLICIES AND MEASURES IN DEVELOPING COUNTRIES[1]

PATTERNS OF INDUSTRIAL LOCATION

In most developing countries industry has concentrated in a few locations, usually metropolitan areas. In India, for example, in 1960 there was an overwhelming concentration in two states, Maharashtra and West Bengal. These states comprised only 17 per cent of India's population, but accounted for 30 per cent of the manufacturing establishments,[2] 44 per cent of the employment and 50 per cent of value added.[3] Even in these states industrial activity centred predominantly around the metropolitan cities of Bombay and Calcutta, especially Bombay.

In Brazil, another country of continental dimensions and vast resources, 66 per cent of industrial employment in 1959 was concentrated in the south. With only 35 per cent of Brazil's population, the south contained 46 per cent of the manufacturing establishments while its share of value added was 68 per cent. In the state of São Paulo, where in 1959 well over 50 per cent of Brazil's industrial manpower was employed, about half the workers were engaged in the capital of São Paulo[4] which accounted for 50 per cent of the value added by industrial production in Brazil.

1/ Paper presented by UNIDO and prepared in co-operation with S. B. Neumark, Stanford University, Stanford, California, based largely on country studies by S. Aziz, Pakistan; K. J. George and A. S. L. Rao, India; and M. S. Brodersohn, Argentina. Presented at the International Symposium on Industrial Development, 1967, as ID/CONF.1/27.

2/ The power-equipped establishments employed 50 or more workers; those lacking power installations had 100 or more workers.

3/ Annual Survey of Industries (1960), Dept. of Statistics, Central Statistical Organization, Calcutta.

4/ Data reported by Serviço Nacional de Aprendizagem Industrial, Serviço de Cadastral e Controle de Departmentos Regional and published in Associação Commercial de Rio de Janeiro, Revista, Rio de Janeiro, June 1960.

In Pakistan, as in India and Brazil, industrial development is characterized by concentration in a comparatively small number of regions and by a growing population in industrial towns. In 1961 the maximum concentration in West Pakistan was at Karachi, Lyallpur, Lahore and Multan. These centres accounted for 40 per cent of industrial employment. In East Pakistan the relative concentration is even more pronounced. Its four main centres account for 5 per cent of all industrial workers: Dacca district, with 25.5 per cent of the total (of which 15.8 per cent are in the city of Narayanganj), Chittagong district, 14.7 per cent; Mymensingh district, 8.0 per cent; and Khulna district, 4.5 per cent. In terms of value added, West Pakistan's share was 74.5 per cent as compared with 25.5 per cent in East Pakistan. In 1960 value added in Karachi (23.7 per cent) exceeded the figure for the whole of East Pakistan.

Similar patterns of industrial location are found in almost all developing countries. In Argentina, for instance, in 1963 about 83 per cent of establishments and workers were concentrated in the East-Centre region,[5/] with the greatest number of establishments (52.5 per cent) and workers (63.4 per cent) in Buenos Aires. In the Philippines 50 per cent of employment and 49 per cent of value added in 1959 were concentrated in metropolitan Manila, which accommodated only 4.7 per cent of the population.

Despite these trends towards concentration and agglomeration, in most developing countries some activities continue to be dispersed over a number of regions and areas. What are the characteristics of the dispersed as compared with the concentrated industries?

Most dispersed activities are small-scale industries catering to local markets with a limited degree of mechanization per establishment and per person employed; the majority of the producing units are small craft establishments. The concentrated industries are medium and large-scale establishments catering to a wider market; they tend to be capital-intensive rather than labour-intensive.

Perhaps the outstanding feature of concentrated activity is its diversity. In Pakistan, centres like Karachi, Lahore, Dacca and Chittagong have a variety of industries, including consumer goods such as textiles, electric bulbs,

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5/ Buenos Aires, Córdoba, Entre Ríos, La Pampa, Santa Fé.

sewing machines, radios, footwear, pharmaceuticals, processed foods and tobacco products; intermediate goods, including wire and wire products, pipes, fittings, plywood, oil refining, paper products, tires and tubes, steel re-rolling, dry batteries, electric wires and cables; and capital goods such as diesel engines, transformers and electric pumps, shipbuilding, motor manufacture and assembly plants, machine tools and scientific instruments.

Dispersed activities in Pakistan are primarily producers of consumer goods (such as textiles and food products for the local markets) manufactured from local materials or raw materials obtained from other areas. There are, however, some regions outside the main centres where engineering is spreading rapidly owing to the traditional skill of the inhabitants in handling metals. Residents of large communities in places like Wasirabad and Daska have traditionally been blacksmiths. The availability of machine tools and the growing demand for pumps and diesel engines in the agricultural sector have generated a large number of small units for the manufacture of these items. The spontaneous growth of this activity has contributed to the success of the private tube well programme in West Pakistan which, in turn, was a major factor in accelerating agricultural growth during the Second Five-Year Plan.

PROBLEMS OF INDUSTRIAL LOCATION

Concern has often been expressed in a number of developing countries about the heavy concentration of industry in metropolitan areas. Consideration has been given to measures for slowing down the trend, both by discouraging further concentration of industry or by facilitating its establishment elsewhere. It is agreed that decentralisation is desirable not only because the development of large cities and over-expanded industrial regions must be discouraged, but also because the development of underdeveloped regions must be accelerated.

Factors influencing industrial location

The factors that have influenced existing patterns of industrial location are well known. Proximity to consumer centres, access to export markets and raw materials, and availability of special skills as well as fuel and power are obvious advantages provided by large towns, particularly ports. Once industries began in certain locations and infrastructure facilities became available, more industries were attracted. The external economies resulting from this concentration created a magnet, drawing still more industries to these urban areas.

overcrowding, smoke, noise and transport congestion. Some of the unfavourable consequences of their rapid growth in population are:

- The rapid rate of increase has placed excessive strain on housing facilities and has forced a large segment of the population to live in sub-standard conditions;
- The increasing congestion in inner areas has shifted a substantial part of the population to suburbs, but this has resulted in acute overloading of the suburban transport system;
- The long daily commuting has reduced the workers' real income, undermined their health, and affected their over-all efficiency and output;
- The increase in land values resulting from concentration has placed a heavy burden on industry and local authorities and has magnified the difficulties of town planning;
- As a result of congestion, smoke and malnutrition, there is an abnormal incidence of infant mortality, respiratory and allied diseases;
- In places like Karachi, which does not have a sizable hinterland to provide fresh supplies of food, the cost of living has gone up more rapidly than in the rest of the country.

It is therefore not surprising that many developing countries have emphasised the importance of industrial decentralisation or dispersal and regional balance. This does not necessarily mean that the circumstances in most developing countries actually justify such dispersal.

GOVERNMENT POLICIES ON INDUSTRIAL LOCATION

Industrial location policies have two main objectives. The first is dispersal from congested and overdeveloped areas; these are principally encountered in developed countries, but are also found in India and Pakistan. Whether there is need for such a policy in other developing countries, especially in Africa and Latin America, is doubtful. In Argentina, for example, the theory that metropolitan Buenos Aires is industrially in the "diminishing returns" stage has been widely accepted. It is often said in political circles that Buenos Aires is overcrowded, that it suffers from gigantism, that new poles have to be stimulated, not only because a more balanced regional distribution of income and activities is socially justified but because it is compatible with maximizing the national rate of growth, a view shared by the Consejo Federal de Inversiones, an interprovincial agency created in 1959. There is, however, no empirical evidence that net returns in Buenos Aires are diminishing.

The second objective is to accelerate the growth of undeveloped regions to counteract economic disparities. The latter are attributable to differences

By contrast, industries in far-away and isolated locations have to provide essential facilities and services for themselves. An industry in an isolated location must provide not only its own workshop, foundry, water and power facilities, but also must build expensive access roads, railway sidings, dispensaries, schools and housing. It is forced to stock large inventories of spare parts and to provide elaborate training facilities.

Clearly, unless secondary centres of industrial activities can be developed around small towns so that essential facilities can converge or, if necessary, be subsidised, the regional dispersal of industries will not be economic.

Unfavourable effects of concentration

Many of the developing countries' large cities, which are characterised by a concentration of industrial development, have become congested and slum-infested, leading to mounting costs of housing, transport, sewage disposal, water supply, fire protection and other social overheads.

The progress of industrialisation in India, for example, has caused a large influx of the population from rural areas into Bombay and Calcutta, which tends to press heavily on the existing amenities. Shortages of water supply, electricity, housing accommodations and education and health facilities are recurring phenomena, the severity of which has become more acute with the passage of years. As long ago as 1944 three quarters of Bombay's population were living in one-room tenements, with an average, in some areas, of fifteen persons to a single room. High rents, pressure on transport, inadequacy in the supply of labour and unhealthy conditions are said to have contributed to rising costs of production and to have offset the advantages of concentration. In other words, apart from the social problems created by over-concentration, it is presumed that increasing costs of public utilities and services and rising production costs may outweigh the benefits derived from external economies.

In Pakistan the unfavourable effects of rapid urbanisation are evident in cities like Karachi, Lahore, Lyallpur, Dacca and Chittagong. They house the bulk of the nation's industrial activity and are characterised by slums,

in factor endowments such as the unequal distribution of natural and human resources, to historical reasons, and to the cumulative effects of external economies. Owing to these inequalities, disparities exist in both developed and developing countries and a policy of balanced regional growth has to be considered within a framework of national economic growth. In developed countries the problem of accelerating growth in undeveloped regions is largely one of "regional balance" rather than of national growth. In developing countries, on the other hand, where the average per capita income is low, regional policy is closely connected with the general objective of growth. The problem of "balanced regional growth" consists essentially of a choice between spreading the limited resources available for investment thinly over all regions in a relatively even way or, at the outset, concentrating development in selected regions to the temporary neglect of others".6/

The choice between a higher rate of national growth and balanced regional growth is unfortunately not just a choice between economic alternatives. A conflict between economic and socio-political objectives is involved. As suggested in a recent publication of the Economic Commission for Europe, such a conflict should be solved by a compromise between the maximization of economic growth and the achievement of income equalization. "The nature of this compromise, of course, would vary between countries according to their political systems, social maturity and the strength of vested interests."

Pakistan

Governments are well aware of this conflict between economic and socio-political objectives. This is evident from the policy statement of the Government of Pakistan on the question of industrial location in the First Five-Year Plan, 1955-1960:

> "Location of new capacity: In the earlier phase of industrialisation, industries have tended to congregate near a few main towns such as Karachi, Lyallpur, Narayanganj and Chittagong. This has been natural because of the facilities and economies available at such places. Karachi, in particular, has figured prominently, due to the advantages of the port, the special facilities of industrial estates, close proximity to the centres of administration and the presence of a large business class that settled there on migration from India. On purely economic grounds, new capacity should be installed where the costs of

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6/ United Nations Economic Commission for Europe (1965) "Problems of regional economic planning and development in Europe and the United States", Economic Bulletin for Europe, Vol.XVII, No.2, p.5.

production and transport will be lowest. But location cannot be determined on economic grounds alone. In the interest of balanced regional development and social stability, it is desirable that industries should be more widely dispersed. to spread the benefits of employment and increased income over large areas. Dispersal will lessen the magnitude and intensity of the social problems created when populations are moved from rural to urban areas, inadequately provided with public facilities.

"The Government already exercises the power to determine the location of new industrial units. The Pakistan Industrial Development Corporation (PIDC) has used its opportunities freely to locate new units in areas close to sources of raw materials such as Chandragona, Nowshera and Daud Khel. More can be done, however, to encourage industries to spread out. The development of integrated systems of power supply, and the availability of natural gas in extended areas, could be utilized in support of such a policy. Consideration should be given also to the possibility of offering concessions in land, local taxes and freight rates. If undue concentration of industry is to be prevented, the Central and Provincial Governments, local bodies, railways and power authorities will have to follow appropriate policies."1/

Accordingly, although the need to develop "smaller" or secondary centres of industrial activity as an alternative to dispersal in isolated locations was recognised, industrial location policy in Pakistan between 1955 and 1960 consisted mainly in preventing the increase of industrial activity in the congested centres.

However, the Second Five-Year Plan, 1960-1965, instead of emphasizing the need for establishing industries in remote or isolated areas, suggested a relaxation of restrictions in areas suitable from an economic point of view, and the encouragement of industries in places with transport and other facilities. The relevant paragraph reads as follows:

"During the past few years, establishment of industries in Karachi has been severely restricted, and expansion has not been welcomed in certain districts of West Pakistan. The effort has been to establish industries in areas where little or no industry exists. The effect of these limitations has been to discourage industrialization in those areas of the country, notably the large industrial centres, where new investments will become most fruitful, at least in the short run. These limitations will need to be relaxed, and location of new capacity encouraged in all suitable areas. In this context it will be of advantage to provide the establishment of industrial estates in centres where the transport system, water and power resources, and availability of raw material and potential markets offer suitable opportunities. Apart from the large centres, efforts will be made, notably through the small-scale industry programme, to encourage smaller centres for industries which mainly supply local markets. Close co-operation will be necessary between

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1/ Planning Board, Government of Pakistan (1955) First Five-Year Plan, Islamabad, p.414.

> authorities responsible for industrial planning and those dealing with urban and regional physical planning, in order to promote the dispersal of industries in suitable locations."8/

Finally, the Third Five-Year Plan, 1965-1970, published in June 1965, emphasized rational and pragmatic criteria (subject to the "overriding" objective of removing economic disparity between East and West Pakistan) and recognized the need for special locations for different kinds of industries:

> "Industrial investment policy, as to kind and location of industry, will be pragmatic and rational to the maximum extent consistent with over-riding the Plan objective of eliminating economic disparity between East and West Pakistan. As a general guide, investment opportunity which offers maximum rate of return on invested capital will be selected over alternative investments for the same purpose but indirect benefits of dispersing industries throughout the country will be fully taken into account. Clustering of industries around a few industrial centres entails many additional costs inherent in rapid urbanization besides numerous social problems in the long run. Besides these general criteria, special considerations must determine the location of different kinds of industries. For some industries such as cement and steel, proximity to raw material is essential, while for others, factors such as availability of skilled labour, or easy access to markets are more important. Export industries are more competitive if located near port towns, but this factor must be weighed against possible advantages from proximity to raw materials such as natural gas or power supply. Subject to these considerations, industries will be sanctioned for locations where they will maximize contribution to economic growth on the basis of rational and pragmatic analysis subject to exceptional considerations of intra-regional disparities and long-term development."9/

In addition to these policy statements, the Government of Pakistan has issued a large number of ad hoc instructions concerning the location of industries, although some of them do not reflect the over-all policy. Orders to ban the setting up of new industries in Karachi were published in 1957, but cancelled in 1960.

India

Balanced regional growth is one of the most desirable national objectives in India, but it may, in the short run, conflict with the objective of maximizing the rate of national growth. Nevertheless, in the public sector, the criterion for the location of new plants in India seems to be the need for

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8/ Planning Commission, Government of Pakistan (1960) Second Five-Year Plan, Islamabad, p.[illegible].

9/ Planning Commission, Government of Pakistan (1965) Third Five-Year Plan, Islamabad, p.[illegible].

correcting regional imbalances. The promotion of small-scale industries, one of the main planks of government policy, has played its part in encouraging regional dispersal. From the point of view of balanced regional development, one of the most important provisions of the resolution adopted by parliament in 1948 (the guideline for the First Five-Year Plan, 1951-1956) was that relating to small-scale industries.

The Second Five-Year Plan, 1956-1961, was based on the Second Industrial Policy Resolution of 1956. Even though the new policy encouraged freedom for the private sector of the economy, the public sector assumed an increasing role in industrial development and contributed greatly to regional dispersal.

The Second Industrial Policy Resolution stated that "in order that industrialization may benefit the economy of the country as a whole, it is important that disparities in levels of development between different regions should be progressively reduced". It emphasised that infrastructure facilities should be steadily made available to areas lagging behind industrially or those where unemployment was greatest.

The policy of the Government of India, though favouring regional dispersal, seems to indicate that the choice of location for basic capital and producer goods industries should be primarily determined by economic and technical considerations rather than by objectives of regional dispersal and the development of underdeveloped regions. However, in the location of certain consumer goods and processing industries, such as cotton textiles, bicycles, sewing machines and the like, a policy of regional balance has met with success.

One of the policy measures taken by the Government of India to secure regional dispersal or balanced regional development has been the selective use of licensing powers in the belief that refusal of a license in a developed region will encourage the establishment of additional capacity in undeveloped regions. This can prevent concentration of new industries in congested areas, but as a means of fostering industrial growth in undeveloped areas it is unreliable. An entrepreneur can be prevented from going to a particular area, but cannot be compelled to set up industries elsewhere.

The objective of regional dispersal can be more effectively implemented through direct state participation in industry. Admittedly the location of heavy and basic projects must be decided on economic considerations, such as the proximity of raw materials, availability of cheap power and transport facilities. But, when alternative sites are available, consideration is given

to the possibility of locating the project in undeveloped areas. In India certain basic industries, such as steel, aluminium, copper, zinc, oil refineries, fertilizer plants and heavy machine building, have allowed scope for alternative decisions, and the development of particular regions has been reviewed before reaching a conclusion about the location of projects.

Several new areas have been opened up as a result of the establishment of public sector undertakings. The development of the Sundargarh area in Orissa has been mainly due to the foundation of the Rourkela Steel Factory. The Drug area in Madhya Pradesh owes its present prosperity to the foundation of the Bhilai Steel Works and associated industries. The Sehore area in Madhya Pradesh was developed after the foundation of Hindustan Heavy Electricals at Bhopal. The phenomenal development of the Ranchi area in Bihar has been due to the large projects (such as heavy machinery, the foundry forges and the like) undertaken by the public sector in this area. The Neyveli project has stimulated the economic growth of the South Arcot district in Madras State.

Even so, as the Third Five-Year Plan observes, "Excessive emphasis on the problem of particular regions and attempts to plan for their development without relating their needs to the requirements of the national economy have to be guarded against, for, in the final analysis, it is as integral parts of the country that different regions can best hope to realise their full potential for growth."[10/]

Argentina

Between the 1930s and the mid-1950s the objective of industrial development policy in Argentina was largely the import substitution of consumer goods. Favoured by external economies derived from the agglomeration of activities and factors of production, the East-Centre region, particularly metropolitan Buenos Aires, attracted most industrial activity.

By the mid-1950s the pattern of industrialization based on import substitution of consumer goods was replaced by import substitution of intermediate and capital goods. The new pattern, although still increasing the development of Buenos Aires, created new centres in the provinces of Córdoba and Santa Fé,

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10/ Planning Commission, Government of India (1961) Third Five-Year Plan, New Delhi, p.153.

both of which had been provided with infrastructure facilities and appropriate inputs. The province of Córdoba was able to develop a metallurgical centre by attracting tractor, automobile and railway equipment industries; Santa Fé attracted a petrochemical complex.

During the latter period government policy was also directed towards achieving a more balanced regional growth. Decentralization was encouraged by the Five-Year Plans of 1947-1951 and 1952-1956, by national industrial promotion laws and, more recently, by the National Development Programme of 1956-1969. The climax of this decentralization process was the 1964 industrial promotion law which excluded investments in metropolitan Buenos Aires from any type of benefits.

As in other developing countries, these policy decisions have involved an unavoidable conflict between the maximization of national economic growth and the achievement of regional equity. How, and by what means, the Government of Argentina proposes to resolve this conflict is still not clear.

POLICIES AND MEASURES TO INFLUENCE INDUSTRIAL LOCATION

The policies and measures adopted by national, state and provincial governments to influence industrial location can be divided into three categories:

(a) Policies to induce national and foreign enterprises or factors of production (capital, labour, entrepreneurship and technical and managerial "know-how") to move into less developed regions;

(b) Policies to mobilize the resources of less developed regions for industrial development; and

(c) Measures to prevent the establishment of new industries in congested areas.

Policies to encourage dispersal through public sector activity

In India incentives have been provided by the central Government and the state Governments to facilitate the movement of industries to undeveloped areas. The location of large public sector projects in such areas has greatly contributed to their economic growth.

Public sector projects are limited as they generally involve heavy investments in which technological and economic considerations cannot be easily overlooked for the sake of balanced regional dispersal. Only where alternative sites are available has the development of undeveloped areas been taken into

consideration before deciding upon the final location of a project; India has been fortunate that alternative locations were available. Those so far selected for public sector projects have, it is claimed, achieved to a substantial extent the objective of opening up undeveloped areas.

Apart from projects sponsored by the central Government, some manufacturing companies have been operated by the state Governments either on their own, jointly with the central Government, or with the private sector. Since the resources at the disposal of state Governments are more limited than those of the central Government, state Government projects are generally smaller. Nevertheless they have played an important part in attaining a wider geographic distribution of manufacturing activities. Examples of state Government projects are the Nizam Sugar Factory and the Andhra Paper Mills in Andhra Pradesh; Travancore Cochin Chemicals and Travancore Titanium Products in Kerala; the Mysore Sugar Company, Mysore Iron and Steel Works, and the new Mysore Government Electric Factory; the Superphosphate Factory in Bihar; and the Silk and Woollen Mills in Kashmir

Apart from direct investment in industrial projects, the central Government of India has allocated funds in successive five-year plans to infrastructure development in the states. This has indirectly contributed to a wider dispersal of industrial activities.

Similarly, in Pakistan, one of the policies adopted since 1960 to eliminate interregional disparity has been the diversion to East Pakistan of an increasing proportion of public sector resources for infrastructure and industrial development.

Although industrial policy in this country relies primarily on private initiative and investment, a Pakistan Industrial Development Corporation (PIDC) was created as early as 1952 to compensate for the lack of private enterprise in specific fields. Between 1952 and 1965 the corporation set up 29 units, a total investment equivalent to US$142 million. Fourteen units were exclusively owned by the Government, fifteen jointly with the private sector of industry.

The decisions to site a large number (more than half) of government-sponsored plants in less developed regions of the country have undoubtedly had an important effect on industrial location in Pakistan. Unfortunately, a number of the plants were set up in uneconomic environments. They have been able to survive only through direct subsidies or by maintaining artificially high prices for their products.

Reviewing the locational factors of public sector projects in Pakistan, the following observations may be made:

- Industries located near the source of raw materials have generally proved viable. Such industries have included jute, sugar, paper, and fertilizers;
- Industries based on imported raw materials but located away from ports have not been able to maintain an economic cost structure because of the additional cost of transporting raw materials and, in some cases, transporting the finished products back to the markets in or near the ports;
- The average rate of return on industries established in completely isolated locations has generally been lower than those set up in the main and secondary centres of industrial activity because of larger overhead expenditure in providing roads, water storage and housing facilities;
- In certain sophisticated industries, like the telephone factory in Haripur (West Pakistan), the higher economic cost is partly compensated by the development and spread of skill in the region; but in the case of some industries, like woollen mills which are not located in sheep-raising areas, the possible indirect social advantages would not seem to compensate for the high economic subsidy involved.

The initial spurt in industrialisation in Pakistan was influenced by the infrastructure already existing in certain regions at the time of independence in 1947. As noted above, since 1960 larger allocations have been made for the expansion of infrastructure in less developed areas, particularly East Pakistan. Although there has been no systematic attempt to spread these facilities on a regional basis, the hope is that the rural works programme initiated in 1963 will pave the way for a more comprehensive regional approach.

In Argentina, the province of Patagonia is richly endowed with resources but lacks infrastructure. Recently the Consejo Federal de Inversiones has organized, with the United Nations, a study group to formulate a development plan for the Comahue region, which includes a part of Patagonia. The main purpose is to decide on a number of projects and to gauge the need for infrastructure in these parts.

Policies to encourage dispersal through private sector activity

Many policies are open to central and regional governments to induce the private sector of industry to locate in less developed areas. Their form varies from country to country, but, apart from the provision of infrastructure and participation in or subsidisation of enterprises, they can be grouped

under four headings: regulation and control, financial measures, fiscal incentives, and industrial estates.

Regulation and control

In India, the most important legislative and administrative framework established to implement the 1948 Industrial Policy Resolution is the Industries (Development and Regulation) Act of 1951. Its provisions apply to all power-operated units employing 50 or more persons or units without power installations employing 100 or more persons. The central Government is given wide powers of direction and control.

The licensing committee established under the act screens applications to set up new units, to effect a substantial expansion of existing enterprises, or to undertake the manufacture of new products. One of its basic considerations is the balanced regional dispersal of industries. By requiring authorisation for substantial expansion of an existing industrial undertaking the Government can check "excessive concentration" in particular regions. However, as mentioned earlier, licensing powers cannot in themselves foster the growth of industries in less developed areas.

In Pakistan, between 1948 and 1958 every industrial unit was specifically approved by the Government, and the sanctioning agencies were expected to give preference to applicants prepared to install their units in less doveloped regions. Administrative measures were also devised to prevent the concentration of industry in certain areas. In 1957, for instance, the Government decided to ban the location of new industries in Karachi. This particular ban was partially lifted in 1960 when it was realised that some industries, such as a steel plant based on imported raw materials, must be sited there.

On the whole the inference is that direct control measures have not proved enough to secure a balanced regional development of industries. The effects of positive incentives, fiscal and otherwise, on decentralisation of the private sector therefore requires examination.

Financial measures

One of the methods adopted by the central Government of India to promote industrial development is financial assistance. Its industrial finance corporation has assisted the growth of several industries through loans on reasonable terms. Small-scale industry has received considerable help from the national

Small Industries Corporation, which has devised programmes like the hire-purchase and industrial estates schemes. Direct loans, including subscription to debentures, have been made by the central Government to private firms (such as the Indian Iron and Steel Company and the Tata Iron and Steel Company) and financial facilities have been extended to many co-operative societies. Village and small-scale industries have benefited from the aid given by centrally sponsored boards such as the All-India Khadi and Village Industries Commission, the Coir Board, the Silk Board, the Rubber Board, and the Handicrafts Board. Many state Governments have set up state finance corporations.

Although financial assistance to private industry has contributed to the promotion of over-all industrial development, regional dispersal can undoubtedly be better implemented by direct official participation in industry. On the other hand, the industrial finance corporation in India, for example, cannot always adjust its lending policies to serve regional development if the latter conflicts with the soundness of the corporation's lending operations.

The wide dispersal of industries in India, including industrial co-operatives in rural areas and small towns, is the result of support given to village and small-scale industries throughout the country. The measures to promote such dispersal include the arrangement of credit and finance through loans and subsidies, the supply of tools and machines, and technical advice.

In the state of Maharashtra, for example, when entrepreneurs undertake feasibility studies with a view to establishing an industry in undeveloped regions, the Government provides 75 per cent of the preparatory cost of a study, if done through an approved agency, and guarantees loans raised by such industries. Other assistance comprises a refund of sales taxes on purchased raw materials and finished products, exemption from duty for the import of capital equipment, building materials and raw materials, and exemption from the payment of royalties for water from public sources. These and other concessions are available to thirty-one industries, including iron castings, steel forging, cotton textile machinery, sewing machines, soda ash, and fibre board. The maximum period for these concessions is generally thirteen years.

Fiscal incentives

The tax holiday scheme has been one of the most important measures in encouraging the growth of industries in less developed regions. Tax holidays

for new industrial ventures take the form of total exemption from company income tax on profits earned during a given period of time. In Pakistan undertakings in the most undeveloped regions receive the longest tax holiday; those in Karachi and other industrial centres have the shortest. The tax holiday scheme, begun in April 1959 and providing for relief periods from two to eight years, was to expire at the end of the Second Five-Year Plan in June 1965, but with some modifications it was extended for the duration of the Third Five-Year Plan. The tax holidays now allowed range from two to six years. A new industrial venture, to become eligible, must fulfil a number of conditions. These specify the industrial sectors and the areas whose development the Government seeks to foster.

The extent to which the subsidy inherent in the tax holiday compensates for possible additional costs in locating industries in less developed areas is difficult to assess. The immediate issue is the effect of fiscal incentives on industrial dispersion.

As far as Pakistan is concerned, industrialists generally continue to prefer urban centres like Karachi, Lahore, Hyderabad and Chittagong, except where proximity to raw materials is an overriding consideration. In secondary centres, where transport, power and other facilities are being developed through industrial estates, the incentives offered by tax holidays are more effective than in totally isolated areas where these facilities cost much more and skilled labour, shifted from industrial centres, demands considerably higher wages. In the past six years the dispersal of industries to secondary centres and some isolated regions has, however, been stimulated by the tax holiday system, supplemented to some extent by the administrative measures mentioned earlier, namely the policy of sanctioning agencies and of development banks of giving preference to applicants who wish to set up industries in less developed regions.

In Argentina a number of fiscal measures have been promulgated to grant concessions to investors in specific industrial sectors and in certain areas, particularly in the interior of the country. The concessions include:

- Duty-free import of machinery and equipment which cannot be made locally;
- Imposition or increase of tariffs and other import charges on goods whose importation would impede the development of local production;
- Suspension or limitation of imports of finished products or raw materials already produced in the country;

- Preferential currency arrangements for the export of industrial goods;
- Preferential credit arrangements for desired industries;
- Preferential supplies of raw materials, electricity, fuels and transport;
- Preferential treatment in government purchasing;
- Tax exemption and relief for specified periods.

When these projects are considered by an executive decree to be of "national interest", the following income tax exemptions are also granted:

- Exemption for interest on bonds, debentures, and stock and for dividends on preference stock issued to finance investment;
- Deductions from income tax to the amount invested in stock.

To encourage investment, tax exemptions as well as duty-free licenses are given for the import of machinery and equipment which cannot be made locally. The exemptions are granted for a maximum of ten years either to the enterprise or to the investor, but not to both simultaneously, a modification of previous legislation. The benefits granted to enterprises relate to a yearly reduction of business income tax, to deferred payment of tax on assets received as grants-in-aid, to excess profits tax ranging from a maximum of 100 per cent during the first four years to a minimum of 10 per cent in the tenth year, and on stamp tax, and include temporary residence permits for required foreign personnel and their families as well as special prices for gas, electricity, fuel and transport.

To qualify for special benefits, the enterprise must process the natural resources of the region and/or help to increase exports or substitute imports. The following activities are particularly encouraged: (a) impregnation, hardening, artificial drying and processing of wood, fibres, and bagasse; (b) complete processing of natural fibres, at least up to the spinning stage; (c) tanning; (d) food processing; (e) metallurgical industries; (f) chemical industries; (g) ceramics and glass production.

In spite of the benefits provided by the industrial promotion laws, decentralization of industrial activity has not been achieved. Investment, with the exception of resource-oriented industries, has tended to concentrate heavily in metropolitan Buenos Aires, Córdoba and Santa Fé. The reason is fairly obvious. Basically the only instruments used to implement dispersal have been tax and import duty exemptions. With no proper transport system, power supply, or other infrastructure facilities, the fiscal incentives have not been enough to stimulate investment in less developed regions.

Industrial estates

The programme for setting up large, medium-size and small industrial estates in East and West Pakistan is regarded as one of the nation's most important instruments for accelerating rational industrialisation. The country's experience in this field of endeavour is consequently of particular interest.

The initial experiment between 1953 and 1955 did not aim at regional dispersal. The large estates set up at Karachi and Hyderabad in West Pakistan and later at Tejgaon (near Dacca) in East Pakistan have actually contributed to the current over-concentration in these cities. The Karachi Estate, for example, covers an area of 4,000 acres, has 500 factories, and employs about 55,000 workers - about half the industrial workers in the Karachi district.

Although the role of industrial estates as an instrument to promote industrialisation in less developed areas was recognised in the Second Five-Year Plan, the programme has so far met with mixed success. Large-scale estates have on the whole fared better than small-scale ones. Attempts are being made to evaluate the experiences of the Second Five-Year Plan period so as to formulate guidelines for the future.

Some difficulties are common to both large and small estates; others are peculiar to small estates. The outstanding one pertains to problems of land acquisition. A basic objective in setting up industrial estates or zones is to overcome the impediment of land availability in suitable locations, but even the industrial estates sometimes run into difficulties. In a number of locations landowners have resorted to litigation and some of the legal questions have taken time to sort out, meanwhile holding up work on the estates.

Other obstructions to industrial development have arisen from an inadequate tie-up between town and regional planning. Apart from acquiring land and providing water, transport and power, the success of an industrial estate depends on the requisite expansion of technical education, appropriate modifications in local tax policies, and speedy development of public housing and satellite towns. In locations where this tie-up has been secured, the industrial estates have made rapid progress; but in several locations the estates have either not been developed according to schedule or, even when completed, have not attracted many industrial units. In other instances polytechnics planned for several locations selected for industrial estates have

not yet begun to supply the industries being set up. The result has been a relative shortage of technicians, particularly at the medium-grade level.

Numerous difficulties have hampered the growth of small industrial estates. Some seem inherent, others may be ephemeral and can perhaps be alleviated by appropriate policies or actions.

Small or very small enterprises be definition cater to local requirements, command limited managerial or technical skills, employ comparatively less skilled and thus poorly paid workers, and as a result show a low level of productivity. The costs of infrastructure facilities for small estates are generally relatively higher than for large estates. Some of the facilities are indivisible and their cost for each unit in the estate is not always proportionate to the size of the unit. Even after substantial subsidies, the price of industrial plots, which includes a part of the development charges and cost of facilities, is excessively high for small investors.

These factors and the difficulties of land acquisition have made the progress of certain small industrial estates comparatively slow. Measures now contemplated include:

- Permission for medium-scale industries to be set up on the small estates;
- Expansion of facilities for technical education in the areas covered by industrial estates and provision of technical advisory services;
- Closer co-ordination between town planning and local authorities and those responsible for the development of industrial estates;
- Simplification of land acquisition procedures.

As some of the existing difficulties are removed and more industries are set up in the large number of industrial estates now being developed, industrial estates will become economically attractive nuclei for establishing industries in less developed regions. The growth of a larger number of such secondary centres of industrial activity is one of the most helpful manifestations of the regional dispersal of industries in Pakistan.

CONCLUSION

Balanced regional development has been the declared policy of the developing countries whose industrial location policies have here been under review. To achieve this end, central and regional governments have taken measures to influence industrial location. Some of these measures may be said to be negative in character, in the sense that they can be effective in preventing

an industry from being set up in a congested area but ineffective in causing it to be set up elsewhere, especially in an undeveloped or less developed area. The choice is often not between establishing an industry in a developed or in an undeveloped area, but between further industrial development in a specific area or none at all.

As far as the public sector of industry is concerned, some large enterprises established by the central government in less developed areas have contributed to their economic growth and consequently to a wider regional dispersal. The scope of the public sector is, however, limited by the fact that the projects undertaken are generally those involving heavy investments where technological considerations such as the availability of raw materials, power, labour and close proximity to markets cannot be overlooked. In other words, the location of heavy and basic projects has to be decided on economic considerations. The development of undeveloped areas has been adopted as an additional consideration only where alternative sites are possible. Notwithstanding these limitations, the undeniable trend towards greater regional dispersal has been made possible by various fiscal and other incentives offered by central and regional governments and by the development of basic infrastructure facilities.

In the private sector of industry the explicit policy of regional dispersal has not been very successful, mainly because policy has not been backed by complementary measures and programmes.

Generally speaking, the circumstances prevailing in most developing countries do not seem to justify industrial dispersion and the actual need for such a policy is doubtful.

The main lesson of Pakistan's experience is that the best approach to a regionally equitable distribution of industries lies in the development of a growing number of secondary centres of activity. To scatter industries in totally isolated locations involves unduly high economic cost.

The second lesson is the importance of indirect control measures, such as incentives through tax holidays or differential tariffs and power rates to encourage industrialization of less developed regions. Administrative decisions on, or direct controls over, the location of industrial units involve an indeterminate subsidy and to a disproportionate extent vitiate the economic criteria.

Third, measures to confine the development of certain areas exclusively to small-scale industries are unlikely to succeed because small industries, unless they are feeder industries, suffer from low productivity and cannot bear the cost of all the infrastructure essential for efficient industrialization. Medium-scale industries must be allowed to set up in the so-called small industrial estates.

Finally, low cost, effective communication is perhaps the most important of all infrastructure facilities for industrialization.

2. REGIONAL DEVELOPMENT AND INDUSTRIAL LOCATION POLICY IN ARGENTINA

by M. Brodersohn[1]

Introduction

The economic growth of a country invariably begins in the regions with the most advantageous location. As national development progresses the external economies offered by these regions rather than their initial resources tend to attract further investment and trade, and the ensuing different rates of expansion increase the per capita income gap between growing and lagging regions. Regional differences exist in all countries, whether developed or developing; the inequalities are more striking, however, in some countries than in others.

The disparate rates of regional growth have led policy-makers in certain countries to regard regional development as a specific goal of economic policy in much the same way as full employment, economic growth, price stability and income distribution are viewed elsewhere. In southern Italy the Cassa per il Mezzogiorno and in Brazil the SUDENE (Superintendency for Development of the Northeast) exemplify this concern to reduce regional differences. In Argentina the excessive concentration of population and industry in metropolitan Buenos Aires has prompted the consideration of national policies designed, on the one hand, to decentralize industrial activities and, on the other, to promote the abundant natural resources of Patagonia and to ameliorate the stagnant economic condition of the northwest provinces.

The crucial problem is how to achieve the rapid development of lagging and undeveloped regions without negatively affecting the expansion of dynamic regions. It might be argued that the growth of national output should not be retarded by a policy of industry location pandering to local sentiment or vested interests, that it would be better to encourage location in the most

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suitable areas and thus to maximise national output. The decision involves a variety of conflicting political, economic and moral considerations. For one, whether the income gap between regions should be reduced is a matter of social policy. Economic theory cannot provide the answer, although it can be of use in defining and evaluating the problem and in pointing to feasible alternatives. This question and the policies undertaken in Argentina to reverse the trend towards an increasing concentration of economic activities in a few areas are the subject matter of this paper.

Inquiry into such questions as balanced versus unbalanced regional growth or concentration versus dispersion of new industrial investments requires first an unambiguous statement of regional government objectives; second, a knowledge of future national demands as well as of technological changes; and, third, an understanding of the spatial distribution of resource endowments. A profound analysis along these lines is beyond the scope of this paper; it belongs rather to the sphere of government planning agencies. No assessment of the present and future potential of particular areas in Argentina is attempted here, and no recommendations are made for future regional structures. What is considered are the basic issues and the alternatives that a regional planner must consider before deciding on industrial location patterns.

Regional development planning can be approached from a regional point of view, that is, as stimulating the expansion of a region independently of the effects on other regions; or it may be viewed from a national standpoint, that is, aimed at "the solution of specifically regional problems as an integral part of a general policy for the development of all regions",[2/] in order to attain national goals for the spatial organisation of the economy. This paper is concerned throughout with the second approach.

The first section summarises the key factors relevant to regional growth within the context of national economic growth in Argentina and indicates the extent of the concentration of economic activities attendant with regional growth. Current development and future prospects are greatly influenced by past development (such as the size of markets that have evolved in different regions), by the state of resource endowments as they are affected by shifts

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2/ J. R. P. Friedmann (1956) Regional Development Policy: A Case Study of Venezuela, MIT Press, Cambridge, Massachusetts, p.4.

in intermediate and final demand, and by changes in technology. The author's aim here is to throw light on previous regional growth patterns as a necessary basis for understanding present differences in standards of living and rates of expansion. The second section examines whether there was a convergence towards or divergence away from the national average in the growth rate of each region as a result of national and regional policies; in other words, has the relative per capita income gap between growing and lagging regions narrowed or widened correspondingly as national development has proceeded? The third section investigates the objectives of regional development policy in Argentina. Finally, an analysis is made of the location policies pursued by the Argentine Government and the provincial governments to encourage decentralisation of industry, and estimates are made of the extent of their success. Special attention is paid here to the location of industry, because the opportunities for influencing location and hence for generating growth in undeveloped regions are greater than in the agricultural or service sectors.

A HISTORICAL REVIEW OF REGIONAL ECONOMIC GROWTH IN ARGENTINA

National development and differential rates of growth among regions interact and both are closely associated with the regional distribution of "resource endowments".[3/] The term resource endowments is meant to embrace not only natural resources but also skilled labour, communication, transportation services and so on. In other words, although a region may not be endowed with material inputs, its location may offer other advantages, such as the external economies derived from an agglomeration of economic activities. Resource endowments are not static; they vary with the different stages of national development. These stages, in turn, are related to changes in the structure of final demand and to the level of technology and the degree of industrial organization. Thus, in a stage of national economic development associated with domestic and foreign demand based largely on agricultural products, those regions will benefit that are endowed with the resources required to satisfy this demand. As national development proceeds, the composition of final demand changes and consequently

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3/ H. Perloff and L. Wingo Jr. [n.d.] "Natural Resources Endowment and Regional Economic Growth", in J. Spengler, Ed. (1961) Natural Resources and Economic Growth, Johns Hopkins Press, Baltimore, Maryland, and reprinted in J. R. P. Friedmann and W. Alonso, Eds. (1964) Regional Development and Planning; A Reader, MIT Press, Cambridge, Massachusetts.

also the composition of the resource endowments necessary for regional development. Hence, the relative advantages among regions for supplying the commodities required during a stage of national growth vary. In other words, an analysis of the geography of national economic expansion must be closely correlated with a stage-by-stage identification of the essential resource endowments in the national economy.4/

Three stages of national development can be distinguished in Argentina.5/ The first, generally referred to as a period of externally oriented growth, was in effect until the world economic crisis in the 1930s. The second stage, based on the import substitution of consumer goods, extends until the beginning of the 1950s. The third or present stage is characterised by a heavy reliance on the import substitution of intermediate and capital goods.

Regions are defined here by grouping states in a way best adapted to allow statistical comparisons to be made over long periods of time within the limitations imposed by available statistical information.

East-Centre region:	Buenos Aires, Córdoba, Entre Ríos, La Pampa, Santa Fé.
Northeast region:	Corrientes, Chaco, Formosa, Misiones.
Northwest region:	Catamarca, La Rioja, Jujuy, Tucumán, Salta, Santiago del Estero.
West region:	Mendoza, San Juan, San Luis.
South region:	Chubut, Neuquén, Río Negro, Santa Cruz, Tierra del Fuego.

This breakdown of regions corresponds more closely to the period that extends up to 1950. After this date Argentina modified its industrial development strategy, giving prominence to new dynamic centres such as Córdoba and Santa Fé. (This strategy will be analysed later in this study.)

Externally oriented growth (until 1930)

The rapid growth of the Argentine economy from 1900 to 1930 was the result mainly of influences from abroad. During this period, the gross national product

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4/ Ibid.

5/ For a detailed and very interesting analysis of the Argentina economic development, see C. D. Alejandro (1966) Etapas de la Industrialización Argentina, Trabajo Interno No.18b, Centro de Investigaciones Económicas, Instituto Torcuato Di Tella, Buenos Aires, and A. Ferrer (1963) La Economía Argentina, Part I, Fondo de Cultura Economica, Mexico.

(GNP) grew at an annual rate of 4.5 per cent. Factors affecting this rate of growth were: the magnitude of foreign demand (exports absorbed around 28 per cent of GNP in 1900-1929); foreign investment, representing 47 per cent of total investment in 1900-1904; and immigration (in 1895, immigrants made up one quarter of the total population and increased to 30 per cent in 1914).

In this period Argentina evidenced a diversified pattern of demand in relation to level of income, and the structure of domestic production was largely concentrated on agricultural output. Thus, a comparison of the structure of total demand with that of domestic output indicates that there was an excess supply of agricultural goods and an excess demand (beyond domestic output) for manufactured goods. This disequilibrium was rectified by foreign trade: the country exported agricultural goods and imported manufactured goods.

What was the regional impact of this national development? Did it tend to create significant disparities among regions? After the second half of the nineteenth century, the Argentine Government based its national economic development strategy on producing goods required to satisfy an ever increasing foreign demand. The essential resources serving this purpose were arable land and an accessible natural port. The East-Centre region, particularly Buenos Aires, possessed the required natural resources to satisfy the growing demand: 92 per cent of its total hectares were planted with wheat, corn, barley and flax, and 82 per cent of Argentina's livestock was located in this region. Thus, the country followed the pattern of regional growth in the East-Centre region. Buenos Aires with its port was the nucleus of an agricultural hinterland well endowed for the production of a staple commodity in demand on the world market.

Since good agricultural land was practically a free resource compared with capital, production was expanded simply by extending the limits of the arable hinterland. This expansion required the further development of facilities such as the transportation system, as well as increases in the size of the labour force. The extension of the railways, which fanned out from the port of Buenos Aires, making possible the expor of agricultural goods and the import of manufactured goods, was concentrated (75 per cent of new lines in 1895) in the East-Centre region. In 1925, about 83 per cent of the Government's expenditures for roads were in this region.[6/] Foreign immigrants who were encouraged to move to

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6/ A. Bunge (1928) Economic Argentina, Buenos Aires, p.162.

Argentina represented 34 per cent of the total population in 1895 and 35.5 per cent in 1914. The East-Centre region absorbed almost 90 per cent of the total of this immigration. Since more than 80 per cent of these immigrants were of working age, the East-Centre region benefited much more than any other area in the quality and size of its labour force.

The development of the agricultural heartland brought with it an increase in processing and servicing activities. Thus, the dynamic industries in this period were directly related to the processing of agricultural inputs, such as meat-packing, milling, wool-washing and quebracho extract. These industries, concentrated in the East-Centre region, absorbed almost 90 per cent of the investment in the years 1895-1914. Financial, commercial and governmental services were also largely concentrated in this region because Buenos Aires was also the seat of the federal Government. In addition, 70.7 per cent of the total number of commercial banks and 85.7 per cent of bank employees were in the East-Centre region.

The East-Centre region had better links to the world than to other regions within Argentina. The rest of the country, isolated from any favourable trade contact with the dynamic region, concentrated on production to satisfy local demands. The exceptions were commodities for which there was a national demand, such as wine from Mendoza and sugar from Tucumán. Even for these commodities, however, the income elasticity of demand was not high enough to stimulate growth. The lack of national integration and interregional trade made it impossible for Buenos Aires to transmit an impetus to growth in the other regions.

In short, this period of Argentine development was characterised by strong polarisation forces working in favour of Buenos Aires and to the detriment of the rest of the country. An even more important effect was that this resource-dominated expansion of the economy set the stage for the next period of development by establishing a spatial distribution of markets, social overhead capital and a labour force, thereby conditioning the nature of succeeding growth. Thus, 65.8 per cent of the total population in 1895 and 73.4 per cent in 1914 were living in the East-Centre region, which represented less than one third of the total geographic area of Argentina; and 86 per cent (in 1895) and 70 per cent (in 1914) of government investment were made in this region.

Import substitution of consumer goods (until mid-1950s)

Until the 1930 world economic crisis, the government strategy, which was based mainly on foreign demand and the inflow of capital and labour, was successful in terms of the growth rate of GNP and the rate of capital accumulation. But the 1930 crisis altered the pattern of international trade. The result was an excess supply of agricultural products and excess demand for intermediate and capital goods. One of the objectives in Argentina following the world crisis was to safeguard the income level. This required the transfer of resources in order to adjust the structure of production to the existing situation. Hence, the country embarked on a far-reaching policy of import substitution and much more emphasis was given to domestic demand. The share of value added in manufacturing of total value added increased from 15 per cent (1900-1904) to 19 per cent (1925-1929) and to 30 per cent (1957-1961), and foreign imports fell off from 25 per cent of GNP (1925-1929) to 8 per cent (1957-1961).

The relevance of this new strategy for Argentina may be seen more clearly by considering in greater detail its industrialisation pattern after 1930. A comparison of the performance of various branches of the manufacturing sector after 1930 indicates that not only did their growth rates differ but that they also played different roles in the import-substitution process. For the purpose of this comparison, the period after 1930 was divided into two sub-periods:[1] 1927-1929/1948-1950 and 1948-1950/1959-1961. Import substitution from 1927-1929 to 1948-1950 was significant in the "lighter" branches of manufacturing (foodstuffs and beverages, tobacco, textiles, clothing, wood products, printing and publishing, and leather products), while it evidenced a lag in those branches that produced capital goods and intermediate products. After 1950 import substitution of capital goods and intermediate products became increasingly important. Both patterns are shown in table 1, which compares the increase in the aggregate value added for the different manufacturing activities with the increase in the aggregate value added for the entire manufacturing sector during the two sub-periods considered. Thus, while consumer goods industries represented 59 per cent of the increase in the aggregate value of the manufacturing sector in the first sub-period, this figure was reduced to

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[1] C. F. D. Alejandro, op. cit.

Table 1

Comparison of increase in value added for branches of manufacturing with increase in value added for entire manufacturing sector, 1927-1961
(Percentages)

	1927-1929/ 1948-1950	1948-1950/ 1959-1961
Primarily consumer goods industries	**58.6**	**11.9**
Foodstuffs and beverages	21.6	6.6
Tobacco	3.2	1.5
Textiles	23.5	2.5
Clothing	3.6	0.9
Wood products	3.1	0.1
Printing and publishing	-0.4	-0.2
Leather products	2.8	0.7
Other manufacturing	1.2	1.8
Primarily intermediate and capital goods industries	**41.3**	**86.1**
Paper and cardboard	1.0	2.2
Chemical products	4.8	9.4
Petroleum refining	9.0	12.0
Rubber products	2.5	2.9
Stone, glass and ceramics	2.4	2.6
Metals	9.0	18.7
Vehicles and machinery	10.3	26.7
Electrical machinery and appliances	2.3	11.6

Source: C. F. D. Alejandro (1966) Ensayos de la Industrialización Argentina, Trabajo Interno No.18b, Centro de Investigaciones Económicas, Instituto Torcuato Di Tella, Buenos Aires.

14 per cent in the second sub-period. This contrast is most marked in the case of foodstuffs, beverages and textiles, whose combined share was 45 per cent in 1927-1929/1948-1950 and only 9 per cent in the period 1948-1950/1959-1961. On the other hand, metals, vehicles and machinery, and electrical machinery and appliances increased their total share from 21.6 per cent to 57 per cent.

Table 2 indicates that by the mid-1950s the possibility of substituting consumer goods imports was almost exhausted, and further import substitution would have had to involve intermediate and capital goods. For the period 1950-1954, metals, vehicles and machinery, and mining products accounted for more than half of the total imports, and the possibilities of substituting imports by increasing domestic production in the lighter industries were small, since most imported goods were either items that could not be produced in Argentina or that were necessary because of barter agreements.

The changes in both demand and supply which occurred with the import-substitution strategy influenced the new stage of regional development. The geographic distribution of markets and overhead facilities governed the location of industries created with the substitution of imported consumer goods by domestic production. The major markets were concentrated in Buenos Aires, Córdoba and Santa Fé. Tables 3 and 4 show that most of the consumer goods industries were concentrated in Buenos Aires. Foodstuffs, beverages and textiles, which absorbed almost one half of the increase in total national value added in manufacturing in 1927-1929/1948-1950, were concentrated heavily in the East-Centre region. This region's share of the total number of foodstuffs and beverages firms was reduced from 80 per cent (1935) to 72 per cent (1953); its proportionate total number of workers went from 84.9 per cent (1935) to 73.1 per cent (1953). These industries tend to locate near urban cities, which were growing in size throughout the country. Textile industries were concentrated nearly exclusively in the East-Centre region; more than 90 per cent of the total number of textile enterprises and workers were located in this region, and especially in metropolitan Buenos Aires.

The process of industrialisation up until the mid-1950s indicates that Buenos Aires did profit from the Hirschman "polarisation effect". While this region had grown until 1930 because it possessed the natural resources (fertile land and a natural port) required to satisfy foreign demand, later the agglomeration economies, built up during the first stage of development, influenced

Table 2

Structure of imports and their share in total available supplies, 1950-1954
(Percentages)

	Imports as percentage of total imports	Imports as percentage of total available supplies
Foodstuffs and beverages	4.4 a/	2.0
Tobacco	0.4	0.2
Textiles	8.2	8.3
Clothing	0.3	0.1
Wood products	5.7	16.3
Paper and cardboard	3.6	21.1
Chemical products	7.4	14.1
Petroleum refining	7.6	16.3
Rubber products	1.5	11.9
Stone, glass and ceramics	2.1	7.7
Metals	18.6	25.9
Vehicles and machinery	21.5	28.6
Electrical machinery and appliances	3.8	20.8
Other manufacturing	1.9	16.6
Mining products	13.0	37.8

Source: C. F. D. Alejandro (1966) Ensayos de la Industrialización Argentina, Trabajo Interno No.18b, Centro de Investigaciones Económicas, Instituto Torcuato Di Tella, Buenos Aires.

a/ Including unprocessed foodstuffs.

Table 1

Textiles and beverages: regional distribution of number of enterprises and workers, [illegible]

Percentage

Region	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
	E	W	E	W	E	W	E	W	E	W	E	W	E	W
[illegible]-Centre	[illegible]	84.9	80.1	84.2	[illegible]	84.6	[illegible]	85.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Aires	61.[illegible]	66.9	61.2	66.5	59.2	66.2	5[illegible].1	66.5	41.[illegible]	60.6	41.8	[illegible]	[illegible]	[illegible]
[illegible]a Fe	[illegible].5	10.6	8.6	9.9	9.6	10.4	[illegible].5	10.3	14.[illegible]	10.[illegible]	14.[illegible]	12.1	[illegible]	[illegible]
[illegible]pina	[illegible].3	4.0	[illegible].[illegible]	4.1	5.9	4.1	6.8	4.4	[illegible].1	[illegible].[illegible]	[illegible].[illegible]	[illegible].[illegible]	[illegible]	[illegible]
[illegible]tern	4.3	3.4	4.6	3.[illegible]	4.8	3.9	4.3	3.8	[illegible].4	3.9	5.3	[illegible]	5.4	4.[illegible]
[illegible]rtheast	[illegible].[illegible]	2.1	3.9	2.0	4.3	2.4	4.3	2.3	5.[illegible]	2.6	5.[illegible]	2.8	6.[illegible]	3.4
[illegible]rthwest	[illegible].3	6.5	6.2	[illegible].3	6.3	6.9	[illegible].3	6.[illegible]	5.9	7.0	5.9	[illegible].3	[illegible].6	[illegible]
[illegible]est	8.[illegible]	6.1	8.6	5.9	8.5	5.6	[illegible].4	5.9	11.8	6.5	11.4	[illegible].[illegible]	11.[illegible]	[illegible].[illegible]
[illegible]th	1.[illegible]	[illegible].4	1.2	0.6	1.4	[illegible].5	1.3	0.6	[illegible].4	1.0	3.2	[illegible].9	[illegible].8	[illegible].[illegible]

Source: National industrial census for each of the years considered.

Note: E = enterprises W = workers

Table 4

Textiles: regional distribution of total number of enterprises and workers, 1935-1953[a/]
(Percentages)

Region	1935		1937		1939		1941		1946		1948		1953	
	E	W	E	W	E	W	E	W	E	W	E	W	E	W
East-Centre	91.7	98.1	92.6	98.9	90.8	98.8	91.9	98.8	90.0	95.7	90.7	94.9	91.6	95.6
Buenos Aires	81.0	93.6	81.9	94.5	80.2	94.8	81.8	95.0	72.7	90.1	75.4	90.3	77.4	90.1
Santa Fé	7.1	3.3	6.2	3.1	6.7	3.0	6.2	2.9	9.4	3.4	8.4	3.1	7.6	3.8
Córdoba	2.9	0.7	3.3	0.9	3.2	0.9	3.0	0.8	6.0	1.7	5.3	1.2	5.2	1.3
Other states	0.7	0.5	1.2	0.4	0.7	0.1	0.9	0.1	1.9	0.5	1.6	0.3	1.4	0.4
Northeast	4.5	0.7	3.8	0.3	5.7	0.5	4.2	0.4	2.6	1.4	2.3	1.3	2.0	2.8
Northwest	2.6	0.8	2.5	0.4	2.0	0.3	2.4	0.4	3.8	1.9	3.7	3.1	3.1	1.3
West	1.2	0.4	1.1	0.4	1.5	0.4	1.5	0.4	2.3	0.9	2.6	0.6	2.6	0.5
South	-	-	-	-	-	-	-	-	0.8	0.1	0.7	0.1	0.7	0.1

Source: National industrial census for each of the years considered.

Note: E = enterprises W = workers

a/ In 1946, 1948 and 1953 clothing included.

the location of the industrial activities induced by the national import-substitution strategy. This industrialization process, concentrated primarily in metropolitan Buenos Aires, had unfavourable effects on the other regions, since they now had to buy regional manufactured goods protected by newly created tariff walls instead of similar goods previously imported from abroad at lower prices.

The impetus to growth in a given region provided by the national strategy will be significant if the final and intermediate demand for the region's resources have a high income elasticity, extensive geographic backward and forward linkages and a high domestic regional income multiplier.[8/] The demand for foodstuffs, beverages and textiles generally has a low income elasticity. The trade barriers imposed after 1930 on imports of these commodities, however, created an immediate vacuum, which was filled by national production. Thus, their production during this stage of development had a crucial dynamic effect in promoting national growth as well as growth of the supplying regions. A preliminary study[9/] of forward and backward linkages of the Argentine economy, using the 1950 national input-output matrix, indicates that the textile industry is ranked first in terms of both linkages. If the linkages are analysed separately, textiles, especially wearing apparel, is ranked first for its forward linkages, which were associated geographically with metropolitan Buenos Aires, but it ranked only fourth for backward linkages, which were not entirely associated with Buenos Aires. Thus, the expansion of the textile industry increased the demand for resources in the primary producer regions, but since they were engaged only in processing inputs for the first stage of industry, no important linked activity was induced to locate in these regions. Foodstuffs and beverages activities were ranked third in terms of both linkages, but they had much stronger backward than forward linkages; both were almost entirely associated with Buenos Aires. Finally, the regional income multiplier in the East-Centre region was high presumably owing to the new emphasis on domestic expenditures as well as to the self-sufficient economic structure of this region.

8/ H. Perloff and L. Wingo Jr., op. cit.

9/ J. Sakamoto (1967) Medición de las repercusiones del proceso de industrialización sobre la economía: Un análisis crítico del modelo Baer-Kerstenetzky, Trabajo Interno No.36, Centro de Investigaciones Económicas, Instituto Torcuato Di Tella, Buenos Aires.

In short, the East-Centre region, particularly metropolitan Buenos Aires, was able to grow during the first three decades of this century because it possessed the appropriate resource endowments needed to produce for export markets. The income generated was partly spent in this region, thus stimulating further growth, and partly spent on imports. This pattern of growth contributed to the expansion of major urban centres, the development of local markets, the extension of the region's social infrastructure (public and private capital), the increase of skilled labour and servicing institutions. And these phenomena, in turn, enhanced the attractiveness of this area because of the external economies they afforded. The change in the supply pattern that occurred after the world economic crisis of the 1930s, in addition to the domestic production of previously imported consumer goods, made further growth possible because the East-Centre region possessed the "appropriate resources" required by the new composition of demand, as well as the mutual reinforcement of linkage and multiplier effects. Thus, after 1930 there was a deepening of the heartland economy built upon the geographic pattern of activities established during the export-base regional development period.

Import substitution of intermediate and capital goods (since the mid-1950s)

The expansion of the East-Centre region after the 1950s would have been retarded if its development had continued to be based on the production of agricultural and manufactured consumer goods, since these were hindered by a low income elasticity of demand. The 1955 elasticity of demand for foodstuffs supplied by the agricultural sector (fruit, milk, fish, vegetables etc.) was 0.4, for foodstuffs and beverages supplied by the manufacturing sector it was also 0.4, and for textiles, 0.75.[10/] Rapid advances in the East-Centre region during the post-war period would have required changes in the product-mix of the region and the production of commodities in nationwide demand with high income elasticity coefficients. In other words, the continuation of the growth stimulus in the East-Centre region depended on the ability of finding new rapid growth sectors complementing the existing slow growth sectors.

10/ ECLA (1958) Análisis y proyecciones del desarrollo económico de la Argentina, Vol.I, United Nations publication (Sales No.: 59.II.G.3), p.111.

With the rise of *per capita* income throughout the country the composition of national final demand changed constantly owing to the different income elasticity of demand for goods and services. In 1955, chemical products had an elasticity coefficient of 2.0, oil products 2.0, rubber 1.60, machinery and electric appliances 2.4, vehicles and machinery 2.0, metals 1.60 etc.[11/] The continued expansion of the East-Centre region, therefore, would have required the alteration of its industry-mix by attracting some of these large-scale industries and/or stimulating the demand for already established industries in the region by promoting foreign demand. These changes in the final demand structure occurred simultaneously, however, with balance-of-payments problems, which induced government policy-makers to adopt a new national strategy based on the import substitution of intermediate and capital goods. This second stage of industrialization, which took place after 1950, witnessed the growth of industries such as vehicles and machinery, electric machinery and appliances, metals, and chemical and petrochemical products. The expansion of these industries absorbed 66.4 per cent of the value added in manufacturing in 1948-1950/1951-1961 but only 26.4 per cent in 1927-1929/1948-1950.

The East-Centre region was able to attract these industries because its market was at the same time at the core of the national market, and because of the external economies obtained from the agglomeration of industries and social overhead investment. Both factors provided this region with the economic environment most conducive to becoming a pole of attraction. If instead of embarking on this process of import substitution, Argentina had adopted a different strategy of importing these non-durable consumer goods and stimulating the production of commodities for export to foreign countries in areas other than the East-Centre region, the effect on regional growth would have been different. Growth in the East-Centre region would have been much less dynamic because its industry-mix would have been based on goods with inelastic demand, while development would have taken place in those regions with resource endowments well adapted to satisfy a newly created foreign demand. The strategy of import substitution, therefore, made further growth possible in the East-Centre region by encouraging the production of commodities with high income elasticity of demand.

11/ Ibid.

This new pattern of industrial development also had significant repercussions within the East-Centre region. Until the mid-1950s, metropolitan Buenos Aires was the pole of attraction for new industries, mainly because the interplay of resource and non-resource advantages stimulated forces in its favour. Investments of the central Government in the East-Centre infrastructure, however, lagged behind the demand for the region's services. The shortage of social overhead investment in metropolitan Buenos Aires was particularly felt in the supply of electricity. The insufficiency of government provision of this service led industrial enterprises to obtain private electric generators. In the early 1950s, industrial firms were obliged to decide whether to locate in Buenos Aires and to make additional investments[12/] in order to avoid losses when the electrical supply was rationed, or to locate in another area with an excess supply of electricity. Córdoba had an excess supply of public electricity. A survey conducted in Córdoba of manufacturing firms employing more than 40 workers regarding their motives for locating there indicates that for vehicles and machinery industries first priority was given to the availability of electrical supply and the third consideration was proximity to the consumer market. Hence, for this type of industry, assuming a proper transportation network exists to deliver products to markets, the decision to invest was influenced by the excess supply of electricity. In deciding whether to invest in Córdoba or in Buenos Aires, the additional needs of investment capital, the cost involved in supplying electricity privately, and the risk that the electrical supply might be rationed seem to have weighed much more heavily than the cost of transporting finished products to markets and of importing items through the ports of Buenos Aires or Rosario to Córdoba.[13/]

Until the early 1950s, the main industrial activities of the province of Córdoba were concerned with the production of consumer goods such as beer, flour and leather. Only two capital goods industries were operating in the region: the production of aircraft for military purposes (Fábrica Militar de Aviones)

12/ Private electric generators consume 10-15 per cent more calories per kWh than government power stations, and in some cases they may require double the amount of capital per kW installed than that required for government power stations. ECLA (1958) Análisis y proyecciones del desarrollo económico de la Argentina, Vol.I.

13/ Some industries in Córdoba supply their own electricity, but with generators installed before the industrial boom that took place after 1957. These industries are flour milling, breweries and cement. The electricity for new plants located since 1957 is provided by the provincial government.

and workshops for repairing railway engines and freight cars (Talleres del Ex-Ferrocarril del Estado). Later the government enterprise IAME (Industrias Aeronáuticas y Mecánicas del Estado) converted the industry for the production of military aircraft into one producing automobiles, tractors and motorcycles. After 1953, two important new foreign enterprises located in the city of Córdoba: Kaiser Industries,[14] for the production of automobiles, and FIAT, for the production of tractors, automobiles and later locomotives. In 1961, Córdoba produced 42.3 per cent of the national output of automobiles and 43 per cent of the output of tractors. Evidently, the concentration of these industries in Córdoba gave a strong impetus to the location of servicing industries, since these make up the end of a production sequence. The big metal-using manufacturing industries are among the most rapidly growing sectors primarily because their products have a high income elasticity of demand.

The development of another industrial pole in South Santa Fé in the late 1950s was influenced by the availability of resources important to chemical and petrochemical plants, that is, inputs from the oil refining plant in San Lorenzo (which in 1961 was the second largest plant in Argentina), and aided by the new pipeline for oil and gas, Campo Durán-San Lorenzo. South Santa Fé also attracted other capital-intensive industries related to previous developments in agricultural machinery replacement and the production of tractors and automobiles. Several factors, other than the availability of natural inputs, enhanced the attractiveness of this region: important accessible ports (Rosario, Santa Fé and San Lorenzo); the second largest urban nucleus in Argentina (Rosario); sufficient supply of electricity; proximity to the largest steel plants in Argentina (SOMISA and Acindar); and a pool of skilled labourers, technicians and professionals. Table 5, which gives the output capacity of petrochemical plants in 1965, indicates clearly the high concentration of petrochemical production in San Lorenzo (Santa Fé).

In short, the new pattern of industrial development based on the import substitution of intermediate and capital goods industries contributed not only

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14/ An important element in the decision to locate this industry in Córdoba was that IAME (now DINFIA), which was operating in Córdoba, participated at a cost of 360 million pesos. Kaiser invested 88 million in machinery, equipment and parts, which at the existing exchange rate was equivalent to 115 million pesos. IAME invested 80 million pesos in machinery and parts. Finally, it was agreed that the remaining part of the capital (165 million pesos) would be obtained in the stock exchange from private investors. In addition, Kaiser received a ten-year loan of 200 million pesos from the Industrial Bank to build the plant and to acquire equipment.

Table 5

Output capacity of petrochemical plants, 1965

Product	Enterprise	Location	Output capacity (tons/year)
Ethylene	Ipako	Buenos Aires (Ensenada)	11,000
	Duperial	Santa Fé (San Lorenzo)	21,000
	PASA	Santa Fé (San Lorenzo)	7,500
			39,500
Propylene	PASA	Santa Fé (San Lorenzo)	5,000
BTX	PASA	Santa Fé (San Lorenzo)	42,000
	Fabr. Militar.	Buenos Aires (Campana)	8,000
			50,000
Methanol	Atanor	Córdoba (Río Tercero)	10,000
	Gasco	Buenos Aires (Pilar)	16,500
			26,500
Butadiene	PASA	Santa Fé (San Lorenzo)	32,000
Carbon black	Cabot	Buenos Aires (Campana)	13,000
Carbon disulphide	Duperial	Santa Fé (San Lorenzo)	14,000
Ethylbenzene	PASA	Santa Fé (San Lorenzo)	15,000

Source: United Nations Economic Commission for Latin America (1966) La industria petroquímica en América Latina (ST/ECLA/Conf.23/L.30).

to the further development of Buenos Aires but also created new poles of attraction: Córdoba and South Santa Fé. Until the mid-1950s, these two states were primarily agricultural, but with the new patterns of industrial development the economic structure of Córdoba and South Santa Fé changed, owing to the location there of new plants for the production of automobiles, tractors, chemical and petrochemical products. Table 6, which shows the regional distribution of the total labour force in primary, secondary and tertiary activities, indicates the changes that these provinces underwent. Thus, while in 1947 agricultural activities in Córdoba and Santa Fé engaged a greater share of the total labour force than manufacturing, the reverse was true in 1960. In 1947, approximately 36 per cent of the labour force in Santa Fé and Córd . were engaged in agricultural activities and about 23 per cent in manufacturing, while the figures in 1960 were 27 per cent and 32 per cent, respectively. Another indication of this pattern is given in table 7, which shows the regional distribution of the total number of industrial enterprises and workers in 1953 and 1963. Córdoba and Santa Fé were the only regions whose participation in industry was increased during this period. Thus, for Córdoba the number of industrial firms increased from 10 per cent (1953) to 12.6 per cent (1963) and of industrial workers from 5.4 per cent (1953) to 7.4 per cent (1963). The attraction of the machinery, metals, petrochemical, and chemical industries to Córdoba and South Santa Fé made further growth possible in these areas. On the one hand, a certain amount of manufacturing growth was induced directly by these industries and, on the other, the regional multiplier income effect of the new activities helped to expand local markets and to create new possibilities for market-oriented industries producing items for regional final demand.

The process of regional growth in the East-Centre stimulated even greater internal growth within the region. The different areas were further integrated by diversifying their economies to make them more complementary and by developing an extensive transportation network linking all the states in the region. As a result, the East-Centre became more self-sufficient, reducing the possibilities of unpleasant effects radiating across the entire country.

For some industries the prospects of quick profits from the assembling of imported parts, the large unfilled excess demand owing to a long-term restriction on imports, and the high tariff protection (imports of automobiles and tractors were forbidden) encouraged several producers to start businesses producing at highly uneconomical scales. In 1962, there were sixteen automobile

Table 6

Regional distribution of labour force by economic activities, 1947 and 1960
(Percentages)

Region	1947			1960		
	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
East-Centre	22.2	32.1	45.7	15.8	39.3	44.9
Buenos Aires	14.7	37.2	48.1	10.2	43.4	46.4
Córdoba	35.9	21.9	42.2	27.3	30.2	42.5
Santa Fé	36.6	23.1	40.3	27.2	32.5	40.3
Other states	43.4	17.5	39.1	34.5	24.9	40.6
Northeast	54.0	16.3	29.7	45.8	21.3	32.9
Northwest	37.8	25.6	36.6	34.4	27.7	37.9
West	35.3	25.3	39.4	35.2	26.3	38.5
South	50.2	14.5	35.5	42.2	21.4	36.4
Total	27.3	29.6	43.1	21.7	35.6	42.7

Source: M. A. Almeda et al., Los recursos humanos de nivel universitario y técnico en la República Argentina, Editorial del Instituto, Buenos Aires.

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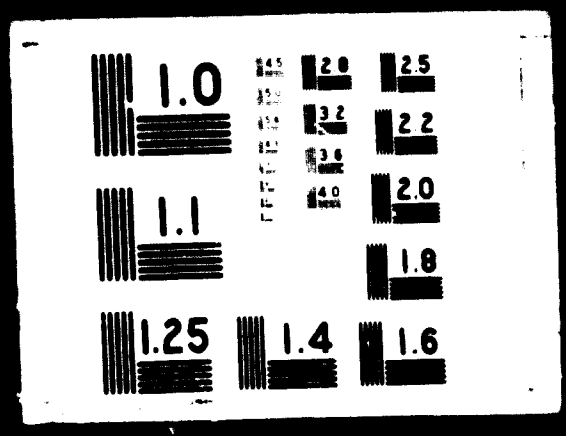

Table 7

Regional distribution of industrial enterprises and workers, 1953 and 1963 a/
(Percentages)

Region	Number of enterprises		Workers	
	1953	1963	1953	1963
East-Centre	82.4	82.7	83.6	83.4
Buenos Aires	57.9	52.5	66.8	63.4
Córdoba	9.4	12.6	5.4	7.4
Santa Fé	11.5	11.0	9.2	9.9
Other states	3.6	3.6	2.2	2.7
Northeast	4.1	4.8	3.2	3.7
Northwest	5.4	4.2	7.5	4.8
West	6.2	6.2	3.7	5.8
South	1.9	2.1	2.0	2.3
Total	100	100	100	100

Sources: For 1953 - Dirección Nacionel de Estadística y Censos, Censo Industrial, Buenos Aires

For 1963 - Dirección Nacionel de Estadística y Censos, Censo nacional económico, cifras provisionales, Buenos Aires.

a/ Including construction in 1963, since it was not possible to separate this item.

and five tractor firms. An analysis of the results of this process with respect to tractor production suggests the answers to some questions dealing with regional concentration, particularly to the problem of the relationship between economies of scale and transportation costs. Argentina has five tractor producers; two are located in Buenos Aires, one in Córdoba, and two in Santa Fé. The distribution of total output in 1960-1964 was 44 per cent in Córdoba, 30 per cent in Buenos Aires, and 26 per cent in Santa Fé.[15] The demand for tractors is also greatly concentrated in these regions: 70 per cent of the total stock in 1960 (Buenos Aires 33 per cent, Santa Fé 20 per cent, and Córdoba 17 per cent). Apparently, these producers located near the consumer market in order to save on transporting the finished product.[16] However, in order to judge the pattern of location, not only transportation costs must be considered but also economies of scale derived from the concentration of total production of tractors in one plant[17] regardless of the geographic location, assuming that other production costs do not vary among regions. If economies of scale are greater than transportation costs, it pays to concentrate total production in one enterprise. The final location will depend of course on the regional variations of production cost components as well as on transportation costs for both the finished products and inputs. A study of the tractor industry gives the short-run average cost function for each tractor producer, for given plant sizes, and the long-run average cost funotion for the whole industry.[18] The 1964 demand for 14,000 tractors can be estimated from the information supplied by the study. The average costs for each state were as follows:[19]

Córdoba	724,628 pesos per tractor of 50 h.p.
Buenos Aires	796,937 pesos per tractor of 50 h.p.
Santa Fé	936,747 pesos per tractor of 50 h.p.

15/ Some producers discontinued their production of tractors. One of them, located in Buenos Aires, was included in these percentage figures.

16/ During the first year of tractor production most inputs were imported. In this case, Buenos Aires and Santa Fé were better located because they have ports. Now the situation might be different, since most direct inputs come from domestic production.

17/ Other aspects to be considered in this case are monopoly regulations etc.

18/ J. M. Dagnimo Pastore [n.d.] La industria del tractor en la Argentina, 3 vols., Trabajo Interno No.21, Centro de Investigaciones Económicas, Instituto Torcuato Di Tella, Buenos Aires.

19/ In order to obtain the average cost for those states with two producers, the average cost of each firm was weighted by their share in total output of tractors.

If it is assumed that total demand for 14,000 tractors is supplied by one producer, the average cost obtained from the long-run cost curve for the whole tractor industry will be 631,475 pesos. A comparison of this cost with the averages of short-run costs for all producers, which is 818,710 pesos, reveals a 30 per cent decrease. This cost reduction results from economies of scale and by far exceeds transportation costs between each of these states.[20] Therefore, the decision to establish different tractor production centres, instead of centralizing the industry in one region, can be questioned on the grounds of efficiency, since these centres do not benefit from economies of scale. However, the decision might be consistent with the goal of creating new "poles de croissance" (growth centres) in order to obtain a more equitable regional distribution of income. The same type of considerations could be applied to automobile production, which is also regionally concentrated in Buenos Aires, Córdoba and Santa Fé.

Interregional trade in Argentina

Regional growth is not evenly distributed within a country. The cumulative growth process that generally takes place in the dynamic areas may have favourable repercussions in other areas, helping in this way to close the development gap between the already industrialized areas and the backward regions. Growth can be transmitted from the dynamic to the stagnant regions by factor mobility and interregional trade. If the backward regions are complementary to the growing regions in their structure of production, interregional trade may transmit the stimulus to growth from the growing to the backward regions. If the dynamic provinces of Buenos Aires, Córdoba and Santa Fé have to rely heavily on goods produced in other regions for their own expansion, growth will be stimulated in these latter regions.[21]

20/ Transportation cost by railroad for a 50 h.p. tractor is as follows:
Buenos Aires - Rosario, 3,570 pesos per tractor;
Buenos Aires - Córdoba, 5,530 pesos per tractor.

21/ Indeed, expanding demand in the advanced provinces for the products of other regions is a necessary but not sufficient condition of growth in backward regions. This growth will depend to some extent on the short-run supply elasticity of products in demand in the lagging regions. If it is low, prices of those goods in demand will increase and induce the growing regions to produce these products and/or import them from foreign countri

It is quite possible, however, that the advanced regions, because of location advantages, might produce for themselves most of the items required for their own expansion, or that they might import these items from other countries. If either is the case, the remaining regions will be isolated from any trade contact with the advanced regions and will therefore suffer from the absence of stimulation.

A regional model is devised here for Argentina[22/] for the purpose of showing the extent to which each region has increased its output because of (a) an increase in the demand for its products (assuming constant interregional trade patterns), and (b) an increase originating in gains from interregional trade either by expanding exports or reducing imports. The model will help to isolate the "interregional trade effect". The first step in such an analysis is to estimate the increase in each region's final demand for commodities and services, and then to compute its increase in production owing to the change in its bill of goods. Thus, the increase in each region's output will be the result of two effects: (a) the demand effect, which indicates how much of the increase is due to an increase in the demand for the products from the given region and/or from other regions; and (b) the trade effect, which indicates the increase due to a change in regional supply patterns. In other words, the trade effect measures changes in each region's share of the national market where a given region is able to increase its exports to other regions and/or reduce its imports from other regions.

The increase in regional output is determined by using the Chenery-Moses interregional input-output model.[23/] The total output of commodity i in region g (X_i^g) in period C is equal to the sales of this commodity to all other regions, including that part which remains in region k ($X_i^{gk}(O)$); k = 1, ..., n.

$$X_i^g(O) = \sum_{k=1}^{n} X_i^{gk}(O) \qquad i = 1, \ldots, n \tag{1}$$

22/ For a very similar model, see H. B. Chenery (1962) "Development Policies for Southern Italy", Quarterly Journal of Economics, LXXVI, Nov. issue.

23/ For a more detailed analysis of this model, and its relation to other interregional input-output versions, see M. S. Brodersohn (1965) An Interregional Input-Output Analysis of the Argentine Economy, Trabajo Interno No.9, Centro de Investigaciones Económicas, Instituto Torcuato Di Tella, Buenos Aires.

The interregional sales are determined by the following structural equation:

$$X_i^{gk}(0) = s_i^{gk}(0)\, D_i^k(0) \qquad (2)$$

where $s_i^{gk}(0)$ is the trade coefficient (the proportion of total demand of commodity i in region k which is furnished by region g in period 0), and $D_i^k(0)$ is the total demand (intermediate and final) of commodity i of region k in period 0.

Total demand localized in region k, in turn, is determined by the following expression:

$$D_i^k(0) = \sum_{j=1}^{n} a_{ij}^k(0)\, X_j^k(0) + Y_i^k(0) \qquad (3)$$

where $a_{ij}^k(0)$ is the standard input-output coefficient and $Y_i^k(0)$ is the final demand for commodity i in region k in period 0.

Substituting (2) and (3) in (1):

$$X_i^g(0) = \sum_{k=1}^{n} \sum_{i=1}^{n} s_i^{gk}(0)\, a_{ij}^k(0)\, X_j^k(0) + \sum_{k=1}^{n} s_i^{gk}(0)\, Y_{i(0)}^k \qquad (4)$$

$$i = j = 1, \ldots, n$$
$$g = k = 1, \ldots, n$$

In matrix notation X_0 will be the regional output vector, S_0 the trade coefficient matrix, A_0 the input-output coefficient matrix, and Y_0 the regional bill of goods vector in period 0. Thus, the set of equations (4) can be stated in matrix notation as follows:

$$X_0 = (SA)_0 X_0 + S_0 Y_0$$

$$X_0 = [1 - (SA)_0]^{-1} S_0 Y_0$$

Regional output in period t can be disaggregated as that part that is derived assuming no change in the trade patterns from time 0 to time t, and that part that derives from changes in trade patterns (AS):

$$X_t = [1 - (SA)_0]^{-1} S_0 Y_t + [1 - \Delta(SA)]^{-1} \Delta S Y_t$$

The change in regional output from period 0 to t, will then be:

$$\Delta X = X_t - X_o = [1 - (SA)_o]^{-1} S_o Y_t + [1 - \Delta(SA)]^{-1} \Delta S Y_t - [1 - (SA)_o]^{-1} S_o Y_o$$

$$\Delta X = [1 - (SA)_o]^{-1} S_o \Delta Y + [1 - \Delta(SA)]^{-1} \Delta S Y_t \qquad (5)$$

The first term on the right-hand side of equation (5) will give the change in each region's output owing to a change in its bill of goods, assuming no change in regional supply patterns (demand effect); and the second term will give that change owing to a change in the interregional trade structure (trade effect). This type of analysis will allow an estimation of the extent to which growth in regional output is either derived from a normal regional pattern, such as that given by a proportional change in final demand, or from a change in supply coefficients. These latter can be treated as a policy variable, and future regional development policy may be concerned with changing the past interregional supply patterns.

This model was applied to Argentina for the period 1953-1959[24/] in order to explain past regional growth and hence to draw conclusions for evaluating future policy. The model determines changes in output in twelve sectors and five regions.[25/] Regional aggregation differs from that adopted for the historical analysis since the data was already aggregated in a different form, and reclassifying it would have been time consuming and beyond the scope of the study. The main difference is that Córdoba is not included in the East-Centre region. Provinces were grouped as follows:

Centre: Federal capital, Gran Buenos Aires, Entre Ríos and Santa Fé.

24/ We used this period because interregional trade flows are available only for these two years. See H. Gruppe et al. (1962) Relevamiento de la estructura regional Argentina, Instituto Torcuato Di Tella, Buenos Aires; Consejo Federal de Inversiones (1963) Bases para el desarrollo regional Argentino, Buenos Aires; and M. S. Brodersohn, op. cit. The use of 1959 as the terminal year is unfortunate since in this year the per capita GNP went down by 4.6 per cent.

25/ Later in the study we have aggregated the results for sectoral output in broad categories and have excluded from the analysis construction and services, because we have assumed that in these sectors for each region total demand equals total output, and hence trade coefficients were assumed equal to 1 for the producing region. There is little sense in analysing the net gain or loss for a region owing to the trade effect of a commodity that is not subject to interregional trade. D. B. Houston (1965) "The Shift and Share Analysis of Regional Growth: A Critique", Southern Economic Journal, 33(4), pp.578-579.

West: Córdoba, La Rioja, Mendoza, San Juan and San Luis.
North: Catamarca, Jujuy, Salta, Santiago del Estero and Tucumán.
East: Corrientes, Chaco, Formosa and Misiones.
South: Rest of Buenos Aires, Chubut, La Pampa, Rio Negro, Santa Cruz and Tierra del Fuego.

Table 8 compares the estimated increase in each region's output between 1953 and 1959, assuming that there was no change in the interregional trade patterns, with the actual increases in each region's output.[26] First, it indicates that only the Centre and West regions enjoyed an actual increase in the production of commodities subject to interregional trade[27] that was greater than the national average. If Córdoba had been excluded from the West region and included instead in the Centre region, as was done in the historical analysis, the Centre region would have remained the only one with an increase in actual production greater than the national average. Second, a significant part of the total variation in output in the West region is clearly explained by a favourable change in the interregional supply patterns. Córdoba may have accounted for this change because it had a significant share in the production of commodities with nationwide demand such as automobiles, tractors and chemical products. The opposite situation pertained in the Centre region where the change in demand, with the existing supply pattern, accounted for its entire increase in regional output. Actually, the demand prediction for the Centre region was too optimistic because the prognostication exceeded the actual increase. Third, the situation in the East region was more dramatic because actual production had decreased since both the demand and trade effects were more influential than the change in interregional supply patterns. The North region also had a pattern very similar to that of the East region. The North, East and South regions lagged behind the Centre and West regions because production in the first three regions was greatly concentrated on commodities with an income elasticity of demand much less than 1. The opposite was true for the Centre and West regions. Table 9 gives clear insight into this pattern. The share of the Centre and West was 95 per cent of the increase in the national supply of produced goods with an income elasticity of demand substantially greater than 1. These regions supplied 58 per cent of the national production

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26/ This analysis omits changes in factor use and prices. Changes in each of the variables are measured in constant prices, thus precluding any effect of changes in the terms of trade between regions.

27/ These commodities are usually called "national sectors" because total demand and supply balance only over the national market. On the other hand, local sectors are defined as those in which demand and supply are balanced over local markets. These latter commodities are not included in table 1.

Table 8

Comparison of predicted with actual increase in regional output, based on final demand, 1953-1959 a/
(Percentages)

	Centre	West	North	East	South	Average national output increase for Argentina
Predicted increase in regional output, with no trade effects	25.8	7.1	1.1	-1.5	6.7	
Actual increase in regional output	25.2	21.8	-5.2	-8.1	12.2	19.1
Difference between increase in average national and regional output						
Predicted	6.7	-12.0	-18.0	-20.6	-12.4	
Actual	5.1	2.7	-24.3	-27.2	6.9	

a/ This analysis only includes changes in regional output for commodities which are subject to interregional trade, i.e., construction and services are not included because it is assumed in these cases that each region's demand is satisfied within its own region.

Table 9

Demand and trade effects on increase in regional output, 1953-1959
(Millions of 1953 pesos)

Sectors	Centre			West			North			East			South			Total		
	Demand effect	Trade effect	Total	Demand effect	Trade effect	Total	Demand effect	Trade effect	Total	Demand effect	Trade effect	Total	Demand effect	Trade effect	Total	Demand effect	Trade effect	Total
Primary production	2,667.0	-2,641.2	25.8	-271.6	501.9	212.1	-268.7	-988.1	-1,256.8	-447.0	-763.5	-1,210.5	-1,081.5	1,391.9	312.4	598.2	-2,495.0	-1,896.8
Agriculture	612.7	-2,152.6	-1,539.9	-564.0	159.8	-404.2	-498.7	-991.4	-1,490.1	-501.1	-790.1	-1,291.2	-1,[illegible]	310.7	741.1	-3,002.9	-3,463.6	-6,466.5
Mining, fuel and electricity	2,054.3	-688.6	1,365.7	292.4	344.1	636.5	230.0	3.3	233.3	54.1	26.6	80.7	970.3	1,083.2	2,053.5	3,601.1	968.6	4,569.7
Manufacturing	18,818.7	2,109.7	20,928.4	1,495.9	2,010.6	3,506.5	361.1	460.6	821.9	351.6	350.8	702.4	1,890.6	87.6	2,968.2	23,910.1	5,019.3	28,929.4
Consumer goods	565.9	2,369.3	2,935.2	495.0	1,219.7	1,714.7	3.4	505.4	508.8	-72.1	625.0	552.9	1,757.2	612.3	2,369.5	2,749.4	5,331.7	8,081.1
Food, beverages and tobacco	2,399.4	2,155.4	4,554.8	336.2	1,330.4	1,666.6	4.6	493.5	498.1	-70.6	649.1	578.5	1,486.2	431.3	1,917.5	4,155.8	5,059.7	9,215.5
Textiles	-4,447.3	-329.1	-4,776.4	5.9	-72.3	-66.4	-43.9	-18.1	-62.0	-39.2	3.9	-35.3	-36.9	-87.3	-124.2	-4,561.4	-502.9	-5,064.3
Paper and board printing and publishing	2,613.8	543.0	2,456.2	152.9	-38.4	114.5	42.7	30.0	72.7	37.7	-28.0	9.7	307.9	268.3	576.2	3,155.0	774.9	3,929.9
Producer goods	18,252.8	-259.6	17,993.2	1,000.9	790.9	1,791.8	359.9	-44.8	315.1	423.7	-274.2	149.5	1,123.4	-524.7	598.7	21,160.7	-312.4	20,848.3
Chemicals and rubber	9,707.9	695.4	10,403.3	202.0	108.5	310.5	131.2	-52.3	150.7	114.1	-215.3	-6.3	179.1	190.4	369.5	10,[illegible].2	798.5	11,227.7
Metals	4,860.1	379.1	5,239.2	188.1	-112.2	75.9	96.1	-12.0	43.8	100.6	-55.0	59.1	418.3	-165.8	252.5	5,6[illegible].7	-6.2	5,670.5
Vehicles and machinery	3,684.8	-1,334.1	2,350.7	610.8	794.6	1,405.4	132.6	-44.8	120.6	423.7	-3.9	96.7	526.0	-549.3	-23.3	5,054.8	-1,104.7	3,950.1
Total	21,485.7	-531.5	20,954.[illegible]	1,224.3	2,514.5	3,738.8	91.6	-527.5	-432.9	-95.4	-412.7	-508.1	1,799.1	1,481.5	3,280.6	24,508.3	2,524.3	27,032.6

of consumer goods. The weight of agricultural production, which has an inflexible elasticity of demand, was much higher in the three lagging regions than in the Centre and West regions.

The principal result of changes in the interregional trade patterns of manufacturing was to increase the share of the Centre and West regions in the national supply of manufactures. If Córdoba and the rest of the province of Buenos Aires had been included in the Centre region, the results would probably have shown a greater gain in the share of manufacturing for this latter region at the expense of all other regions, thus widening the gap between this region and the rest of the country. Buenos Aires, Córdoba and Santa Fé are almost self-sufficient, that is, they are able to supply most of their own regional total demand. In 1959, 80 per cent of the country's interregional trade was concentrated in these provinces. If Mendoza, Entre Ríos and Tucumán are added, 87 per cent of the total domestic sales of these provinces occurred within their borders, and the remaining 13 per cent comprised shipments to the other provinces.[28/] This situation clearly shows the high degree of trade interconnexion between a few provinces, with the remaining provinces almost isolated from contact with the growing regions.

In short, this analysis of trade relationships in Argentina shows that unless there are basic changes in the regional supply pattern, the lagging regions will be left without any favourable trade contact with the expanding regions. A greater degree of complementary effort should be encouraged in order to fully integrate the national market. Regional barriers to trade and factor flows have to be eliminated in order to make possible the communication of growth stimulus to lagging regions.

Summary

Regional growth is greatly influenced by the changing patterns of national demand and the state of technology and organization. Each region undergoes different rates of growth in accordance with the resource endowments relevant to the changing patterns of national demand. The first stage of national development also influenced the early geographical structure of the country. Growth took place in the East-Centre region because it had the appropriate resource

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28/ Consejo Federal de Inversiones (1963) op. cit., pp.85-105.

endowments - arable land and a natural port - needed to supply the staple commodities in world demand. This stage of regional growth was characterized by specialization in the production of primary goods. The second stage of regional development was influenced by economic phenomena generated during the first stage, such as size of markets, social overhead investments as well as by a new strategy of national development adopted after the world crisis of the 1930s. Thus, the East-Centre region expanded because its resources and other advantages were adapted to supply previously imported consumer goods. This pattern brought about a high concentration of simpler branches of industrial activities, such as foodstuffs and beverages, textiles, and leather in this region and particularly in metropolitan Buenos Aires.

The third stage of regional growth was united with changes in the composition of national final and intermediate demand and in the existing agglomeration of population, economic activities and social overhead facilities in the East-Centre region. By the mid-1950s, growth was no longer dynamic in the East-Centre region, because its industrial composition was based on the production of goods with low income elasticity of demand. Further growth required either the continued attraction of new activities, even from declining industries, or changes in the industry-mix by the attraction of rapid growth sectors. The new import-substitution strategy, based on the domestic production of metals, machinery, chemical and petrochemical products, greatly influenced the future regional patterns because the East-Centre region was again the more advantageous area in which to locate. If the national strategy of growth had been based on exporting new commodities to foreign markets and using the foreign exchange thus created to import intermediate and capital goods, the regional growth patterns might have been different. Growth would have been rapid in those regions with the appropriate resources to satisfy the newly created foreign demand; and the East-Centre region's industry-mix based on goods with low income elasticity of demand would have resulted in a retardation of growth in this region.

The diversified and more complex process of industrialization, based on the import substitution of intermediate and capital goods highly concentrated in the East-Centre region, had irregular geographic effects within this region. The metropolitan Buenos Aires pole of attraction was complemented by two new dynamic centres: Córdoba, in which almost 50 per cent of the national production of tractors and automobiles was concentrated, and South Santa Fé, where the petrochemical complex was concentrated.

In short, the East-Centre region was able to grow during the first stage of regional economic development because it had the essential natural resources to satisfy the increasingly expanding foreign demand. This, in turn, made it possible to attract people and servicing activities for the local and national market. The high concentration of markets and activities in this region generated agglomeration economies, which strengthened existing tendencies to market orientation. Thus, one agglomeration led to the creation of new agglomerations.[29] On the other hand, the development of this pole of attraction did not stretch out to tap the resource inputs of the hinterland areas, since its industrial development was based to a large extent on imported inputs.

If the future national strategy of economic development is based on a "deepening" of a pattern of import substitution of intermediate and capital goods, the stimulus to growth might be transmitted to regions with the proper resource endowments to satisfy this new strategy. The production of metallurgical products in the East-Centre region has not spread favourable dynamic effects to other regions because the expanded input requirements were not met by imports. The southern part of Argentina (Patagonia) seems to have the required natural resources in abundance for this possible course of future development. This region is inaccessible in an economic sense, however, for both input and market-oriented activities. Its population is sparse; consequently it does not have a ready labour supply and its social infrastructure is almost non-existent. If domestic migration from the northern provinces is directed towards Patagonia instead of Buenos Aires, and public investment is heavily concentrated in this region, advantages in location might tip the balance in its favour, and the goal of achieving the highest rate of national growth would be met. In short, future trends in "balanced" regional development, and concentration versus dispersion of new industrial ventures, will be influenced by the future structure of national demand as determined by national strategies of economic development. Since natural resources are not evenly distributed over the country, regions rich in resources vital to industrialization will have an advantage.

On the other hand, the promotion of growth in lagging regions will require not only finding commodities with nationwide demand, high income elasticity of

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29/ These external economies are usually known as localization economies (those economies obtained by an industry when different plants of the same industry cluster together) and urbanization economies (those economies obtained by an industry because of location near a city).

demand, locational linkages and multiplier effects, but also stimulating structural changes in the interregional supply patterns. Social overhead facilities would have to be extended, particularly a transportation network. Not all regions have the same capacity to grow, however. Investments in some regions will entail a conflict between achieving national economic efficienoy by maximizing national output and a more equalized regional distribution of inoome. The solution would involve both economic and politioal considerations. If there are extreme inoome differences between regions, and the gap between rioh and poor areas rapidly increases over a period of time, moral oonsiderations might strongly influence a decision as to future regional goals. In order to place regional objectives for Argentina in the proper perspective, the inequalities in the relative regional per capita income are oonsidered in the following section. In other words, consideration will be given to whether there was a regional trend in per capita income towards or away from the national average as national economio development has progressed.

REGIONAL INEQUALITY PATTERNS AND NATIONAL ECONOMIC GROWTH IN ARGENTINA

Economic growth does not take place in all regions of a oountry simultaneously. Growth starts in some points and oreates consequent disparities in income among regions. "...There can be little doubt that an economy, to lift itself to higher income levels, must and will first develop within itself one or several regional centres of economic strength. This need for the emergenoe of growing points or growth poles in the oourse of the development process means that international and interregional inequality of growth is an inevitable concomitant and oondition of growth itself."[30]

Different explanations - proximity to fertile land or mineral sources, and geographical advantages, such as a natural port - have been advanced to explain the fact that the development process necessarily entails interregional inequalities in growth rates.[31] The interesting question, however, is whether regional

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30/ A. Hirschman (1958) The Strategy of Economic Development, Yale University Press, New Haven, Connecticut, pp.183-184.

31/ G. Myrdal (1957) Economic Theory and Underdeveloped Regions, London, chapters 3-5. F. Perroux (1955) "Note sur la notion de 'pole de croissance'", Cahiers de l'Institut de Soienoe Economique Appliquée, D(8). United Nations (1955) The Economic Survey of Europe in 1954, Geneva (Sales No.: 55.II.E.2), chapter 6.

inequalities will continue to increase over a period of years or whether there is a tendency for them to be reduced in time. Regional divergence from or convergence towards the national average is the crucial point. Hirschman clearly describes the way in which polarization forces tend to increase the disparity in regional growth rates once regional growth has started at one centre. When the economy has reached maturity, Hirschman argues, trickling-down forces tend to reverse the trend and make possible a convergence in regional income distribution. Capital and labour mobility, interregional trade and the policies of the central government are the elements that give rise to this regional pattern of growth. Williamson[32/] has tested this theory empirically. He demonstrates, first by an international cross-section study and then by a time-series analysis, that for some countries during the first stages of national growth, relative regional growth disparities tend to increase; and when the country reaches the stage of maturity there is a reverse trend and regional growth rates converge to the national average. Williamson does not supply a concrete turning point for this inverted pattern of regional growth, nor does he consider in depth the causes for the pattern. Major research is being conducted to determine when this turning point occurs and whether the government can act on it, since this would help countries to delineate their regional economic policy.[33/]

This section will be devoted to an analysis of the time path of the Argentine regional growth rates in <u>per capita</u> income to determine whether there was a convergence of these regional rates towards the national average.[34/] It is concerned only with relative and not with absolute income disparities. The second type of disparity depends not only upon the annual rate of growth in relation to the national average but also upon the starting position of each region <u>vis-à-vis</u> the others. This does not mean that absolute inequalities among regions are not important. On the contrary, the welfare of the community is generally more related to absolute differences, although if the assumption

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32/ J. Williamson (1965) "Regional Inequality and the Process of National Development: A Description of the Patterns", <u>Economic Development and Cultural Change</u>, <u>13</u>(4/II), June issue.

33/ Hirschman and Myrdal, the latter in particular, emphasize the importance of political forces to help narrow the gap between the developed and backward regions.

34/ The regional income equalization goal is closely related with the definition of regional boundaries. The smaller the size of the area considered, the likelier they are to differ from the national average.

is that all regions are growing at the same rate after initial growth has taken place in one of them, the absolute regional differential would not only persist but increase.

The analysis of the relation between Argentine levels of development and regional inequality are based on data for the per capita gross regional product (GRP)[35] for 1946, 1953, 1958, 1959 and 1961. The data for 1953, 1958 and 1959 were obtained from a study carried out by the Instituto Torcuato Di Tella and the Consejo Federal de Inversiones.[36] GRP for 1946 was estimated by breaking down the gross national product (GNP) according to regional indicators taken from the 1946 national census. The data for 1961 were obtained from an unpublished study of the Consejo Federal de Inversiones. The two different sources of information obviously affect the comparability of results because it was impossible to follow uniform criteria in computing the GRP for each year. This is particularly important in the comparison of results between 1946 and 1953 with 1958 and 1959 because the results for the latter two years were obtained partly by applying regional indicators to national aggregates and partly through direct information. This was not the case for 1946 where only indicators were used. It is unlikely, however, that the heterogeneity of the data employed in computing the GRP will significantly affect the trend of the results.

The Williamson coefficient (R_W) was used to measure relative differential rates of growth: a measure of deviation of the GRP per capita level relative to the national average, with each regional deviation weighed by its share in the national population. The higher the R_W, the greater the size of state income differentials.[37]

35/ Indeed the analysis should be based on income accruing to the residents of each region (on regional income per capita), and not on the value of product produced in each region (GRP). The difference between them is given by factor payments to and from the region residents. In Argentina, this distinction is particularly relevant because metropolitan Buenos Aires may concentrate a great deal of income generated in other areas.

36/ H. Gnappe et al. (1967) Relevamiento de la estructura regional de la economía Argentina, 5 vols., Editorial del Instituto, Buenos Aires.

37/ $$R_W = \frac{\sqrt{\sum_i (Y_i - \bar{Y})^2 (P_i/N)}}{\bar{Y}}$$

Where P_i = population of the i^{th} region; N = national population; Y_i = income per capita of the i^{th} region; $\bar{Y}$ = national income per capita.

Table 10 presents the results. Column 1 shows the results for the weighted coefficient, R_W, and column 2 for the unweighted coefficient, R_{UW}.[38] The results show that the degree of inequality was increasing over time, indicating that over the fifteen-year period there was a trend towards increasing regional inequality at the same time that the whole economy grew at an annual rate of 1.7 per cent (1946-1961). Thus, R_W increased from 0.368 (1946) to 0.449 (1961) and R_{UW} from 0.534 (1946) to 0.815 (1961).

Table 10

Regional inequality index[a]

	R_W	R_{UW}
1946	0.368	0.534
1953	0.369	0.555
1958	0.378	0.587
1959	0.387	0.696
1961	0.449	0.815

a/ For backward regions these results are biased downwards because their estimates of income do not take into consideration that the type of income differs from that in fully monetized and market-oriented regions.

The statistical computations of GRP for the period 1953-1959 followed the same procedure. Hence, the change in the inequality index could be imputed to changes in regional income inequality patterns and not to changes in procedures of measuring statistics. From 1953 to 1959 the increase in the inequality index was 5 per cent; from 1958 to 1959 it remained almost at the same level. The high value of the index for 1961 might result from the statistical procedure followed owing to data limitations.

The same type of analysis can be made if province is defined as the "national" unit and department as the "regional" unit in order to observe whether the pattern of inter-province inequality is consistent with that for intra-province inequality. Table 11 shows the weighted coefficient R_W for each province for 1953, 1958 and 1959, these being the only years for which there were income and population estimates for each department. The results do not give a definite indication whether intra-province inequality increased over a period of time or not. Column 4 shows the change in R_W for each province from 1953 to 1959. The trend seems to be consistent with inter-province

38/ $R_{UW} = \dfrac{\sqrt{\sum_i (Y_i - \bar{Y})^2/N}}{\bar{Y}}$

Table 11

Regional inequality index by province (R_W) [a]

Provinces	R_W (1953)	R_W (1958)	R_W (1959)	R_W (1959 minus 1953)
Buenos Aires	0.234	0.259	0.328	+0.094
Catamarca	0.545	0.754	0.470	-0.075
Córdoba	0.336	0.237	0.320	-0.016
Corrientes	0.296	0.274	0.372	+0.076
Chaco	0.274	0.211	0.199	-0.075
Chubut	0.593	0.531	0.35	-0.243
Entre Ríos	0.196	0.171	0.191	-0.005
Formosa	0.150	0.257	0.245	+0.095
Jujuy	0.480	0.511	0.506	+0.026
La Pampa	0.288	0.228	0.323	+0.035
La Rioja	0.317	0.336	0.239	-0.078
Mendoza	0.327	0.409	0.454	+0.127
Misiones	0.405	0.360	0.468	+0.063
Neuquén	0.463	0.400	0.332	-0.131
Río Negro	0.383	0.312	0.220	-0.163
Salta	0.421	0.412	0.329	-0.092
San Juan	0.357	0.452	0.442	+0.085
San Luis	0.346	0.254	0.323	-0.023
Santa Cruz	0.196	0.300	0.290	+0.094
Santa Fé	0.182	0.164	0.190	+0.008
Santiago del Estero	0.495	0.567	0.534	+0.039
Tucumán	0.157	0.098	0.111	-0.046
Tierra del Fuego	0.262	0.239	0.233	-0.029

[a]

$$R_W = \frac{\sqrt{\sum_i (Y_{ik} - \bar{Y}_k)(P_{ik}/N)}}{\bar{Y}_k}$$

Y_{ik} = gross product of the i^{th} department in the k^{th} province

$\bar{Y}_k$ = gross regional product of the k^{th} province

P_{ik} = population of department i in the k^{th} province

N = province population.

inequality in eleven provinces; that is, the size of regional inequality increased. This analysis includes the advanced provinces of Buenos Aires, Mendoza and Santa Fé, and also the backward regions of Formosa, Jujuy and Santiago del Estero. For the remaining twelve provinces the size of regional inequality decreased. These provinces include advanced areas such as Córdoba and Entre Ríos and poor areas such as La Rioja and San Luis. The results for Buenos Aires and Córdoba, however, where the industrialization process was significant, indicate two patterns. There was a clear trend towards regional inequality in Buenos Aires which might have resulted from a concentration of investment in its metropolitan area. In Córdoba, an inverse trend might have resulted from a more widely dispersed allocation of investment.

The analysis thus far has been based on <u>per capita</u> GRP as an indicator of the level of development. The lack of data made it impossible to extend the period of analysis. For this reason, a new index of regional inequality was devised in order to provide more empirical evidence. Thus, the inequality coefficient (R_W^I) was defined as industrial productivity deviations weighted by the share of the regional industrial labour force in the total industrial labour force.[39] Table 12 indicates the R_W^I since 1935, and the trend towards

39/ $$R_W^I = \frac{\sqrt{\sum_i (I_i - \bar{I})^2 (O_i/O)}}{\bar{I}}$$

where $$I_i = \frac{VA_i}{O_i} = \frac{\text{manufacturing value added in province } i}{\text{labour force employed in manufacturing in province } i}$$

$$\bar{I} = \frac{VA}{O} = \frac{\text{total manufacturing value added}}{\text{total labour force employed in manufacturing}}$$

As an idea of how good the manufacturing value added per worker employed is as an approximation of regional income <u>per capita</u> in this sector, we have correlated this latter variable with regional income <u>per capita</u> for 1953, i.e.

$$X = a + bY$$

where X = manufacturing value added per worker employed in this sector
Y = regional income <u>per capita</u>.

The results were positively correlated and significant at 2.5 per cent. If we eliminate the influence of extreme cases (Tierra del Fuego, Chubut and Santa Cruz) the results are:

$$X = 8067 + \underset{(0.720)}{3.30}\, Y \qquad r = 0.7256, \quad d = 2.429$$

The coefficient of Y is positive and significant at 1 per cent.

regional inequality seems to have increased over a period of time. The average of these coefficients for the 1930s is 0.194, for the 1940s, 0.301, and for the first three years of the 1950s, 0.332. This coefficient, in other words, increased by 70 per cent between the average for the 1930s and that for the 1950s.

Table 12

Index of inequality in the industrial sector[a/]

	R_W^I
1935	0.230
1937	0.159
1939	0.194
1941	0.306
1943	0.262
1946	0.269
1948	0.370
1950	0.322
1953	0.372

a/ The provinces Chubut, Santa Cruz and Tierra del Fuego are included in a single region.

However, this trend seems nearly to have levelled off, since the increase between the average for the 1940s and that for the 1950s was 10 per cent.

The analysis of the patterns of relative regional differential growth rates indicates that the trend to greater inequality increased after the 1930s and appeared to level off in the 1950s. The inequality index used does not refer, however, to absolute per capita income differences among regions; this might be significant despite the recent levelling-off trend in relative regional growth rates. If the lightly populated southern provinces are excluded from the analysis, in 1958 only three areas had per capita income above the national average (table 13): metropolitan Buenos Aires (27 per cent), the rest of Buenos Aires (17 per cent) and Mendoza (14 per cent).[40/] San Juan was at the same level as the national average. On the other hand, six provinces had a per capita income

40/ This analysis is based on GRP and, because of data limitations, it assumes that there is no difference between the value of the products of each province and income accruing to the residents of each province. This assumption will undoubtedly cause distortion in our analysis because non-resident ownership of factors of production is highly significant. Thus, we may expect in our comparisons with the national average that per capita income would be much higher in metropolitan Buenos Aires and much lower in the southern provinces.

Table 13

Per capita income by areas, 1953
(Percentage of national average)

Total Argentina	100.0
Tierra del Fuego	287.7
Santa Cruz	225.4
Chubut	143.7
Metropolitan Buenos Aires	126.8
Río Negro	121.7
Rest of Buenos Aires	116.6
Mendoza	114.2
La Pampa	109.2
San Juan	100.4
Santa Fé	94.3
Jujuy	80.3
Tucumán	75.6
Córdoba	73.8
Chaco	63.5
Entre Ríos	60.8
Neuquén	57.9
Salta	54.3
San Luis	51.5
Corrientes	50.0
La Rioja	46.1
Formosa	45.3
Catamarca	40.3
Santiago del Estero	38.0
Misiones	36.4

Sources: (1) Consejo Federal de Inversiones (1963) Bases para el desarrollo regional Argentina, Buenos Aires, pp.85-105.

(2) H. Gruppe et al. (1962) Relevamiento de la estructura regional de la economía Argentina, 5 vols., Editorial del Instituto, Buenos Aires.

that was less than 50 per cent of the national average: Corrientes (50 per cent), La Rioja (46.1 per cent), Formosa (45.3 per cent), Catamarca (40.3 per cent), Santiago del Estero (38 per cent) and Misiones (36.4 per cent). These provinces contained only 9 per cent of the population. Córdoba and Santa Fé were below the national average because the new dynamic metallurgical and chemical industrial plants became productive only after 1958. The southern provinces of Chubut, Santa Cruz and Tierra del Fuego had a per capita income above the national average because their agricultural and mining production processes are not labour-demanding activities. These provinces contained less than 2 per cent of the country's population in 25 per cent of the geographic area, and earned 2.8 per cent of the GNP.

The regional problem for Argentina was that 77 per cent of the GNP was generated in 22 per cent of its geographic area (Buenos Aires, Córdoba and Santa Fé). The absolute per capita income differences among provinces, although significant, did not, however, have the characteristics that one might expect from the regionally unbalanced distribution of economic activities, since three quarters of the population had a per capita income approximating the national average. Moreover, relative regional per capita income differential growth rates seem to be narrowing down.

The dilemma that Argentina faces lies in its regional dualism. On the one hand, a small geographic area contains most of the population and economic activities, and, on the other hand, areas of abundant resources, which might be integrated into the national economy, are sparsely populated and lack social infrastructure. Argentine regional problems are different from those in such countries as Colombia, Peru and Italy, since regional per capita income approximates the national average for 75 per cent of its population. In Brazil, "while the northeastern region contains 25 per cent of the population, it earns 10 per cent of the national income, and while the south has 35 per cent of the population, it earns 50 per cent of the national income".[41/]

Public opinion and politicians are hence invariably concerned with these two regional problems: (a) that 45.5 per cent of the GNP is earned by 36.3 per cent of the population in less than 0.2 per cent of the geographic area (metropolitan Buenos Aires), and (b) the integration of large resource-endowed region

41/ W. Baer (1964) "Regional Inequality and Economic Growth in Brazil", Economic Development and Cultural Change, 12(3), p.271.

into the national economy. The solution of these problems will depend on whether future location criteria are based on national or on regional perspectives, and on short-run or long-run aims.

OBJECTIVES OF REGIONAL DEVELOPMENT POLICY

Regional goals and the choice of location

Although considerations of regional equity are usually present in major government planning, the economic policy of the first stage of Argentine economic growth (until 1930) was concerned with the national rate of growth, and the regional distribution of activities followed as a natural corollary. This pattern of economic growth gave rise to the centre-periphery interrelationship in Argentina.

After 1930, until the mid-1950s, the strategy of national growth relied heavily on the import substitution of consumer goods. Again the East-Centre region, particularly metropolitan Buenos Aires, attracted the most industrial activities because of the external economies derived from the agglomeration of activities and factors of production in this region. Since infrastructure was poorly developed over the entire country and markets were concentrated in a few centres, the choice of location was severely limited and industry tended to concentrate where agglomeration economies already existed. In this period as well the concern was more with the national rate of growth than with the regional distribution of industrial activities.

By the mid-1950s, the patterns of industrialization based on the import substitution of consumer goods had ended and Argentina began to substitute intermediate and capital goods. This new pattern, while furthering the development of Buenos Aires, also created new poles of attraction in Córdoba and Santa Fé. After 1955 Córdoba became a metallurgical centre, attracting tractor, automobile and railway producers; and, after 1960, Santa Fé became the hub of a petrochemical complex. The development of these new centres was attributed to the rationing of government electricity in Buenos Aires and an excess supply of electricity in Córdoba; the availability of labour in Córdoba and Santa Fé with standards of quality comparable to those in Buenos Aires; the accessibility of inputs in South Santa Fé for petrochemical production; a good transportation network linking Córdoba, Santa Fé and Buenos Aires; and a chain of ports on the Paraná river in the state of Santa Fé.

During this latter stage of economic growth, the Government seemed to be aiming at a more balanced regional development, and regional problems had become an issue of national importance. The two five-year plans for 1947-1951 and for 1952-1956, the national industrial promotion laws, and the recent national plan for 1965-1969 have encouraged the decentralization of economic activities. The Government has manifested the desire to stimulate investment outside metropolitan Buenos Aires by using fiscal incentives. The climax of this process of decentralization was the 1964 industrial promotion law, which explicitly excludes investments in metropolitan Buenos Aires from any type of benefits.

All of these considerations concerned the volume of economic activity of each region compared with the others, in other words, the regional patterns of concentration of economic activities. However, growth in total output may differ from the welfare aspects of regional growth, that is, from the behaviour of per capita income growth in each region. The strategic variables that affect both the volume and welfare aspects of economic development need not be identical, although they depend on the same set of forces. "The failure of the 'volume' of economic activity to keep pace with the national average growth in certain areas may be helpful in achieving the socially desirable goal of economic efficiency. Yet this need not imply that the income of persons in the area affected - either those who migrate elsewhere or those who remain - need increase any less rapidly than the income of persons elsewhere, at least in the long-run."[42/]

An analysis was made earlier of the welfare aspects of regional development in terms of regional differential growth rates in per capita income in relation to the national average. The index of regional inequality used indicated an increasing trend towards unequal growth which appeared to be levelling off in the 1950s. The pattern referred to relative per capita income differential growth and not to absolute growth. The concern with community welfare, however, is generally related more to absolute differences with respect to the national average than with relative differences. Absolute per capita income differs widely among the various states, although these differences do not display the characteristics that one might expect from the spatial analysis on concentration of economic activities, because, on the one hand, three quarters

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42/ H. Perloff and L. Wingo Jr., op. cit., pp.56-57.

of the population live in states that have a per capita income approximating the national average, and, on the other hand, only 9 per cent of the population live in states with a per capita income that was less than half of the national average.

Social concern over regional problems in Argentina is basically related to breaking down the centre-periphery model, that is, the aim is to discourage the high concentration of economic activities and population in a few centres, particularly metropolitan Buenos Aires, and to better integrate large areas that are isolated from the existing centres of population and richly endowed with natural resources, but that lack population and social infrastructure. There are also states with a per capita income which is one half the national average: San Luis, Corrientes, La Rioja, Formosa, Catamarca, Santiago del Estero and Misiones. The elimination of this centre-periphery relationship has been the object of increasing governmental efforts in recent years to stimulate regional development by the creation of new centres of growth.

Political considerations generally come into play when there are regional disparities in income distribution. The creation of new centres that can give an impetus to centripetal forces for their development raises a political issue. The case is usually not stated in terms of a regional redistribution of income, however, but in terms of the economic advantages that would accrue from establishing new poles of attraction. Over-concentration, if continued, it is argued, will increase the per capita expenditures for government services and result in additional social overhead capital. "However, there is no agreement as to the urban size at which this occurs, nor, for that matter, is there solid evidence that costs do in fact increase with urban size for a given level of services and facilities."[43/] The question of the optimal size of a region has been the source of endless discussion and speculation on the part of planners, but no answer has yet been given.[44/]

Two primary goals are to maximize the national rate of growth[45/] and to equalize the spatial distribution of income. There should be no conflict

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43/ W. Alonso (1966) "Location, Primacy and Regional Economic Development", paper presented at the Second International Congress of Regional Planning, Rio de Janeiro, p.1.

44/ J. Friedmann, op. cit., p.73.

45/ Efficiency implies that production could not be increased if we produce the same output with the same amount of resources at an alternative location (also including resources used in transportation).

between efficiency and equity through the creation of poles of growth if, for any additional investment, the new centre shows higher net returns than the existing centre.[46]

The thesis that metropolitan Buenos Aires has reached the stage of diminishing returns is apparently widely accepted in Argentina. The common view among political circles is that it is overcrowded and that it suffers from gigantism. The Consejo Federal de Inversiones, an inter-provincial agency created in 1959,[47] has accepted this viewpoint[48] in its study on planning regional economic development in Argentina,[49] although no empirical investigation was undertaken to prove that net returns in Buenos Aires were really diminishing.

Regional development policy cannot be based on such vague objectives as industrial decentralization and the creation of new poles. For location decisions concerned with regional decentralization explicit answers must be found to a number of questions: What constitutes a "satisfactory" regional balance? Where should new poles be located? Of what dimension? What is the goal when there is conflict between regional equity and national efficiency? As Lloyd Rodwin stated: "The regional development goals, like the other goals in the national development plan, need to be spelled out, enlarged, dramatized, made more visible".[50]

Considerations of concentration *versus* decentralization and national efficiency *versus* regional equity are particularly relevant for Argentina. Since the distances are so great, it is impossible in the short-run to provide a good system of transportation, communication and power supply for the entire country, and to distribute population and industry evenly in all the provinces.[51]

46/ For further elaboration on this point, see W. Alonso, *op. cit.*

47/ The purposes of this agency are described elsewhere in this study.

48/ At this time we should point out that maximizing growth for every region will maximize growth for the entire nation only under conditions of perfect competition. See C. Leven (1964) "Establishing Goals for Regional Economic Development", *Journal of the American Institute of Planners*, XXX, May issue, and reprinted in J. R. P. Friedmann and W. Alonso, *op. cit.* (see footnote No.3), chapter 29.

49/ Consejo Federal de Inversiones (1963), *op. cit.*

50/ W. Rodwin (1964) "Choosing Regions for Development", in J. R. P. Friedmann and W. Alonso, *op. cit.* (see footnote No.3).

51/ The density of population in Argentina is 8 per km^2 against 100 to 400 in Europe.

Spatial alternatives in Argentina

Argentina clearly lacks a regional development strategy. It is beyond the scope of this paper to establish what the optimum future spatial patterns in Argentina should be, but several points related to the problem will be discussed here in order to clarify the issues involved in delineating such a regional strategy.

The first consideration is whether the objective of national or regional growth will guide the future course of action. At an international seminar in which six developing countries with wide regional inequalities participated (Greece, Israel, Portugal, Spain, Turkey and Yugoslavia), it was generally agreed that policy concerned with regional problems depends on the development stage of the country. The promotion of individual regions in developing countries must therefore be limited to those of high economic potential, which would be likely to contribute to a higher rate of national economic growth.[52] Only countries at an advanced stage of development can afford to concentrate on raising the level of backward areas.[53]

If the basic planning objective is national economic growth, regional goals and consequently decisions for regional location become merely an instrument for achieving the national objective. The simple goal of maximizing national output, however, presents problems of how it is to be realized in a dynamic context. Decisions for location guided by the aim of national efficiency may involve various spatial solutions, according to the importance attached to external economies, especially when the decision makes possible a substantial trend in investment concentrated regionally. The decision as to the optimal location will depend on the potential effect of external economies on production and distribution costs in one region as compared with the others. In short, different solutions may be considered as advancing national efficiency depending on whether the criterion for location is based on a "static" approach (concerned with the efficiency of the existing location pattern) or on a "dynamic" approach (concerned with changing the existing pattern). The solution based on a dynamic approach is more nebulous, since it depends on the planner's or private

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52/ Organisation for Economic Co-operation and Development (1965) Regional Development and Accelerated Growth, p.11.

53/ Ibid.

investor's subjective evaluation of the comparative regional advantages in terms of external economies.

Another consideration that deserves special attention is the spatial alternatives present in Argentina, and to what extent the goal of regional decentralization can be achieved without having to sacrifice part of the national income. For this analysis, the development of regions in relation to their resource endowments and the future structure of total national demand will be considered. Three regions in Argentina may serve as examples: the core region (metropolitan Buenos Aires, Córdoba and Santa Fé), the resource frontier region (Patagonia), and depressed or backward regions that have less than one half of the national average *per capita* income (San Luis, Corrientes, La Rioja, Formosa, Catamarca, Santiago del Estero and Misiones).[54] These three regions have been chosen instead of other equally important regions, because they present cases where, with a goal of decentralization, the conflict between welfare and efficiency seems most relevant. This analysis should also throw light on future regional strategies for Argentina.

The core region

The high concentration of population, economic activities and investment in the core region means that its growth is closely related to national economic development and that it performs a critical role in the process of industrialization. This relationship also operates in reverse; that is, when the core region's capacity to grow slackens (when its actual output is below its potential level of production), owing to an inadequate supply of basic services, the country as a whole will suffer.

The core region has the problems of urban congestion that are characteristic of highly urbanized regions. Among other things it lacks an appropriate urban transportation system, adequate highways, sewerage, electricity and housing. A solution to these problems would contribute to the development of other regions. This is particularly true in Argentina since metropolitan Buenos Aires accounts for almost one half of the gross national product. A faster industrial growth in this region will in turn enhance the economic development of other regions, owing to an increase in the demand for their resources as well as an increase in savings.

54/ We have followed in this approach the definition of regions given by J. R. P. Friedmann, *op. cit.*

The frontier Patagonia region

The situation of Patagonia is different. This is a region where natural resource endowments may play a significant role if the national strategy of economic development is based on promoting heavy industries. The connexion between the region's natural resources and future strategy, based on the expansion of the national demand for this type of resource, may be a major factor in determining the strategy for regional development. The basic planning problems that the Patagonia region presents are its relative isolation from existing centres of population and the small size of its population, which is well below the critical minimum threshold for attracting servicing activities.

The crucial question in this case is whether, from the point of view of national efficiency, it is socially justified to promote the development of this resource frontier region or to continue the process of concentration in the core region. The approach of the Consejo Federal de Inversiones is based on the empirically untested assumption that metropolitan Buenos Aires has reached the stage of diminishing returns, and consequently that national output will be maximized if a pole is created in Patagonia which shows increasing net returns. In other countries, urban centres that are larger than metropolitan Buenos Aires do not seem to have diminishing returns, however, and there is no theory on which to base a determination of the urban size at which this process begins. "The continued growth of even the largest metropolitan regions in the world contradicts the expectation of diminishing marginal returns to scale."[55/] On the other hand, even if the core region has increasing returns, still the development of Patagonia may be justified from the point of view of national efficiency, if in the long run it has higher increasing returns than metropolitan Buenos Aires.[56/] But whether Patagonia has higher net returns than the core region will ultimately depend on the effect that the creation of social infrastructure and inflow of population into Patagonia will have on the advantages of this region compared with others. It is quite possible that for a lightly populated region with abundant natural resources, the improvement in the transport system could significantly affect the relative advantages of the

55/ Ibid., pp.14-15.

56/ It is assumed in this analysis that decisions are only made in relation to these two regions. It is quite possible that other regions have even higher increasing returns than Patagonia and metropolitan Buenos Aires.

region for industrial location. Such improvements might give the region advantages over locations which had been preferred because of proximity to market, especially in the case of transport-oriented industries. Moreover, when a big investment effort is carried out in one region, it will influence the structure of demand, prices and costs of each region in comparison with the others because of the external economies provided by this investment effort, and hence might help to develop the resource-endowed region.

Therefore, building up a social infrastructure in Patagonia may be justified not because metropolitan Buenos Aires has reached the stage of diminishing returns but because higher returns are expected from an investment effort in Patagonia than in Buenos Aires. Moreover, the development of this resource frontier region may also be justified by introducing other planning variables, given the multiplicity of government objectives for long-term development. National integration might be a criterion in considering locations for the effect that they may have in bringing the remote frontier regions into closer communication with the existing centres of population. A decision about the development of the frontier region first requires a delineation of the national industrialization strategy, since the linkage between its natural resource endowments and the national economy is a basic condition of this region's development. Patagonia would be an "open" region, exporting its output to other domestic markets, particularly the advanced regions, and to foreign markets. As a highly specialized and export-oriented region, the development of its social infrastructure would be justified in that the markets for its products would be important in the future.

Backward regions

Completely different problems are present in the development of depressed regions. These are areas with low development potential in relation to other regions and with a high rate of selective outward migration of labour. Although the Government may feel that its first concern is to promote the development of the nation as a whole, political and social pressures sometimes force it to pursue urgent remedial action in backward areas. In this case, regional equity conflicts with national efficiency.

Different goals may be pursued when it is desirable to raise the standard of living in backward areas: (a) the per capita income of the backward region

may be raised to equal the national average (this means that the per capita income of these regions must grow much faster than per capita income in the advanced regions); (b) each region grows at the same rate so that absolute per capita income differences will increase over time; (c) the backward regions will have a self-sustained per capita income growth rate. This rate may be lower than the national average, thus increasing the relative and absolute per capita income gap between the backward and advanced regions.

The purpose here is not to recommend one of these goals over the others, but simply to present different economic criteria that might be adopted for regions whose development is desired although for non-economic reasons.

In Italy, "the principal post-war objective of government policy in the South has been to reduce the difference in consumption and income levels between the South and the rest of the country. As the years have passed without any gain in the growth rate of the South over the rest of the country, official statements on development policy have tended to shift this goal to an indefinite time in the future and to stress the establishment of a self-sustained process of growth as the main objective. The main objective of development policy in the South should be to achieve an economic structure capable of sustained growth rather than a particular ratio between the growth rate in the South and North".[1/]

Which of these or other goals should be selected and the relative weight that should be attached to the goal of regional welfare in relation to the goal of national efficiency are questions that only the community can answer.

A final consideration is the public investment strategy to be followed in order to achieve the desired goal. One type of approach might be to disperse public investment regionally; another might be to concentrate this effort in priority regions. A regionally decentralized pattern of public investment makes it possible to originate external economies in the favoured regions.

Argentina has relied basically on fiscal incentives to pursue its regional goals. The following section considers to what extent these incentives have been successful in achieving regional objectives.

[1/] H. B. Chenery, op. cit., p.526.

INDUSTRIAL LOCATION POLICY IN ARGENTINA

Industrial promotion laws

Governments can use a variety of policy instruments to influence the distribution of economic activities among regions. Most aim at either encouraging labour and capital mobility, creating external economies through training a labour force and building social overhead capital, or adjusting the price-cost structure among regions for the production and transportation of unfinished and finished goods. Some of these policies might be compatible with national plans others might be the result of increasing political pressures for the equalizations of regional income.

In Argentina, regional decentralization was encouraged primarily by the industrial promotion laws of both central and provincial governments[58] offering fiscal incentives, notably tax exemptions and duty-free licences for the import of machinery and equipment. These incentives were offered in three geographic areas: Patagonia, the Northwest and the Northeast (see map). In 1964 metropolitan Buenos Aires was excluded from the benefits afforded by these laws with the aim "of stimulating a convenient decentralization of economic activities". Tax exemptions up to a maximum of ten years are granted in the latest industrial promotion law (Decree 3113, 1964) either to the enterprise or to the investor. The benefits granted to enterprises concern yearly business income tax, substitute tax on corporate capital, excess profits tax (which goes from 100 per cent during the first four years to a minimum of 10 per cent in the tenth year), stamp tax, and special prices for gas, electricity, fuel and transport. If the enterprise chooses to encourage the investor, the firm will forego most of the previous tax exemptions, and the investor will receive a yearly tax exemption, lower than that for the enterprise, from the income tax on amounts invested in the enterprise.

58/ A very complete and exhaustive survey of the national and provincial industrial promotion laws can be found in E. Herrero (1965) Aspectos legales de la promoción industrial en la Argentina, 2nd ed., Editorial del Instituto Buenos Aires.
Appendix I of this paper summarizes the main legal characteristics of the laws.

REGIONS DEVELOPED UNDER ARGENTINE INDUSTRIAL PROMOTION LEGISLATION

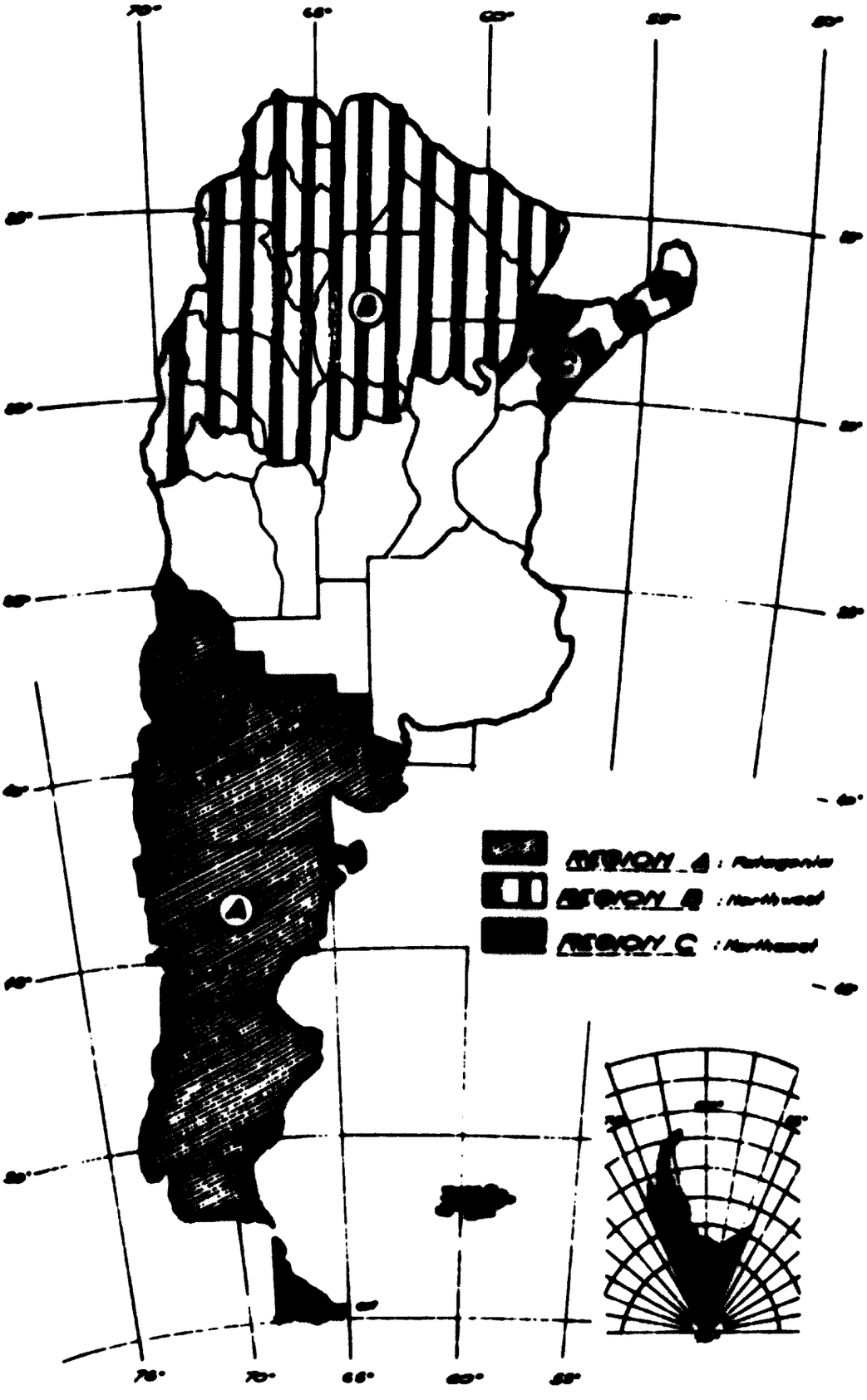

Table 14 indicates that the regions promoted had a small share in the GNP in 1959 (13.5 per cent) and that their share of total population was 22.7 per cent concentrated in 66 per cent of the geographic area of Argentina. Metropolitan Buenos Aires by contrast had 42.6 per cent of the GNP, 34.6 per cent of total population concentrated in 0.4 per cent of the geographic area.

The following sections analyse the economic circumstances of the regions promoted in order to determine whether the goal of decentralization can be attained by fiscal incentives alone.

Patagonia[52/]

Patagonia is a large geographic area that is lightly populated. The population density is 0.7 per cent per square kilometre as opposed to 7.2 per cent for the whole country. Agriculture, particularly the production of fruit and wool, is the main activity of the region, which comprised 40 per cent of the GRP in 1959. Patagonia has approximately 50 per cent of the hydroelectric resources of the country, 99 per cent of the coal reserves, 70 per cent of the petroleum reserves, 60 per cent of natural gas reserves, 70 per cent of iron reserves, and it also has minerals such as beryllium, tungsten, manganese, and vanadium.

Initial investment in resource facilities in this unpopulated region may lead to a sequence of economic growth if it is accompanied by immigration of workers and their families, improvements in transport facilities within the region and with other regions, provision of community facilities, and services such as housing, water, sewerage and electricity. The initial resource exploitation and the building of a population nucleus would stimulate small market-oriented activities, input-oriented processing activities, and urban-oriented activities as the result of investment in construction for community facilities etc. This multiplier effect would depend in turn on the input-output relationships arising from investment in the new resource activity, on the population movements in response to the incentives provided in the region, on the social overhead facilities offered and so on.

52/ A complete survey of the potentialities of this region can be found in Consejo Federal de Inversiones (1966) Análisis regional de la Patagonia, Vols. I-II, Buenos Aires.

Table 14

Economic situation of promoted regions compared with Buenos Aires under industrial promotion legislation, 1959 and 1960
(Percentages)

Region	Share in GNP (1959)	Share in total population (1960)	Geographic area	Density of population per km^2 (1960)
Promoted regions	13.5	22.7	66.0	
Patagonia	3.1	2.7	31.8	0.6
Northwest	8.9	16.6	31.8	3.7
Northeast	1.5	3.4	2.4	10.2
Metropolitan Buenos Aires	42.6	34.6	0.4	666.4

Sources: (1) H. Gruppe et al. (1962) Relevamiento regional de la economía Argentina, Editorial del Instituto, Buenos Aires.

(2) Dirección Nacional de Estadística y Censos (1961) Censo nacional de 1960 de población - resultados provisionales, Buenos Aires.

(3) Instituto Geográfico Militar (1965) Atlas de la República Argentina, Buenos Aires.

In short, Patagonia is a region richly endowed with resources but lacking the necessary social overhead capital. Although it encompasses a third of the geographic area of Argentina, it disposes of less than 10 per cent of the railroads, less than 1 per cent of the electrical supply, inadequate port facilities, 5 per cent of the paved roads, less than 1 per cent of the telephone lines, 7 per cent of the total number of post offices, and less than 1 per cent of the water supply. Moreover, it does not have skilled labour or appropriate technical schools and universities.

Given this absence of social infrastructure in Patagonia, it is doubtful that industries will locate in this region if the only stimulus is fiscal incentives. As we shall see below, the firms making use of the benefits provided by the industrial promotion laws tend to locate in Buenos Aires, Córdoba and Santa Fé, and only resource-oriented investments, such as in petroleum, have been attracted to this region. The great concern in Argentina over the potentiality of this region is indicated by the creation of a joint study group (the Consejo Federal de Inversiones and the United Nations) to formulate a development plan for the "Comahue region".[60] The Comahue includes part of Patagonia: the states of Neuquén and Rio Negro and the southern part of Buenos Aires and La Pampa.[61]

The outstanding features of the Comahue region are:

(a) Soil with an irrigable surface that equals the area irrigated in the rest of the country.

(b) Subsoil, whose possibilities, with the exception of oil and gas, are not yet known, but which nevertheless has future potential. It contains more than half the national reserves of iron (Sierra Grande salt (Gaulichy), wolfram and flourite, and its mining actually represents 24 per cent of the entire country's mining activity.

(c) Hydroelectric resources, which are capable of generating more than double the power actually consumed.

The first specific recommendation of this study group is the construction and operation of the Chocón-Cerros Colorados multiple purposes complex, which would ensure flood control in the Rio Negro Valley, provide water to several

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60/ This is a two-year study with a total budget of $1,240,050 and the contract was signed in August 1966.

61/ Consejo Federal de Inversiones (1965) "Informe preliminar sobre aspectos generales de la economía del Comahue".

thousand square miles of land, eventually allow navigation of the Rio Negro river from its source to the ocean, and produce 4,700 GWh of hydroelectric power.[62]

Northwest region[63]

This region is composed of cities founded in the colonial period. The Spanish colonists came from Peru and Chile through the northern part of the Argentine territory. During this period, the Northwest was the most populated area in Argentina, containing 40 per cent of the total population;[64] it was on the periphery of a centre located in Lima (Peru). Its situation contrasts radically with the lightly populated Patagonia, and naturally imposes restrictions on possible further growth, since traditional activities will have to coexist with modern ones. Labour-intensive and artisan industries must operate side by side with capital-intensive and sophisticated industries. Tradition will inhibit the mobility of labour and capital much more in this old settled region than in new, still unsettled Patagonia, and this aspect should be carefully considered in designing a promotion policy for this region.

The Northwest region has a greater share of the GNP than Patagonia, and its population per square kilometre is more than four times that of Patagonia, but still well below that of metropolitan Buenos Aires. Its share of total population has been continually decreasing: 28 per cent in 1869; 17.8 per cent in 1895; 12.6 per cent in 1935; 11.3 per cent in 1947; and 11.1 per cent in 1960. On the other hand, the annual rate of growth of population (1947-1960) was around 2.5 per cent, while for the country it was 1.9 per cent. Domestic migration has therefore negatively affected this region, especially the states

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62/ Comisión Especial para el Estudio del Desarrollo de las Zonas de Influencia de los Rios Limay, Neuquén y Negro [Comahue] (1962) "Summary of the preliminary study for the full development of the Comahue Region", Senado de la Nación, República Argentina.

63/ The analysis will be based on a report of the CFI which includes most of the states of the promoted region but not all of them. Chaco and Formosa are excluded in this report. Consejo Federal de Inversiones (1966) Plan de emergencia para el Noroeste Argentino, 1967. Diagnóstico preliminar, Documento de Trabajo, Buenos Aires.

64/ A. Ferrer, op. cit.

of La Rioja, Catamarca, Santiago del Estero and Tucumán. Since the age structure of the region shows a younger average than that for the entire country, this migration was not only selective but also largely of working age persons.

Age structure of part of the Northwest region, 1960
(Percentages)

	0-19	20-59	60 and over
Northwest	51.6	42.3	6.1
Argentina	39.4	51.7	8.9

Metropolitan Buenos Aires is the main attraction for those who migrate; 61 per cent of the total migration from Catamarca went to the capital, 40 per cent from Jujuy, 50 per cent from La Rioja, 72 per cent from Salta, 73 per cent from Santiago del Estero and 93 per cent from Tucumán emigrated to Buenos Aires Metropolitan Buenos Aires absorbed not only the disguised unemployed of the Northwest region, but also drew away from the region its key technicians, managers and other enterprising young men.[65/] This selective migration accentuated the relative disadvantages of this region, since basically unskilled and less qualified people have remained there. If some effort had been made and resources had been used to assist people in moving to Patagonia instead of to metropolitan Buenos Aires, a larger contribution might have been made to the country as a whole, especially if the migration had involved unemployed workers from the Northeast.

The analysis so far was made for the entire Northwest region. However, it is not a homogeneous region. Table 15 indicates that Salta and Jujuy had the higher gross regional product with positive internal migration in the period 1947-1960, and with lower unemployment rates. Thus, we can distinguish two subregions that demonstrate different potentialities for growing: (a) Salta and Jujuy; (b) Catamarca, La Rioja, Santiago del Estero and Tucumán.

Chaco and Formosa, a third subregion, should be considered here since it is included in the industrial promotion law's definition of the Northwest region. However, statistical information is unavailable for these two states.

65/ There is no information to quantify the selective characteristics of this migration, though it is generally accepted that the best talent in the professional groups has migrated to metropolitan Buenos Aires.

Table 15

Economic indicators for the Northwest region, 1947-1960

Provinces	GRP per worker, 1960	Domestic migration, 1947-1960	Unemployment rate, 1960
Jujuy	81,600	5,500	3.1
Salta	79,700	13,300	3.2
Catamarca	41,100	-25,100	6.4
La Rioja	54,900	-19,400	6.9
Santiago del Estero	46,600	-115,700	6.8
Tucumán	61,700	-28,600	4.2
Northwest region	62,900	-170,000	4.7
Argentina	122,000		

Source: Consejo Federal de Inversiones (1966) Plan de emergencia para el Noroeste Argentino 1967, Documento de Trabajo, Buenos Aires.

The subregion Salta-Jujuy was growing faster than the national average in the period 1953-1963: 4.2 per cent and 2.3 per cent annual rates of growth of gross regional product, respectively. This was due to the increase in the production of commodities in nationwide demand, such as petroleum and gas, sulphur, lead and zinc, all of which have an income elasticity of demand greater than one. This subregion is well endowed with minerals and fuels. In 1965, the region produced 99 per cent of the national production of iron (Patagonia has the largest unexploited iron reserves), 100 per cent of tin, 16 per cent of manganese, 84 per cent of lead, 89 per cent of zinc, 99 per cent of sulphur, 43 per cent of natural gas, 6 per cent of petroleum, and 5 per cent of limestone.

On the other hand, the subregion comprising Catamarca, La Rioja, Santiago del Estero and Tucumán, remained at the same level of gross regional product from 1953 to 1963. Most industries of this subregion are regionally oriented, that is, they satisfy the demand in the region for foodstuffs, beverages, textiles, wood products etc. Only a very few industries export their output to other regions. This is the case in Tucumán where sugar represents 62 per cent of its exports, Santiago del Estero where firewood, coal and cotton fibres represent 35 per cent of its exports, and La Rioja where wine represents 27 per cent of its exports. These products have a low income elasticity of demand,

that is, their local and national demand does not increase as rapidly as income.

To sum up, the Northwest region is formed by states founded during the colonial period, with production heavily based on slow-growing industries, most of them oriented to satisfy local demand. In the period considered, the per capita gross product of the region was one half the national average; migration from the area was significant and selective; the unemployment rate was above the national average; and the Government had to absorb a great deal of the labour force, thereby increasing disguised unemployment. The situation worsened especially in several states of this region: Tucumán, Catamarca, La Rioja and Santiago del Estero. In the subregion Salta and Jujuy the situation was more promising since these states are rich in mineral resources: gas, petroleum, iron, tin, lead, zinc, sulphur, limestone etc.

The Northwest region differs substantially from Patagonia, which is a frontier region, sparsely populated and rich in natural resources. Moreover, traditional restrictions on labour and capital movement, and the lack of entrepreneurial spirit to undertake dynamic new activities are present to a greater degree in the old settled Northwest region than in Patagonia. Given all these considerations, it seems likely that the long-term conflict between national efficiency and regional equity is more significant in the Northwest region than in Patagonia. Only a careful analysis by sector and project could indicate what types of investment are profitable for the region from both the national and regional points of view.

Regional impact of the central government industrial promotion laws

This paper has described the benefits provided by the industrial promotion laws and the economic characteristics of the promoted regions. The fiscal incentives consisted of tax exemptions up to ten years for both the firm and/or investors and duty-free import of machinery and equipment. We indicated earlier that when these incentives were granted these regions did not have the required social infrastructure. The influence of external economies in location choices is particularly important, especially if it is considered that alternatives for the private investor also include metropolitan Buenos Aires, where 42.6 per cent of IVP is generated and 31.6 per cent of the population live, and the new industrial centres in Córdoba and Santa Fé.

In order to obtain an idea of the actual pattern of investment benefiting from the industrial promotion laws, statistical information has been compiled on foreign and domestic capital investment by sectors and regions for the period 1959-1966, the years covered by the tax and import-duty exemption regulations. Table 16 summarizes this information and annex 2 includes a further breakdown of the information by economic activities.

Metropolitan Buenos Aires absorbed almost 50 per cent of the total investment. If we add to this percentage the remaining part of the province of Buenos Aires, Córdoba and Santa Fé, the figure goes up to 90 per cent. On the other hand, investment in the promoted region was significant only in the period from 1964 to 1966. Although this period coincides with the exclusion of metropolitan Buenos Aires from the industrial promotion law exemptions, it is unlikely that the process of decentralization resulted from this policy, since some of these investments were planned before 1964 and were resource-oriented. In 1964, almost the entire investment in the Northwest region (in the states of Salta and Chaco) was in sugar refining. In 1965, the states of Tucumán and Jujuy (Northwest region) attracted most of the investment in sugar refining. In Patagonia, investment was in the cement industry (Neuquén) and in the development of nylon spinning (Chubut). In the province of Corrientes (Northeast region), investment was in order to develop cotton spinning, whose inputs come from this region. In 1966, almost 40 per cent of the investments benefiting from franchises were for television channels throughout the country. The only significant investment in the promoted regions was a packing plant for dry fruits in Rio Negro (Patagonia).

These results demonstrate that the aim of decentralizing the industrial activity was not achieved, and that investment tended to concentrate heavily in metropolitan Buenos Aires, Córdoba and Santa Fé, with a few exceptions for resource-oriented industries. What have been the difficulties in achieving the policy objectives pursued? Basically, the only instruments used to attain this goal were tax and import-duty exemptions. Evidently, they were not effective in stimulating investment in the promoted regions because there was an inadequate transportation system and energy supply, an insufficient labour supply both in quantity and quality, a lack of the proper commercial and banking services etc. The new industrial centres in Córdoba and Santa Fé attracted industrial investment not because of tax incentives but because of other features, such as an adequate transportation network, proximity to Buenos Aires,

Table 16

Patterns of investment under promotion legislation, 1959-1966
(Percentages)

Region	1959	1960	1961	1962	1963	1964	1965	1966
Promoted regions	4.7	0.3	0.4	3.1	-	21.4	35.9	1[illegible]
Patagonia	0.6	0.3	0.4	3.1	-	0.1	17.1	[illegible]
Northwest	4.0	-	-	-	-	20.3	10.5	[illegible]
Northeast	0.1	-	-	-	-	1.0	8.3	.7
Metropolitan Buenos Aires	58.6	13.3	40.7	23.8	50.6	65.0	34.8	56.4
Buenos Aires	8.2	77.8	22.3	30.9	19.4	9.7	24.1	25.4
Córdoba	13.4	3.4	3.3	8.9	28.6	0.3	0.6	0.5
Santa Fé	15.0	3.2	33.3	33.3	1.4	3.6	2.4	10.5
Other provinces	0.1	2.0	-	-	-	-	2.2	3.2

Sources: Dirección Nacional de Promoción Industrial, Secretaría de Industria y Minería, and Sector Balance de Pagos Interprovinciales, Consejo Federal de Inversiones.

excess capacity in the supply of electricity, an appropriate pool of skilled labourers, and technical schools. Tax and import-duty exemptions are only two of the elements that make up the total cost in any investment decision, and they might not be enough to offset the advantages that other regions offer in calculations of total cost. If one assumes that the location decision of the private investor is motivated by the desire to minimize the present value of total future cost (production as well as distribution), those regions that are adequately equipped in labour and social overhead capital will generally benefit more in comparison with those that lack these two advantages. For this reason, if the Government wants to promote the development of backward and frontier regions but is unwilling to subsidize production in these areas, either by direct subsidies or by strong fiscal incentives in order to offset advantages in labour and transport costs in other areas, investment will not be oriented to these retarded regions.

The small part that fiscal incentives play in the location decision of investment is confirmed by a survey in Córdoba among manufacturing firms - excluding construction firms - which employed more than 40 workers in late 1961. Its purpose was to determine what factors persuaded them to locate in the city of Córdoba in the period 1946-1963. The number of establishments included in the survey was 130, classified as follows:

Year of location	Number of establishments	Manufacturing sector	Number, by sector
1946-1948	13	Foodstuffs and beverages	22
		Clothing	5
1949-1951	16	Chemical products	5
		Leather products	4
1952-1954	17	Cement	18
		Metals	14
1955-1957	20	Vehicles and machinery	46
1958-1960	35	Electrical machinery and appliances	7
1961-1963	29	Others	9
	130		130

Firms were also classified according to whether their organizers or directors were actually within the state of Córdoba (using state capital) when the

decision was made about location or outside the state (using external capital). The distribution was as follows:

Manufacturing sector	State capital (per cent)	External capital (per cent)
Foodstuffs and beverages	16	18
Cement	10	21
Metals	11	7
Vehicles and machinery	34	36
Electric machinery and appliances	5	5
Others	24	13
	100	100
Number of establishments	91	39

The following reasons for location were given in the questionnaires:

(1) Manpower training, indicating the training level of the labour force, particularly with respect to skilled, technical and professional labour.

(2) Manpower availability, i.e. the supply of manpower in relation to the needs of each factory, in particular skilled, technical or professional manpower.

(3) Proximity to the market of processed products.

(4) Market location, taking into account not only market proximity but also Córdoba's geographic location and its access to other provinces.

(5) Proximity to raw materials, i.e. proximity to the main sources of raw materials used by the enterprise.

(6) The availability of energy, i.e. whether or not power availability was a determinant in location.

(7) Electric supply cost.

(8) Communications.

(9) Highways and means of transport.

(10) Proximity to railway station.

(11) Tax exemptions.

(12) Directors' residence - where directors, founders or main shareholders live. (This question was designed to establish if plant location was determined by the fact that the organizing members lived in the same place.)

(13) Residence (other activities). (The purpose of this question was to determine whether the organizers of the enterprise previously controlled or supervised other activities in place chosen for location.)

(14) Climate and health conditions of the location.

(15) Building already constructed. (If so, the savings could be more important than the other advantages in locating the plant in another area.)

(16) Cost of land.

Each enterprise selected approximately three of these sixteen motives for location, giving a total of 340 answers. The frequency distribution was as follows:

Motives for location	Frequency
(1) Manpower training	3
(2) Manpower availability	18
(3) Market proximity	40
(4) Market location	14
(5) Proximity to raw materials	[illegible]
(6) Availability of energy supply	44
(7) Energy cost	4
(8) Communications	4
(9) Highways and means of transport	[illegible]
(10) Proximity to railways	5
(11) Tax exemptions	16
(12) Directors' residence	75
(13) Residence (other activities)	[illegible]
(14) Climate and health conditions	3
(15) Building already constructed	20
(16) Land cost	18

This frequency distribution is limited as an indication of motives for location. For example, "residence of directors" was given as a frequent reason because twice the number of state firms were covered by the survey as firms coming from other geographic areas, and availability of electricity was second in the number of frequencies because many more metallurgical industries were included in the survey than any other type of industry.

Tax exemptions were given as the decisive reason only sixteen times.

Tax exemption	Domestic capital	External capital
Foodstuffs and beverages	1	
Paper and cardboard	1	
Mucho	1	1
Cement	1	
Metal	2	
Vehicles and machinery	3	6
	9	7

Excess electrical capacity, labour supply and an adequate transport system figured prominently as reasons. The five most important location motives for each manufacturing activity were:

Priority	Domestic firms	External firms
	Foodstuffs and beverages	
1	Residence of directors	Proximity to consumer market
2	Proximity to input suppliers	Availability of electric energy
3	Buildings constructed	Proximity to raw materials
4	Residence (other activities)	Highways and means of access
5	Market proximity	Land cost
	Chemicals	
1	Highways and means of access	Proximity to raw materials
2	Residence of directors	
3	Availability of electric energy	
4	Proximity to the market	
5	Manpower availability	
	Lime, cement etc.	
1	Residence of directors	Proximity to raw materials
2	Proximity to raw materials	Supply of electric energy
3	Availability of electric energy	Proximity to the market
4	Highways and means of access	Highways and means of access
5	Proximity to the market	
	Vehicles and machinery	
1	Residence of directors	Availability of electric energy
2	Residence (other activities)	Availability of manpower
3	Proximity to the market	Proximity to the market
4	Availability of electric energy	Land cost
5	Communications and means of access	Communications and means of access

Other policy measures used to encourage regional decentralization: the Consejo Federal de Inversiones (CFI) 66/

The CFI is an interprovincial agency created in November 1959. It is "a permanent institution for research, co-ordination and technical advice, whose purpose is to recommend the necessary measures for an adequate investment policy and a better utilization of economic resources in order to obtain a development

66/ We have outlined before the philosophy of this institution with respect to the Argentine regional development.

...ased on decentralization".[67] The annual budget of the CFI, which in the present amounts to around $3 million, is provided by each of the provinces, the municipality of the city of Buenos Aires, and the Territorio Nacional de la Tierra del Fuego.

The role of the CFI is to make studies and assemble data on the provinces, to provide technical assistance and to train personnel.

The CFI has undertaken the following research with regard to regional problems:

(a) A systematic computation of the provincial social accounts;

(b) A study of commodity flows among provinces;

(c) An analysis and evaluation of regional natural resources;

(d) A definition of economic regions;

(e) An economic and functional classification of provincial government expenditures and revenues; and

(f) A diagnosis of the economic situation of several provinces.

At present the CFI is organizing development plans for two regions: the Northwest and the Comahue regions. Both of these programmes have been analyzed above. Plans will be developed later for the regions of the Northeast, Patagonia and metropolitan Buenos Aires.

The CFI has provided technical assistance for the organization of provincial bureaux of statistics and for reorganizing more efficiently the administrative departments of provincial governments, particularly the internal revenue service. It has also collaborated in the preparation of provincial public health and education programmes, in programming the budget and in evaluating private investment projects.

Several training courses have been offered to public officials in the provinces of Mendoza, Bahía Blanca, Rosario, Resistencia, Tucumán, Córdoba and San Juan on theory and planning in economic development. These courses last three months and require the full-time attendance of the participants.

CONCLUSIONS

Economic policy decisions in Argentina have been oriented much more towards reaching national objectives than towards establishing a desired regional

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[67] Law establishing the Consejo Federal de Inversiones (CFI).

structure. Indeed, the regional distribution of economic activities has been the by-product of this orientation. As a result, metropolitan Buenos Aires generated 42.6 per cent of GNP (1959), and contained 34.6 per cent of the 1960 total population in 0.4 per cent of the geographic area of Argentina. Its population density per square kilometre was 1,854.6 in 1960, whereas the figure for the entire country was 7.2. The over-concentration of industries and population in metropolitan Buenos Aires, in the late 1950s, stimulated policy measures designed to decentralize economic activities. The regional goal was never explicitly stated, however, and only a broad, general definition was given to guide regional policy-makers. The Consejo Federal de Inversiones then recommended the creation of nuclei of growth. Since not all regions have the same capacity to grow, however, a conflict arises in some regions between regional equity and national efficiency. In such cases the community must delineate explicit regional goals so that appropriate policy instruments can be devised to attain them.

The federal Government, in pursuing a policy aimed at decentralization, relied almost exclusively on fiscal incentives to stimulate investment in lagging regions. Nevertheless, private investment was attracted by the growing and already developed regions of Buenos Aires, Córdoba and Santa Fé. With some exceptions the regions promoted absorbed less than 5 per cent of investments stimulated by fiscal incentives. This failure to achieve regional objectives results in part from a misleading definition of regional priorities in Argentina, as well as from the policy instruments used. The fiscal incentives were intended to work in two distinct types of regions: Patagonia and the Northwest. Patagonia, although it is richly endowed with natural resources, lacks an appropriate social infrastructure. The Northwest region is not as well endowed with resources as Patagonia and it also lacks social overhead facilities. Thus, both regions found competition difficult with the advanced regions, which were able to attract investment by providing external economies. Tax and import duty cost reductions were not enough to offset the cost reductions that an investment in metropolitan Buenos Aires gains from the external economies provided in this region. Fiscal and financial incentives might attract investments if proper overhead facilities exist. Otherwise, the industrialized centre will attract capital and labour. The build-up of social overhead facilities may not permit by itself, however, a more regionally balanced

distribution of economic activities.[68/] The favourable effects of interregional trade are felt in only a few regions. Buenos Aires, Córdoba and Santa Fé are linked more closely with the rest of the world than with the other regions in Argentina. Basic changes in the patterns of interregional supply must be effected in order to facilitate the production in lagging regions of commodities demanded in expanding regions.

Another policy, which has been neglected in Argentina and never stated in proper perspective, would be to encourage the migration of labour from poorly endowed regions to areas with abundant sources, to Patagonia, for example.

68/ The lack of success in the development of southern Italy, despite a policy giving heavy emphasis to overhead facilities in order to stimulate commodity production, has been because this "overhead approach" has ignored the structural changes needed in interregional trade. "The experience of southern Italy over the past decade shows that a change in the productive structure must be put on a par with an increase in total investment as an immediate objective of development policy. The development of overhead facilities is only one aspect of the total change that is needed." H. B. Chenery, op. cit., p.547.

Appendix 1

INDUSTRIAL PROMOTION LEGISLATION IN ARGENTINA

Laws of the central Government[1/]

The first successful industrial promotion law was put into effect in 1943. The basic legal framework for the promotion and encouragement of private industry by the Argentine Government was provided later by law 14781, which was enacted in December 1958. Other measures designed to stimulate foreign industrial investment in Argentina included legislation on foreign capital investmen (law 14780), special regulations for capital goods imports, and legislation for particular industries such as automobiles and tractors.

The industrial promotion law is applicable to foreign and national investment alike. Foreign investment legislation provides for equality of treatment with domestic investment, transference of profits abroad, repatriation of capit and so on. Specifically, among other things, preferential consideration for approval is given to projects that locate in the interior of the country, particularly in the areas stressed in the industrial promotion law.

There are two main features of the 1958 industrial promotion law. First, it specifies that industrial projects, if they are to qualify for special incen tives, must contribute to one or more of the following:

Equilibrium of Argentina's international balance of payments;

Development of the country's present and potential resources;

Decentralization of industry;

Advancement, expansion and diversification of industrial output;

Improvement of industrial technology;

Advancement of national defence, welfare and public safety.

Second, it authorizes specific kinds of actions, where applicable, to encourage industrial investment:

Duty-free import of machinery and equipment that cannot be produced locally;

Tariffs and other import charges on goods whose importation would impede the development of local production;

1/ This summary follows closely the interesting study of H. W. Laurant (1963) Factors Affecting Foreign Investment in Argentina, Stanford Research Institute, Menlo Park, California, pp.31-34.

Suspension or limitation of imports of finished products or raw materials already produced in the country;

Preferential exchange arrangements for export of industrial goods;

Preferential credit arrangements for desired industries;

Preferential supplies of raw materials, electric power, fuels and transport;

Preferential treatment in government purchasing;

Tax exemption and relief for specified periods.

When these projects are considered to be of "national interest", and are so officially decreed, the following exemptions to the income tax are granted:

Tax exemption for interest on bonds, debentures, stocks and for dividends on preferred stocks that are issued to finance investment;

Tax deductions on income taxes for the amount invested in stocks.

The industrial promotion law is primarily an enabling law requiring subsequent legislation to cover the specific steps taken by the Government to implement its objectives.

Five concrete measures have been adopted, establishing special concessions to investors in specific industrial sectors, and in certain geographical areas of the country whose development the Government seeks to foster. The following sectors were given special incentives:

Steelmaking. An Executive Decree of June 1961 defines as eligible companies that begin the production cycle with the processing of pig iron and steel, as well as those that are entirely integrated and begin with the smelting of iron ore. Benefits are greater for integrated companies than for semi-integrated ones. Qualifying companies receive exemption from duties and other charges on the import of machinery, spare parts, raw materials and products destined for steel mills. In addition, special tax benefits are provided: tax-deductible allowances are increased 100 per cent for integrated and 80 per cent for semi-integrated companies; private shareholders of qualifying companies receive special exemptions on dividend income taxes. Certain other tax privileges and provisions for accelerated amortization of assets are also provided, as are preferential treatment in financing, in the provision of supplies and services supplied by state enterprises, and in consideration for government guarantees of various types.

Petrochemicals. Decree 5.039-61 extends special benefits to companies establishing or expanding basic petrochemical plants producing hydrocarbons, sulphur or hydrogen, and to enterprises that may be integrated with such basic plants for the production of synthetic rubber, carbon black, fertilizers, pesticides and herbicides, phenol plastics and resins, polyethylene, polyvinyl chloride, polypropylene, and polystyrene. Tax-deductible allowances are established at 100 per cent on machinery and 20 per cent on buildings, i.e. double the percentages allowed by existing regulations. Accelerated amortization, various substantial tax benefits on loans (which in effect would lower the borrowing rate) and on reinvested profits, and customs duty and import surcharge exemption on

machinery and equipment are also allowed. Raw materials supplied by state enterprises will be sold to qualifying companies at reduced prices, although this particular concession will also be extended to petrochemical enterprises already established in Argentina.

Pulp and Paper. Decree 8.141-61 grants benefits to companies installing plants for the production of cellulose from short or long fibre, and to those installing integrated plants that also produce paper and cardboard. Existing companies that are already engaged in these activities and expanding their operations are also eligible, but only on investment after the date of the decree; companies that had initiated their applications for the installation of plants prior to the decree date (14 September 196 are specifically excluded. Special preference is to be given companies whose investment proposals include plans for reforestation. Benefits are similar in almost all respects to those of Decree 5.039-61 (petrochemical investments), with stress on import tax exemption, increased tax deductions and rapid write-off. Companies whose investments fall within the terms of this decree will be declared of national importance and will receive priority in the supply of raw materials, electric power, fuels and transport facilities from state enterprises.

There were also special regulations for promoting the development of three regions:

South Argentina (Patagonia). An executive decree of August 1961 accords special facilities to companies installing or expanding plants (a) locate in Patagonia (defined as all of continental Argentina south of the Rio Colorado and its tributary Rio Barrancas) and in Tierra del Fuego, and (b) engaging in the manufacture of chemicals, petrochemicals, aluminium or other metals (provided that this includes the processing of primary materials), woollen textiles, or in the processing and refrigeration of fish. To qualify for special benefits, the enterprise must utilize the area's electric power, labour or natural resources to a high degree in relation to the other inputs in its production process, must contribute to the achievement of import substitution or increased exports, and must be organized so as to permit co-ordination with plants making similar products in other areas of the country. Qualifying companies will recei either a ten-year exemption from, or the reduction of, import taxes and charges on machinery and equipment, income and excess profit taxes and several minor taxes. In calculating their prices for purposes of Argent sales taxes, these companies may deduct the cost of transporting their products to destinations outside Patagonia. Moreover, natural gas may be supplied by the state gas enterprise at specially reduced prices, in accordance with a schedule detailed in the decree: the lowest gas price apply to chemical and metal manufacturing plants utilizing gas or electricity as a main input into the production process; the next lowest prices apply to metal processing plants utilizing the area's raw materia and the least price reduction, to other qualifying types of activities.

Northwest Argentina. Decree 9.477-61 provides certain benefits to indus trial investments in the Northwest, defined as the provinces of Catamarc Jujuy, La Rioja, Salta, Santiago del Estero, Tucumán and the western par of Chaco and Formosa. To qualify, enterprises must engage in mineral extraction and processing (except of petroleum and gas and their derivatives); impregnation, hardening, and artificial drying of wood; production of pressed wood from wood or bagasse fibres; extraction of vegetabl taxes; processing of vegetables; packing houses; or the metallurgical

industry. Existing activities must at least be double that of current production capacity to qualify for benefits. Benefits include exemption from import duties and charges on machinery and equipment, up to 50 per cent income tax reduction, rapid write-off of assets, and other less important benefits.

The state of Corrientes (Northeast Argentina). Decree 11.324-61 provides incentives to the following departments in Corrientes: Ituzaingó, Santo Tomé, Esquina, Senco, and, later, Monte Caseros (Decree 2.323-62). The activities included in the two decrees were impregnation of woods, production of pressed wood, processing of vegetables and fruits (excluding alcoholic beverages), meat packing plants, metallurgical industry, textiles, food processing, mineral extraction and processing (excluding that of petroleum and gas and their derivatives), and leather and tobacco industries. Benefits include exemptions from import duties and charges on machinery and on taxes, bank credits, and priority is given to raw material, energy and transport supply.

In 1963, Executive Decree 5.338 grouped all of these regulations into a single legal text and introduced some minor changes while favouring the same industrial activities and regions. Decree 1.081 of November 1963 abrogated industrial promotion laws because the Government wanted to reduce the importation of capital goods and increase fiscal revenue. However, only four months later the Government re-instituted the industrial promotion legislation (Decree 3.113 of April 1964) but introduced some changes; in particular, it excluded metropolitan Buenos Aires from all the incentives provided by this legislation.

Decree 3.113, 1964

In order to qualify for the special benefits of this law, the enterprise must be a new or expanding one, and it must be technically efficient and economically profitable. The following industrial sectors are promoted if investments are located in any area of Argentina, except for metropolitan Buenos Aires:

(a) Steelmaking (for integrated and semi-integrated companies);

(b) Petrochemicals;

(c) Cellulose;

(d) Mining, excluding petroleum, gas, and other minerals;

(e) Forestry;

(f) Fishing;

(g) Construction, for standardized production of economic dwellings.

Three different geographical areas are promoted:

(a) Region A: Patagonia (south of Rio Colorado and Rio Barrancas);

(b) Region B: Northwest and Centre;

(c) Region C: Northeast.

To qualify for special benefits, the enterprise must industrialize the natural resources of the region and/or help to increase exports or substitute imports. In particular, the following activities are promoted:

(a) Impregnation, hardening, artificial drying and industrialization of wood, fibres and bagasse;

(b) Processing of natural fibres until complete, at least up to the process of spinning;

(c) Tanning;

(d) Food processing;

(e) Metallurgical industries;

(f) Chemical industries;

(g) Ceramics and glass.

In order to encourage investment, tax exemption and duty-free licences are allowed for the import of machinery and equipment that cannot be made locally. Tax exemptions, for a maximum of ten years, are granted either to the enterprise or to the investor but not to both simultaneously, modifying in this way previou legislation, which granted tax exemptions to both the enterprise and investor. The benefits granted to enterprises entail a yearly reduction of business income tax; substitute tax on corporate capital; excess profits tax (which goes from 100 per cent during the first four years to a minimum of 10 per cent in the tenth year); stamp tax; authorization for temporary residence in the country for foreign personnel required (and their families); and special prices for gas, electricity, fuel and transport.

If the enterprise chooses to benefit the investor, the firm will not be able to obtain tax exemptions on business income tax, on the substitute tax on corporate capital, on excess profits, or on stamp taxes, but the investor will receive a yearly tax exemption lower than that for the enterprise from the income tax on the amounts invested in the promoted enterprise. Tax reduction percentages granted to enterprises and to investors are given in tables 1 and 2 below.

Besides these general benefits there are others that pertain specifically to the sectors promoted. The tax reductions for enterprises locating in the areas promoted and in those areas that qualify for the benefits of this industrial promotion law will be 100 per cent for ten years.

Laws of provincial governments[2/]

All provinces, with the exception of Santa Cruz, have industrial promotion laws. These evidently affect the position of each province, since there have been no major changes in the relative position of each geographic area.

The legal system is not the same for all provinces and is not clearly defined. Some provinces indicate what industrial sectors are being promoted and assign priorities to these sectors (e.g. Neuquén, Santa Fé and San Juan). Other provinces simply state that only "those industries that use regional inputs" will be able to benefit from tax exemptions. Some laws indicate that benefits apply only to new industries, and others, that the industry should be the first of its kind in the region. All of these promotion laws grant tax exemptions (in some cases for all taxes, in others just for some provincial taxes), although percentages and the length of time for which the exemption is granted vary with each province.

In order to benefit from these franchises, some provinces require that certain industries use regional inputs while other industries are encouraged to use national inputs.

2/ For a detailed summary of these regulations, see F. Herrero (1965) Aspectos legales de la promoción industrial en la Argentina, 2nd ed., Editorial del Instituto, Buenos Aires.

Table 1

Percentage tax reduction granted to enterprises

	Year of operation of the plant									
	1	2	3	4	5	6	7	8	9	10
Steel mills										
Semi-integrated	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
Integrated	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00
Petrochemicals										
Type one[a/]	50.00	50.00	50.00	50.00	42.50	35.00	27.50	20.00	12.50	5.00
Type two[b/]	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00
Cellulose										
Short or long fibres	50.00	50.00	50.00	50.00	42.50	35.00	27.50	20.00	12.50	5.00
Paper and cardboard	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
Newsprint paper	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00
Mining	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00
Forestry and reforestry	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00
Fisheries and wildlife										
Extraction and industrialization	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00
Extraction or industrialization	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
Construction industry	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00
Patagonia, northwest and northeast regions	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00
When a promoted industry locates in a promoted region	100.00	100.00	100.00	100.00	85.00	70.00	55.00	40.00	25.00	10.00

Source: F. Herrero (1965) Aspectos legales de la promoción industrial en la Argentina, 2nd ed., Editorial del Instituto, Buenos Aires.

a/ Plants which produce from petroleum or natural gas, or their fractions or cuts, principally saturated and unsaturated hydrocarbons, naphtenic or aromatic, or sulphur or hydrogen.

b/ Plants which produce any of the following products: synthetic rubber, carbon black, fertilizers, pesticides, herbicides, plastics and phenolic resins, polyethylene, PVC, polypropylene, polyamides, polyesters, polyurethane and its monomers, or other similar products that may be developed in the future, provided they are integrated within one enterprise or keep a harmonious relation with the basic plants installed in the country.

Table 2

Percentage tax reduction granted to investors

	Year of operation of the plant									
	1	2	3	4	5	6	7	8	9	10
Steel mills										
Semi-integrated	50.00	50.00	50.00	50.00	42.50	35.00	27.50	20.00	12.50	5.00
Integrated	70.00	70.00	70.00	70.00	59.50	49.00	38.50	28.00	17.50	7.00
Petrochemicals										
Type one[a/]	30.00	30.00	30.00	30.00	25.50	21.00	16.50	12.00	7.50	3.00
Type two[b/]	70.00	70.00	70.00	70.00	59.50	49.00	38.50	28.00	17.50	7.00
Cellulose										
Short or long fibres	30.00	30.00	30.00	30.00	25.50	21.00	16.50	12.00	7.50	3.00
Paper and cardboard	50.00	50.00	50.00	50.00	42.50	35.00	27.50	20.00	12.50	5.00
Newsprint paper	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
Mining	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
Forestry and reforestry	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
Fisheries and wildlife										
Extraction and industrialization	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
Extraction or industrialization	50.00	50.00	50.00	50.00	42.50	35.00	27.50	20.00	12.50	5.00
Construction industry	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
Patagonia, northwest and northeast regions	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50
When a promoted industry locates in a promoted region	75.00	75.00	75.00	75.00	63.75	52.50	41.25	30.00	18.75	7.50

Source: F. Herrero (1965) Aspectos legales de la promoción industrial en la Argentina, 2nd ed., Editorial del Instituto, Buenos Aires.

a/ Plants which produce from petroleum or natural gas, or their fractions or cuts, principally saturated and unsaturated hydrocarbons, naphtenic or aromatic, or sulphur or hydrogen.

b/ Plants which produce any of the following products: synthetic rubber, carbon black, fertilizers, pesticides, herbicides, plastics and phenolic resins, polyethylene, PVC, polypropylene, polyamides, polyesters, polyurethane and its monomers, or other similar products that may be developed in the future, provided they are integrated within one enterprise or keep a harmonious relation with the basic plants installed in the country.

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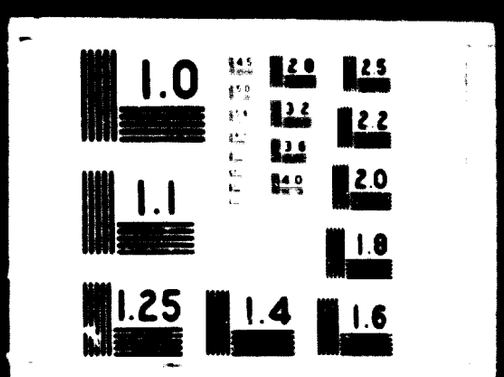

Appendix 2

Investments made under promotion legislation, by sector: 1958-1961
(thousands of dollars)

Area	Total	Agriculture	Mining	Construction	Foodstuffs and beverages	Textiles	Wood products, paper and cardboard	Chemical and petro-chemical	Metallurgical	Automotiles	Tractors	Railways	Machinery	Other	U.S.A.
1958															
Promoted regions:															
Patagonia															
Northeast		140						644							
Northwest			11				1,500			2,480					
Metropolitan															
Buenos Aires					30	104									
Buenos Aires		9		65	544	552	1,577	36,093	386	1,240	1,561	64	6,[illegible]	[illegible]	[illegible]
Córdoba								1,170	628	3,105			[illegible]	[illegible]	[illegible]
Santa Fé		4,668	1,382							11,327		1,500			1,[illegible]
Other								4,224	289	4,350					14,[illegible]
	TOTAL	4,817	1,393	14 99	576	656	4,077	42,281	1,301	30,102	1,561	1,564	6,710	[illegible]	33,[illegible]
1960															
Promoted regions:															
Patagonia					18[illegible]										
Northeast								134							
Northwest															41[illegible]
Metropolitan															-
Buenos Aires															-
Buenos Aires			620	46	26		21	3,343	369	3,948	301	893	1,04[illegible]	1,761	1,[illegible]
Córdoba			500		710			60,046	4,236	6,302			159	500	72,45[illegible]
Santa Fé									2,000	996			150		3,14[illegible]
Other											3,000				3,000
	TOTAL	-	1,120	522 568	1,331 2,248	-	21	63,523	6,605	11,246	3,301	893	1,452	2,261	1,45[illegible] 93,13[illegible]
1961															
Promoted regions:															
Patagonia															
Northeast						396									
Northwest															39[illegible]
Metropolitan															-
Buenos Aires			3,425		560			195	1,647	29,711	478		1,337	270	37,623
Buenos Aires					3,276			3,015	11,037			2,839	208	244	20,619
Córdoba								1,821		262		13	925		1,021
Santa Fé								24,378		3,638	750				[illegible]
Other															-
	TOTAL	-	3,425	-	3,836	396	-	31,409	12,684	33,611	1,228	2,852	2,470	514	92,425

Appendix 2 (cont'd)

Areas		Agriculture	Mining	Construction	Foodstuffs and beverages	Textiles	Wood products, paper and cardboard	Chemical and petro-chemical	Metallurgical	Automobiles	Tractors	Railways	Machinery	Others	TOTAL
	1962														
Promoted regions:															
Patagonia			925		158										1,083
Northeast															-
Northwest															-
Metropolitan															
Buenos Aires						275	300	928	986	1,941			1,265	2,517	8,212
Buenos Aires				1,400	950	500		2,625					5,200		10,675
Córdoba								1,821	1,265						3,086
Santa Fé				9,408				605			1,520				11,533
Other															-
	TOTAL	-	925	10,808	1,108	775	300	5,979	2,251	1,941	1,520	-	6,465	2,517	34,539
	1963														
Promoted regions:															
Patagonia															-
Northeast															-
Northwest															-
Metropolitan															
Buenos Aires								50	3,700	1,400			262	2,643	8,055
Buenos Aires		1,912			429	425								319	3,085
Córdoba									956	2,500		1,100			4,556
Santa Fé									214						214
Other															-
	TOTAL	1,912	-	-	429	425	-	50	4,870	3,900	-	1,100	262	2,962	15,911
	1964														
Promoted regions:															
Patagonia						16									16
Northeast					205										205
Northwest				33	4,086								145	1,417	4,119
Metropolitan															
Buenos Aires					191		1,646	2,904	4,500	2,416					11,219
Buenos Aires					33		345			1,600					1,978
Córdoba							50								50
Santa Fé													743		743
Other					4										4
	TOTAL	-	-	33	4,519	16	2,041	2,904	4,500	4,016	-	-	888	1,417	21,134

Appendix 2 (cont'd)

Areas		Agriculture	Mining	Construction	Foodstuffs and beverages	Textiles	Wood products, paper and cardboard	Chemical and petro-chemical	Metallurgical	Automobiles	Tractors	Railways	Machinery	Others	TOTAL
	1965														
Promoted regions:															
Patagonia			2,866			134		1,328							4,328
Northeast					218	1,411									2,129
Northwest					2,136			236					114		2,486
Metropolitan															
Buenos Aires					1,540	684	499	838	543	401			192	1,541	5,445
Buenos Aires				2,545	445		45	1,606	135	505			500	129	5,144
Córdoba										69				74	143
Santa Fé					393			180	45						618
Other					476								66		542
	TOTAL	-	2,866	2,545	6,008	2,143	547	4,188	1,023	1,679	-	-	872	1,744	25,615
	1966														
Promoted regions:															
Patagonia					936	60								256	1,252
Northeast														124	124
Northwest				54										354	408
Metropolitan															
Buenos Aires					462		145	3,048		172					
Buenos Aires				500	394	1,532	445	329					1,490	3,844	8,221
Córdoba						86								1,440	4,647
Santa Fé							740								86
Other			31		54									1,170	1,910
														518	603
	TOTAL	-	31	554	1,846	1,678	1,330	3,377	-	172	-	-	1,490	7,746	19,254

Sources: National Directorate for Industrial Promotion, Secretariat for Industry and Mining (Dirección Nacional de Promoción Industrial, Secretaría de Industria y Minería), and Inter-provincial Balance of Payments Section, Federal Council on Investments (Sector Balance de Pagos Interprovinciales, Consejo Federal de Inversiones).

3. INDUSTRIAL LOCATION POLICY IN MEXICO

by A. Lamadrid

GEOGRAPHIC DISTRIBUTION OF MANUFACTURING

Past and future development

The modern industrial era in Mexico began in 1880 with the building of railroads and the construction of plants for the large-scale production of industrial metals or metal concentrates. Industrial development gained considerable momentum during the Second World War when the volume of manufacturing output grew at an unprecedented rate.

The increase in the manufacturing output of Mexico was stimulated during the war years by increased domestic earnings and by the lack of foreign competition. Under these conditions the volume of industrial output showed an impressive annual increase of 9.4 per cent between 1939 and 1945, a record rate which exceeded the substantial rise of 8.1 per cent in real national income for the same period. The share of the processing industry in the gross national product thus rose from 16.3 per cent in 1939 to 18 per cent in 1945.[1/]

The post-war years were notable for the high level of industrial investment. As the result of massive sales of its manufactured goods abroad, Mexican industry emerged from the war with funds to finance its own expansion and proceeded to increase its capacity in line with an optimistic assessment of the prospective post-war market at home and abroad. The majority of industrial investment went into new small enterprises or towards backing and extending existing industries.[2/]

1/ The economic development of Mexico and its capacity to absorb foreign capital, Fondo de Cultura Económica, Mexico, 1953, p.224.

2/ Ibid., p.225.

Between 1945 and 1950 the volume of manufacturing output grew at an average annual rate of 6 per cent, compared to the 9.4 per cent achieved during the war years. Cessation of armed conflict resulted in a revival of foreign competition for the domestic market and loss of the foreign market for Mexican goods. The decrease in growth rate was affected also by a rise in domestic prices caused by high-deficit public expenditure. The salient features of this five-year period were the emergence of a tendency to establish large factories, particularly for capital goods, and the beginning of active government intervention in the form of industrial investment.3/

During the period 1951-1955, output in the manufacturing industry grew at about the same annual rate as national income, the former at 4.8 per cent, the latter at 4.6 per cent. As a result, industry's share in the national product remained constant over this period, approximately 18.4 per cent.4/

During the period 1956-1960, development in the industrial sector was consolidated and the average annual increase in industrial production (7.4 per cent) was higher than that of the national income (5.2 per cent). The contribution of industry to the gross national product was at times strikingly high, being more than 20 per cent in 1960.5/

It should be emphasized that during the period 1951-1960 the general picture was one of fundamental change in the structure of the conversion industries. The index for industries producing iron and steel, petroleum and its derivatives, and textiles showed a downward trend, while the industries producing foodstuffs, chemicals and chemical products, together with the engineering sector, contributed a greater share to the volume of industrial production.6/

3/ Ibid., p.225 and p.232.

4/ Economic Commission for Latin America (1957) El desequilibrio externo en el desarrollo económico latinamericano, el case de México [The foreign deficit in the economic development of Latin America; the Mexican situation], Vol.I, Mexico, p.60.

5/ H. V. Tercero (1966) Fomento Industrial en México [Industrial Promotion in Mexico], Centro de Estudios Económicos del Sector Privado A.C. [Centre for Economic Studies of the Private Sector], Mexico, p.22.

6/ G. Robles (1960) El desarrollo industrial; México - 50 años de Revolución; La Economía, Fondo de Cultura Económica, México, pp.202-203. (See also the table on page 201.)

Productivity of manufactured goods also underwent a change; whereas in [illegible] the value of goods produced per employee was [illegible],771 pesos, in 1964 it was [illegible],093 pesos (at 1950 prices) showing an annual growth rate of [illegible].4 per cent.[7]

Public and private investment in industry in the total gross investment of the country has played a larger part over recent years. In 1950 the percentage was 31.3 per cent; by 1964 it had increased to 41.9 per cent.

During the period 1939-1960, the volume of production in the conversion industries grew at an annual rate of 7.1 per cent, a considerable achievement when compared to that of countries with similar economies, as well as to that of the developed countries. It is far in excess of the annual rate of economic development in Mexico for the same period (6 per cent). Industrialization has been the main force for progress in Mexico, as the manufacturing industries have grown more vigorously than the other sectors of the economy. To be exact, the manufacturing industries, including petroleum and electrical energy, contributed 29.6 per cent of the gross domestic product in 1965, more than any other sector of the economy.[8] This rapid industrial growth was basically made possible by the active participation of private investors although the Government also contributed, mainly through substantial investments in fields of particular importance to the country, such as petroleum, fertilizers, iron and steel, chemical and pharmaceutical products, power generation and transmission, railways, airlines, and the manufacture of motor vehicles and railway carriages.

Mexican industry geared its development to the production of goods to satisfy domestic needs by import substitution. This substitution was relatively easy so long as it involved consumer and capital goods which could depend on a growing and stable home market, rigorously protected against imports. Now, however, Mexico has greatly increased its capacity to replace intermediary or consumer and capital goods which are not only of complex fabrication, but call for a much larger market than that offered at home.[9] The process of import substitution is posing increasing problems for rapid

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[7] El desarrollo Industrial de México [Industrial Development in Mexico], Centro Nacional de Productividad, a paper prepared for the Latin American Symposium on Industrialization, Santiago de Chile, March 1966, p.3 and p.6.

[8] Bank of Mexico S.A. (1966) Annual Report for 1965, Mexico, p.15.

[9] Economic Commission for Latin America (1963) Hacia una dinámica del desarrollo latinoamericano [Towards a dynamics of Latin American development], Mexico, p.9.

industrial expansion. The difficulties result basically from the fact that the market is small, and can expand only if there is a rapid growth in the production machinery generating employment opportunities, earnings and effective demand.

The low demand on the home market derives from the fact that more than half of the population of Mexico lives in rural areas from which uneven productivity brings limited returns, reflected in low incomes and a standard of living practically at subsistence level. Apart from the acute social implications of this situation, economically speaking it makes for very low purchasing power and, consequently, a limited demand for industrial goods. This factor, coupled with others such as acutely disproportionate income distribution, unemployment and under-employment, is the main reason that the domestic market, although constantly expanding, is still very small. The market thus hampers the industrialization process and constitutes a restrictive factor which, in turn, obstructs solution of the agrarian problem, since there is nothing to generate remunerative employment to absorb the excessive rural labour force.10/

Within this general framework of past achievements and future problems in Mexico's industrialization, one crucial factor impedes progress towards new stages of development: the inadequate location of Mexican industry which, as indicated below, is aggravating the imbalance between regions of the country. If this trend persists at its present rate it will result in low utilization of national productive resources, thereby worsening the inequitable distribution of income to the detriment of expansion of the home market; it will also delay solution of the basic problem of Mexico, namely the agricultural problem

Present location of industry

The industrialization process in Mexico has by no means been co-ordinated throughout the various regions of the country. The inward growth of the Mexican economy has favoured industrial centralization since, in the establishment of industries, the essential location factor has for the most part

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10/ D. M. Ayala (1966) La exportación factor de desarrollo [Export as a factor in development], Escuela Nacional de Economía, Universidad Nacional Autonóma de México (doctoral dissertation), Mexico, pp.10-11.

been the market. The only industries located close to the source of raw materials are those which process primary commodities, since the economic weight of such undertakings has not made it possible to locate them otherwise.

Other industrial location factors such as communications and transport, manpower, electricity, fuel and water, which predominate either singly or in combination according to types of industries, have played a secondary role as determining factors in the siting of Mexican industries.[11/] In fact, to date, owing to government policy regarding industry and public investment, this combination of factors has favoured certain regions, thereby aggravating the present inadequate distribution of manufacturing activities.

Since industry is oriented towards the home market, the bulk of the processing industries concentrate on articles for end consumption. It is thus not surprising that the majority of these establishments are found in the central region, where most of the country's population is concentrated - primarily in the metropolitan area of Mexico City and, to a secondary extent, in the border states of the north, where in recent years the growth rate has been the highest in the country. The following table shows the share of each of these regions in 1960.

Table 1

Share by region in total area and population of Mexico, 1960

	Area ($1,000 km^2$)	Total population (millions)	Urban population[a/] (millions)
Central region	353	20,559	7,728
Northern region	798	5,734	3,063
Other regions	816	9,710	1,605
Total	1,967	36,003	12,396

a/ Population in concentrations of more than 10,000 inhabitants.

The central region of Mexico is the most densely populated and consists of the states of Jalisco, Colima, Aguascalientes, Guanajuato, Querétaro,

11/ E. L. Malo (1963) Localización de la industria en México [Location of industry in Mexico] Mexico, pp.175-176.

Hidalgo, Michoacán, Puebla, Morelos, Puebla, Veracruz, Mexico and the Federal District. In 1960 this region accounted for 47.1 per cent of the total national population and 69.5 per cent of the value of industrial output. In this portion of the country, urban development has been more intensive over recent years than in the rest of the country, and now accommodates 67.3 per cent of the total urban population.

The northern region, comprising the states of Tamaulipas, Nuevo León, Coahuila, Chihuahua, Sonora and Baja California, accounted during the same year for 23.3 per cent of the national manufacturing output and for 7.4 per cent of the total population. In other words, in 1960, 92.8 per cent of industrial activity was concentrated in nineteen of the thirty-two federal states forming the Republic, in which 73 per cent of the population of Mexico were resident.

The extent of industrial centralization is even more evident if one considers that three of these states alone (the Federal District, Mexico and Nuevo León) account for 58.9 per cent of the total value of manufacturing output.

Notwithstanding the large part played by the northern region in national industrial production, the volume of industrial production is three times greater in the central region and a single state, the Federal District, accounts for one and a half times the value of the manufacturing output of the northern region.

Industrial activity scattered throughout the rest of the country is characterized by small enterprises emerging from a cottage industry level and orienting their production towards supplying local markets with products that do not call for advanced manufacturing techniques. These territorial units, which cover 41.4 per cent of the area of the country and contain 27 per cent of its total population, are the site of 7.2 per cent of the manufacturing industry. Consequently, in approximately one half of the country industrial development has not yet begun.

Within the northern and central regions three areas have the greatest concentration of industrial production: the state of Nuevo León in the northern region, Veracruz in the central region, and the area comprising the state of Mexico and the Federal District. In 1960, 65.7 per cent of the total value of national manufacturing output was concentrated in these three geographical areas.

The present pattern of industrial centralization in the country can be traced to historical, political, administrative and economic factors which date from colonial times. The situation was aggravated in subsequent decades by the railway policy of Porfirio Díaz and by the policies pursued with respect to roads and railway and electricity charges by the revolutionary governments.[12]

The territorial units best served by railways are in the central region and in the north, where the main railway junctions are located. The structure of the railway network has influenced, and in many cases determined, the growth of industrial centres and, consequently, the location of manufacturing enterprises. In many parts of the country it is either impossible or very difficult to set up modern industries, owing partly to the scarcity or absence of railway communications, often combined with the dearth, backwardness or non-existence of other economic factors.

Furthermore, railway freight charges are so arranged as to encourage industry to move towards the central region, and in particular to the Federal District. Thus, in most categories, charges for the transport of raw materials, and particularly minerals, are low whereas those for finished products are high. As a result, the industrialist seeks to reduce the transport of finished products to a minimum, locating his plant close to the market, regardless of how far away the raw materials may be.[13] Lastly, electricity charges have also tended to favour the central region, where the average price of power per kilowatt hour is generally equal to or less than that in the other regions of the country. An even more important factor in industrial location than variations in electricity charges has been the existence of a good power service, since power is scarce in Mexico and vital to industrial production.

12/ The intensively centralist nature of the colonial government gave particular priority to the Valle de México. During the Díaz era, the expansion of mining activities and the railway boom, oriented the country towards the north and set the pattern of communications. Railways were built linking the capital to the mining areas and extending to the border with the United States, to which minerals were exported. The network of roads built in more recent times followed the geographic coverage of the railway network. P. L. Yates (1961) El desarrollo regional de México [Regional development in Mexico], Bank of Mexico S.A., Mexico, pp.34-35.

13/ Ibid., p.171.

The central region has therefore always had a large concentration of electrical industries and has received a considerable share of all new installations built during recent years.[14/]

In 1930 the central region accounted for 63.1 per cent of the total value of the small industrial output of the country and the northern region for 22.1 per cent. Twenty years later, accumulation in the central region had decreased in relative terms to 60 per cent and increased in the northern region to 27.7 per cent; however the central region retained its position as the most important centre of industry in Mexico. From 1930 to 1950, the states leading in manufacturing output were Chihuahua, Baja California and Nuevo León in the northern region; and Mexico, Veracruz and the Federal District in the central region (see tables 3 and 4). In 1930 first place was taken by the Federal District, followed by Veracruz, Nuevo León, Puebla, Coahuila and Guanajuato. In 1950 the first three states remained ahead, but were followed by Chihuahua, Coahuila and Mexico. By 1960 the most industrialized areas in order of importance were the Federal District, Mexico, Nuevo León, Veracruz, Coahuila and Jalisco. Of these six states, four are in the central region and two are in the north.

The table below shows the changes that took place in the ten most industrialized states over 30 years.

Table 2

Share of ten federal states in the industrial production of Mexico
(Percentages)

	1930	1940	1960
Federal District	27.7	28.6	39.7
México	3.5	4.8	10.1
Nuevo León	7.7	6.5	9.2
Veracruz	10.0	12.7	6.8
Coahuila	5.6	5.3	4.3
Jalisco	3.7	3.9	4.3
Chihuahua	1.9	6.2	3.4
Tamaulipas	2.6	4.0	3.0
Guanajuato	4.3	2.0	2.6
Puebla	6.9	3.5	2.3

14/ G. R. Kolbeck and V. L. Urquidi (1952) La exención fiscal en el Distrito Federal como instrumento de atracción de industrias [Fiscal exemption in the Federal District as a means of attracting industry], Mexico.

Table 3

Participation of federal states in industrial production

	Population in 1960	1930	1940	1950	1960
Aguascalientes	255,700	0.45	1.28	0.24	0.24
Baja California, Northern territory	535,700	2.47	1.63	3.19	1.65
Baja California, Southern territory	82,400	0.30	0.15	0.23	0.19
Campeche	176,500	0.18	0.22	0.30	0.23
Coahuila	951,700	5.58	12.27	5.32	4.33
Colima	169,900	0.18	0.45	0.14	0.16
Chiapas	1,218,700	1.22	0.85	0.31	0.27
Chihuahua	1,245,700	1.94	7.30	6.20	3.38
Federal District	5,010,900	27.74	31.52	28.55	39.65
Durango	787,200	2.78	3.82	2.24	0.90
Guanajuato	1,786,800	4.28	2.27	2.02	2.57
Guerrero	1,241,700	0.34	0.15	0.69	0.31
Hidalgo	1,030,100	2.00	3.32	1.20	1.25
Jalisco	2,512,400	3.75	2.92	3.86	4.31
México	1,937,400	3.50	2.53	4.75	10.05
Michoacán	1,938,900	2.21	1.44	1.43	0.91
Morelos	402,900	0.34	0.46	0.71	0.62
Nayarit	410,600	0.56	0.43	0.24	0.22
Nuevo León	1,118,700	7.75	4.67	6.52	9.17
Oaxaca	1,763,900	0.98	0.47	0.76	0.47
Puebla	2,021,800	6.96	0.56	3.50	2.32
Querétaro	370,600	0.80	4.52	0.44	0.42
Quintana Roo	50,400	0.02	0.01	0.13	0.02
San Luis Potosí	1,098,460	2.02	0.83	2.77	1.17
Sinaloa	866,900	2.49	0.98	1.79	1.68
Sonora	822,400	1.86	2.36	2.41	1.76
Tabasco	508,400	0.27	0.13	0.18	0.09
Tamaulipas	1,080,000	2.55	0.78	4.04	3.04
Tlaxcala	360,200	0.91	0.45	0.46	0.26
Veracruz	2,761,300	10.02	8.22	12.67	6.80
Yucatán	646,300	2.99	1.13	1.73	1.09
Zacatecas	858,500	0.58	1.88	0.98	0.47
Total	36,003,000	100.00	100.00	100.00	100.00

Table 4

Participation of regions in industrial production
(Percentages)

	1930	1950	1960
Northern region	22.1	27.7	23.3
Baja California	2.5	3.2	1.6
Sonora	1.9	2.4	1.8
Chihuahua	1.9	6.2	3.4
Coahuila	5.6	5.3	4.3
Nuevo León	7.7	6.5	9.2
Tamaulipas	2.5	4.1	3.0
Central region	63.1	60.0	69.5
Veracruz	10.0	12.7	6.8
Puebla	6.9	3.5	2.3
Tlaxcala	0.9	0.5	0.2
Morelos	0.3	0.7	0.6
Federal District	27.7	28.6	39.6
Mexico	3.5	4.8	10.1
Hidalgo	2.0	1.2	1.3
Michoacán	2.2	1.4	0.9
Querétaro	0.8	0.4	0.4
Guanajuato	4.3	2.0	2.6
Colima	0.2	0.1	0.2
Jalisco	3.8	3.9	4.3
Aguascalientes	0.5	0.2	0.2
Other regions	14.7	12.3	7.2

Source: Industrial censuses of Mexico, General Directorate of Statistics, Ministry of Industry and Commerce, Mexico.

The central market has always been the largest in the country and has undergone a process of continuous expansion, so that its capacity to absorb manufactured goods has also grown at a high rate. This increase has been achieved as a result of three factors: an increase in population from 9.5 million in 1930 to 20.5 million in 1965; an increase in generated incomes; and an increase in the share of such income spent on products of the manufacturing industry.[15] The attractive force of this combination of factors

15/ Ibid., pp.37-38.

has been a prime consideration in the location of industry in the central region and particularly in the metropolitan area of Mexico City.[16/]

Degree of industrial concentration

To assess the extent and major characteristics of industrial concentration in the various regions of the country, an analysis was made of the industrial branches located in the hundred largest industrial centres; the resulting statistical data was arranged by states and regions.[17/]

In 1960 these manufacturing centres accounted for 86.4 per cent of the value of national industrial production and for 71.6 per cent of the total number of workers engaged in industrial activities. These statistics afford a fairly detailed picture of the degree of concentration of the various branches of industry.

Table 5 lists these hundred centres according to the value of their industrial output and table 6 indicates the industrial structure of the thirty main manufacturing centres.

The conclusion to be drawn from this investigation is that concentration in the central region is by no means general for all industries. In some, the proportion is high, such as electricity production with 87.6 per cent of the national output localized in the central region. Other sectors, arranged in order of concentration, are: transport equipment (85.9 per cent); cement and other building materials (83.2 per cent); chemicals and chemical products (83 per cent); metal products, electrical goods, machinery and equipment, (82.9 per cent); coal, petroleum and its derivatives (78.5 per cent); paper and pulp products (74.7 per cent); textiles, footwear and other articles of clothing (74.1 per cent).

16/ The metropolitan area of Mexico City proper has grown from 1.6 million inhabitants in 1940 to 6.4 million in 1965, an expansion unequalled by any other area in the Republic, including the northern and central regions. The Water Board, Hydrological Commission of the Valle de México Basin (July 1964) El desarrollo económico del Valle de México y la Zona Metropolitana Ciudad de México [Economic development of Valle de México and the Metropolitan Zone of Mexico City], Mexico, p.II-25 and p.III-15.

17/ This assessment was necessary because the industrial census of 1960 did not concentrate the value of production of the various industrial groups at the state level. Information on the existing branches in each industrial centre was compiled from data supplied by the National Commission on Minimum Wages, based on confidential information obtained from the General Statistics Bureau, in accordance with census results.

Table 5

The hundred most important industrial centres in Mexico in 1960

Order of importance	Municipality	Federal state	Population (thousands)	Total value of industrial production (thousand pesos)	Number employed	Value of production in basic industries (thousand pesos)	Value of production in processing industries (thousand pesos)
1	Mexico City[a/]	Federal District	5,147	30,875,139	490,387	8,181,573	22,693,566
2	Monterrey[b/]	Nuevo León	708	5,758,017	67,737	2,133,020	3,624,997
3	Guadalajara	Jalisco	740	1,596,973	26,986	138,243	1,458,730
4	Minatitlán	Veracruz	68	1,196,248	3,172	1,193,771	2,477
5	Chihuahua	Chihuahua	186	1,024,551	9,231	759,082	265,469
6	Puebla	Puebla	297	937,098	23,940	38,137	898,961
7	Salamanca	Guanajuato	67	858,844	2,829	800,759	58,085
8	Monclova	Coahuila	45	857,780	6,911	791,871	65,909
9	Toluca	México	156	612,213	6,827	53,385	558,848
10	Cd. Madero	Tamaulipas	53	610,769	6,813	606,099	4,670
11	Mérida	Yucatán	190	559,896	10,659	19,803	540,093
12	Mexicali	Baja California (Northern)	281	546,628	6,596	128,639	417,989
13	Orizaba	Veracruz	69	523,924	7,796	3,931	519,993
14	San Luis Potosí	San Luis Potosí	193	459,670	6,996	277,007	182,663
15	Torreón	Coahuila	203	459,074	5,899	145,849	313,225
16	Veracruz	Veracruz	153	436,794	4,723	294,156	142,638
17	Saltillo	Coahuila	127	390,346	7,519	35,586	354,760
18	Cajeme	Sonora	124	361,300	2,855	163	361,137
19	Matamoros	Tamaulipas	143	329,249	3,197	16,936	312,313
20	Culiacán	Sinaloa	208	320,929	6,260	15,854	305,075
21	Reynosa	Tamaulipas	134	298,247	1,886	157,701	140,546
22	León	Guanajuato	260	276,642	9,108	38,371	238,271
23	Querétaro	Querétaro	103	255,599	2,547	2,221	253,378
24	Gómez Palacio	Durango	103	237,175	3,217	15,240	221,935
25	Cananea	Sonora	21	216,540	1,688	211,724	4,816
26	Irapuato	Guanajuato	127	195,608	3,272	6,155	189,453

27	Tampico	Tamaulipas	125	185 081	3,904	28,286	156,795
28	Córdoba	Veracruz	62	179,326	2,808	8,056	171,270
29	Cd. Juárez	Chihuahua	277	178,353	2,559	23,390	154,963
30	Jalapa	Veracruz	78	178,132	3,821	53,474	124,658
31	Hermosillo	Sonora	118	176,732	3,238	28,670	148,062
32	Mazatlán	Sinaloa	113	176,713	3,003	32,736	143,977
33	Poza Rica	Veracruz	72	176,609	1,358	155,583	21,026
34	Tequila	Jalisco	15	174,269	811	168	174,101
35	Durango	Durango	143	169,631	3,765	37,336	132,295
36	Ahome	Sinaloa	90	165,017	2,208	195	164,822
37	Zacapu	Michoacán	39	164,649	1,482		164,649
38	Cuernavaca	Morelos	86	162,817	3,710	4,487	158,330
39	Tula	Hidalgo	29	158,938	1,327	158,326	612
40	Tijuana	Baja California (Northern)	156	153,121	2,385	9,193	143,928
41	Pachuca	Hidalgo	72	148,016	5,272	87,340	60,676
42	Lagos de Moreno	Jalisco	52	145,954	553	166	145,788
43	Atlixo	Puebla	58	144,027	6,258	845	143,182
44	Aguascalientes	Aguascalientes	154	142,950	3,792	7,525	135,425
45	Parras	Coahuila	33	141,835	2,094	8	141,827
46	Ocotlán	Jalisco	32	133,426	419	419	133,007
47	El Mante	Tamaulipas	50	121,691	1,950	4,880	116,811
48	Tecate	Baja California (Northern)	8	120,964	283	2,406	118,558
49	Tepic	Nayarit	74	114,742	1,853	795	113,947
50	Ensenada	Baja California (Northern)	65	113,010	1,832	9,396	103,614
51	Tepeapulco	Hidalgo	14	111,972	3,063	38,054	73,918
52	Navojoa	Sonora	54	104,881	823	205	104,676
53	Morelia	Michoacán	153	103,683	2,249	10,366	93,317
54	H. del Parral	Chihuahua	45	103,600	1,183	58,489	45,111
55	Zacatepec	Morelos	16	95,672	2,417	432	95,240
56	Celaya	Guanajuato	99	88,605	1,897	1,705	88,900
57	Nuevo Laredo	Tamaulipas	96	85,792	1,284	296	85,496
58	Sabinas	Coahuila	37	79,778	1,238	39,872	39,906
59	Cd. Victoria	Tamaulipas	60	79,063	2,994	43,161	35,902
60	Tlaquepaque	Jalisco	56	78,237	1,376	58,456	19,691
61	Acapulco	Guerrero	85	74,566	1,621	27,639	46,927
62	Cd. del Carmen	Campeche	41	72,678	1,467	84	72,594
63	Delicias	Chihuahua	52	70,682	1,195	269	70,413

Table 5 (cont'd)

Order of importance	Municipality	Federal state	Population (thousands)	Total value of industrial production (thousand pesos)	Number employed	Value of production in basic industries (thousand pesos)	Value of production in processing industries (thousand pesos)
64	Zapopan	Jalisco	[illegible]	64,416	1,356	560	63,856
65	Tulancingo	Hidalgo	[illegible]	57,783	1,252	1,142	56,641
66	Tuxtepec	Oaxaca	[illegible]	54,596	412	65	54,531
67	Tezuitlán	Puebla	[illegible]	49,871	790	43,625	6,246
68	F.I.M. Madero	Coahuila	[illegible]	44,700	870		49,700
69	Tehuacán	Puebla	45	48,461	1,[illegible]	2,700	45,761
70	Oaxaca	Oaxaca	79	45,906	1,164	5,602	40,306
71	Colima	Colima	54	39,483	1,925	2,768	36,815
72	Piedras Negras	Coahuila	46	39,229	1,343	23,622	15,607
73	San Pedro	Coahuila	70	38,343	356	318	38,025
74	Chiautempan	Tlaxcala	25	38,168	1,142	62	38,106
75	Guanajuato	Guanajuato	55	36,765	884	34,171	2,094
76	Camargo	Chihuahua	29	36,231	896	22,802	13,429
77	Guaymas	Sonora	54	35,890	996	17,399	18,491
78	Tapachula	Chiapas	85	34,125	1,045	315	33,810
79	La Paz	Baja California (Southern)	29	33,987	849	17,564	16,423
80	Salina Cruz	Oaxaca	16	32,063	455		32,063
81	Tizimín	Yucatán	27	30,562	597	81	30,481
82	Campeche	Campeche	54	28,318	725	7,424	20,894
83	Coatzacoalcos	Veracruz	54	28,299	1,206	9,283	19,016
84	Cd. Valles	San Luis Potosí	44	27,840	1,127	6,891	20,949
85	Izucar de Matamoros	Puebla	35	26,055	249	1,202	24,853
86	Centro	Tabasco	104	22,919	701	3,418	19,501
87	Tuxpan	Veracruz	50	21,013	357	282	20,731
88	Apatzingán	Michoacán	31	20,823	1,707	46	20,777
89	Loma Bonita	Oaxaca	15	20,614	260		20,614
90	Silao	Guarajuato	54	20,075	270	18	20,057
91	Tuxtla Gutiérrez	Chiapas	45	19,304	698	566	18,738
92	Nogales	Sonora	40	17,926	378	5,805	12,121
93	Chilpancingo	Guerrero	36	17,448	1,024	8,161	9,287
94	Lerdo	Durango	39	14,933	294	25	14,908

95	Angangueo	Michoacán	8	14,611	809	14,595	16
96	Tecomán	Colima	24	12,961	111	56	12,905
97	Zamora	Michoacán	54	12,451	462	130	12,321
98	San Juan del Río	Querétaro	39	9,360	257		9,360
99	Sn. Luis Río Colorado	Sonora	42	6,188	280		6,188
100	Manzanillo	Colima	40	6,065	223	1,158	4,907
		Total:	14,326	56,182,749	840,735	17,229,340	38,952,939

a/ Metropolitan area with the following municipalities in the state of Mexico: Naucalpan, Tlalnepantla, Zaragoza, Cuautitlán, Tultitlán, Ecatepec and administrative subdivisions of the Federal District.

b/ Metropolitan area with the following municipalities in the state of Nuevo León: San Nicolás de las Garzas, Santa Catarina, Guadalupe and Garza García.

Table 6

Structure of the thirty main manufacturing centres in Mexico by branch of manufacturing in 1960
(Percentages)

	Municipality	Federal state	BASIC INDUSTRIES						OTHER MANUFACTURING INDUSTRIES							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Mexico City (metropolitan area)	Federal District	4.15	3.88	0.07	10.81	2.11	5.48	15.50	9.74	3.53	13.61	11.28	6.57	0.01	13.26
2	Monterrey (metropolitan area)	Nuevo León	0.90	15.93	0.48	6.45	11.93	1.35	25.88	4.08	5.50	6.41	11.02	2.25		7.82
3	Guadalajara	Jalisco	0.05	0.39	0.04	3.32		4.85	42.92	14.83	3.53	9.90	7.08	0.45	0.18	12.46
4	Minatitlán	Veracruz	94.02		5.39			0.38	0.01							0.19
5	Chihuahua	Chihuahua		5.33		12.98	55.78		15.43	1.23	0.30	0.50	0.92		5.45	2.08
6	Puebla	Puebla	0.12	0.14		3.61	0.20		20.21	63.85	0.77	1.76	4.06	0.13	0.07	5.08
7	Salamanca	Guanajuato	93.24						2.75	0.05		3.64	0.18			0.14
8	Monclova	Coahuila	3.31	87.44	0.62	0.04	0.14	0.77	0.09	0.03		6.54	0.35			0.67
9	Toluca	México				8.72			35.37	11.17		30.06	10.89	0.26		3.53
10	Cd. Madero	Tamaulipas	99.21			0.03			0.61	0.05			0.01			0.09
11	Mérida	Yucatán		0.30		3.23			25.76	65.50	0.06	1.53	0.38			3.24
12	Mexicali	Baja California (Northern)				10.90		12.64	53.75	5.29	0.25		0.21	8.86		8.10
13	Orizaba	Veracruz				0.06		0.69	83.16	9.76	3.75	0.17	0.06	0.02		2.33
14	San Luis Potosí	San Luis Potosí	0.25	1.05	9.95	4.33	44.68		21.11		0.23	4.56	1.60	7.01		5.23
15	Torreón	Coahuila		0.66	0.60	0.31	30.20		42.21	6.20		10.54	1.85	0.10		7.33
16	Veracruz	Veracruz		65.99		1.35			23.83	0.14	0.19	0.26	3.45	0.01		4.78
17	Santillo	Coahuila		3.94		4.41	0.77		19.94	11.84	0.06	0.22	25.66	30.31		2.85
18	Cajeme (Cd. Obregón)	Sonora				0.05			21.42	52.40		20.95	0.75	0.04		4.39
19	Matamoros	Tamaulipas				0.99		4.16	10.75	61.83		19.56	0.47			2.24
20	Culiacán	Sinaloa				0.51	1.37	3.06	71.33	5.54		8.59	0.49	0.08		9.03
21	Reynosa	Tamaulipas	49.24			0.46		3.18	1.04	21.30	8.15	14.88	0.10			1.65
22	León	Guanajuato				13.66	0.21		25.13	42.69	2.23	1.75	0.97	0.01		13.35
23	Querétaro	Querétaro	0.06		0.02	0.79			42.11	14.09	0.03	0.16	12.02	0.01		30.71
24	Gómez Palacio	Durango		0.09		0.59	5.75		24.44	6.74		60.02	0.13			2.24
25	Cananea	Sonora					93.54	4.24	0.41	0.36			1.02			0.43

26	Irapuato	Guanajuato		0.13	3.02	78.01	5.04	0.37	4.66	4.00	0.64		4.13
27	Tampico	Tamaulipas		13.20	2.10	51.20	1.50		10.80	5.30	1.10		14.80
28	Córdoba	Veracruz	0.15	3.96	0.38	81.08	0.90		6.49	1.87	0.33	0.33	4.81
29	Cd. Juarez	Chihuahua		11.60	1.50	60.90	11.20		3.80	1.10		1.00	8.90
30	Jalapa	Veracruz			30.00	40.00	24.50		0.80	0.90			3.80

Source: 1960 Industrial Census, General Directorate of Statistics, Ministry of Industry and Commerce, Mexico.

Note: The figures 1 to 14 of the column headings indicate the following branches of industry: (1) Coal, petroleum and its derivatives; (2) Iron and steel; (3) Non-metallic minerals; (4) Cement and other building materials; (5) Non-ferrous metals; (6) Generation of electric energy; (7) Food products, beverages and similar products; (8) Textiles, footwear and other garments (including hard-fibre textiles); (9) Paper, cellulose and paper products; (10) Chemicals and chemical products; (11) Metal products, electrical goods, machinery and equipment; (12) Transport equipment; (13) Sawmills and (14) Other.

Table 7

Value of industrial production of regions by branch of manufacturing in 1960
(Percentages)

	BASIC INDUSTRIES						OTHER MANUFACTURING INDUSTRIES								Percentage of total value of industrial production
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Northern region	21.5	52.3	28.4	14.6	62.5	10.3	26.6	18.2	21.8	13.2	16.7	12.2	40.7	13.4	25.2
Baja California				1.3		4.2	4.9	0.5	0.1			2.0	1.3	1.5	1.1
Sonora	0.3		2.0	0.6	7.7	0.7	1.6	4.8		1.7	0.2			0.9	1.5
Chihuahua		2.9		3.0	23.5		2.5	0.7	0.2	1.0	0.3		39.4	0.9	5.3
Coahuila	1.7	22.5	11.6	0.4	5.4	0.5	3.2	3.4		2.0	2.4	4.8		1.1	4.2
Nuevo León	1.2	26.9	14.7	8.1	25.9	3.7	11.9	3.8	20.0	6.2	13.5	5.3		8.0	10.7
Tamaulipas	18.3		0.1	1.2		1.2	2.5	5.0	1.5	2.3	0.3	0.1		1.0	2.4
Central regions	78.5	46.4	46.1	83.2	29.0	87.6	64.5	74.1	74.7	83.0	82.9	85.9	3.8	82.7	65.9
Veracruz	29.3	8.6	35.1	1.4		2.2	6.4	1.6	1.3	0.3	0.5		0.1	1.1	6.2
Puebla		1.3		0.8	0.1	0.1	2.1	11.9	0.5	0.3	0.8	0.1	0.5	1.0	1.4
Tlaxcala								0.6							
Morelos				0.1				1.1	1.7					0.2	0.2
Federal District	30.0	13.0	10.0	68.3	15.2	80.1	35.6	39.8	45.9	56.6	58.4	71.3	0.8	61.1	41.9
México	0.2	22.2	0.7	5.5	9.3		4.6	10.4	22.9	17.7	19.1	11.1		12.0	9.7
Hidalgo		1.1		3.5	3.1	0.2	0.3	1.1			0.1	3.0	0.1	0.1	0.9
Michoacán						1.1	0.5			3.4	0.1		0.8	0.3	0.5
Querétaro				0.1			0.9	0.6			0.7			1.4	0.3
Guanajuato	19.6			1.0	1.3		2.6	2.2	0.5	0.8	0.5	0.1		1.1	2.1

Colima					0.2	0.1			0.5				0.3	0.1
Jalisco	0.2	0.3	2.4		3.7	9.2	3.9	3.6	3.4	2.6	0.3	1.5	3.8	2.5
Aguascalientes			0.1			1.1	0.3			0.1			0.3	0.1
Other regions	1.3	25.5	2.2	5.5	2.1	8.9	7.7	3.5	3.8	0.4	1.9	55.5	3.9	8.9

Source: 1960 Industrial Census, General Directorate of Statistics, Ministry of Industry and Commerce, Mexico.

Note: The figures 1 to 14 of the column headings indicate the following branches of industry: (1) Coal, petroleum and its derivatives; (2) Iron and steel; (3) Non-metallic minerals; (4) Cement and other building materials; (5) Non-ferrous metals; (6) Generation of electric energy; (7) Food products, beverages and similar products; (8) Textiles, footwear and other garments (including hard-fibre textiles); (9) Paper, cellulose and paper products; (10) Chemicals and chemical products; (11) Metal products, electrical goods, machinery and equipment; (12) Transport equipment; (13) Saumills and (14) Other.

Table 8

Total population employed in industry by branch of manufacturing in 1960
(Percentages)

	BASIC INDUSTRIES						OTHER MANUFACTURING INDUSTRIES								Percentage of the total population employed in industry
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Northern region	51.7	48.8	37.5	14.6	21.3	13.2	21.7	13.9	2.8	18.5	18.9	17.7	61.4	16.2	25.7
Baja California				2.1		1.6	3.4	1.0	0.2		0.1	2.0	1.9	1.5	1.0
Sonora	0.1		2.0	0.4	9.9	0.3	2.2	1.6		0.7	2.4	0.7		1.3	1.5
Chihuahua		3.1		3.0	9.4		2.6	1.4	0.7	0.5	0.5		35.0	1.2	4.1
Coahuila	9.5	20.0	10.9	0.7	5.1	0.3	2.6	3.0	0.2	1.4	3.8	3.4	24.5	1.8	6.2
Nuevo León	4.4	24.9	24.6	6.8	6.9	1.7	7.4	4.6		6.2	11.8	11.1		8.5	8.5
Tamaulipas	37.7			1.6		9.3	3.5	2.3	1.7	1.7	0.3	0.5		1.9	4.3
Central region	48.3	51.7	38.4	82.3	58.1	85.2	65.0	58.2	94.5	68.3	70.4	70.8	6.8	77.5	66.6
Veracruz	14.7	7.1	22.2	1.9		1.3	6.9	2.0	1.3	0.2	0.5	0.2	0.2	2.9	4.4
Puebla		1.5		0.8	0.1	0.2	2.7	16.1	0.5	0.6	0.7	0.3	1.2	1.3	1.8
Tlaxcala								0.7							
Morelos				0.2			2.3	1.4		0.1				0.5	0.3
Federal District	22.4	18.6	11.8	68.4	0.8	75.7	37.7	41.0	57.7	61.4	54.1	45.0	1.0	55.1	40.0
México	1.8	19.4	3.5	5.3	23.1		3.9	7.6	23.7	16.5	10.0	22.5		9.2	11.0
Hidalgo		3.5		1.2	28.9	0.4	0.6	1.1			0.2	4.9		0.2	2.4
Michoacán				0.1		3.5	0.7	0.1		3.1	0.2	0.3	1.9	1.4	0.8
Querétaro			1.0	0.1			0.5	0.7			0.5			0.2	0.2
Guanajuato	10.2			0.8	4.9		3.4	3.0	5.9	0.6	0.7	0.2		1.4	2.3

Colima					0.4		0.2			1.0				0.8		0.2
Jalisco	0.6	0.8	2.1		3.7		8.1	5.0	5.4	2.8	3.3	5.2	2.5	3.9		3.0
Aguascalientes			0.3	0.2	0.1			0.6			0.2	0.2		0.6		0.2
Other regions	1.3	29.1	2.1	8.8	1.5		12.3	5.8	2.7	3.2	2.7	3.5	31.8	8.3		1.7

Source: 1980 Industrial Census, General Directorate of Statistics, Ministry of Industry and Commerce, Mexico.

Note: The figures 1 to 14 of the column headings indicate the following branches of industry: (1) Coal, petroleum and its derivatives; (2) Iron and steel; (3) Non-metallic minerals; (4) Cement and other building materials; (5) Non-ferrous metals; (6) Generation of electric energy; (7) Food products, beverages and similar products; (8) Textiles, footwear and other garments (including hard-fibre textiles); (9) Paper, cellulose and paper products; (10) Chemicals and chemical products; (11) Metal products, electrical goods, machinery and equipment; (12) Transport equipment; (13) Sundries and (14) Other.

Apart from the iron and steel industries (those processing non-metallic minerals and non-ferrous metals) and the sawmills, which are located largely in the northern region, most branches of industry are in the central region. The vast concentration of the iron and steel industry in the northern region is because of the rich deposits of coking coal, which is used as a fuel, and the proximity of iron ore deposits.[18]

However, the concentration of the various branches of industry in the central region is not uniform; it is greatest in the Federal District which is, almost entirely, Mexico City. Most of the value of production from the industrial sectors of the central region is in the Federal District (see table 7). Thus, if manufacturing enterprises are divided into basic industries and other processing industries,[19] the industrial concentration in the Federal District, measured in terms of production value, is as follows: 41.9 per cent of all industries in the entire country (compared to 65.9 per cent in the central region); 36.1 per cent of basic industries; and 46.2 per cent of other processing industries (compared to the central region with 61.8 per cent of basic industries and 69 per cent of other processing industries).

These figures show that an appreciable portion of basic industry and most of the sectors classified as "other manufacturing industries" are to be found

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18/ The carboniferous strata of Mexico are to be found in Coahuila, Nuevo León, Tamaulipas, Oaxaca and Puebla. The majority of national reserves lies in the Sabinas River basin in Coahuila, and have provided the basis for the metallurgical coke used in all blast furnaces in Mexico. On the other hand, the main iron ore resources used at present in the iron and steel industry come from Cerro de Mercado in the state of Durango, adjoining the parts of the northern region where the steel industry is situated. C. Prieto (1960) La industria siderúrgica: México - 50 años de Revolución [The steel industry; Mexico - 50 years of Revolution], La Economía, Fondo de Cultura Económica, Mexico, p.224 and p.230.

19/ This classification is similar to that adopted in the various publications of the Nacional Financiera S.A., the main financing body of the Mexican Government. The basic industries thus classified are: coal, petroleum and its derivatives; iron and steel; non-metallic minerals; cement and other building materials; non-ferrous metals and electric power (this includes only sales of electric current). The heading "other manufacturing industries" includes: food products, beverages, etc; textiles, footwear and other articles of clothing (including hard-fibre textiles); paper and pulp products, chemicals and chemical products; metal products, electrical goods, machinery and equipment; transport equipment; sawmills and other industries.

in a single territorial unit. The Federal District accounts for 80.1 per cent of the total electricity produced, for 68.3 per cent of the production value of the cement and other construction material industries, for 71.3 per cent of the production value of the transport equipment industry, for 58.4 per cent of the production value of the metal products, electrical goods, machinery and equipment industries, 56.6 per cent of production in the chemical industry, 45.9 per cent of paper and pulp production, 39.8 per cent of the value of goods produced in the textile and clothing industries and 35.6 per cent of the food and beverages industry.

As regards the industrial labour force, the Federal District also absorbs a large portion of the total number of workers employed in the hundred manufacturing centres of the country. In 1960, 66.6 per cent of the country's industrial labour force was concentrated in the central region (with approximately 60.9 per cent of those employed in basic industries and 70.9 per cent of those in other manufacturing industries); and 40 per cent in the Federal District (approximately 34.6 per cent of basic industries and 44.1 per cent of other processing industries) (see table 8).

In this connexion, it is instructive to note the relative share of the various industrial groups in the section under examination in the total value of national manufacturing production for the decade 1950-1960 as shown in table 9. This analysis demonstrates not only that there is a marked concentration of certain categories of industry in the central region and the Federal District, but also that the most dynamic sectors have gained a foothold in these two centres, thereby undesirably contributing to the intensification of industrial concentration.

This survey shows that the most dynamic industries at the national level have tended to gravitate to the central region close to the market. This is especially true of the processing plants for food and beverages, paper and pulp products, chemicals and chemical products, metal and electrical goods, machinery and equipment and transport goods. Thus, as the process of industrial integration accelerates, industrial concentration will be further encouraged in these regions, to the detriment of the balanced industrialization of Mexico and homogeneous regional development.

From another point of view, an analysis of the data compiled from the hundred major industrial centres in Mexico reveals a number of other relevant

factors. The value of industrial production in the metropolitan area of Mexico City is 1.2 times greater than that in the remaining ninety-nine industrial cities of the country, despite the fact that these other cities contain 1.8 times more population. This vast industrial centre has, moreover, a volume of industrial output 5.4 times greater than the metropolitan area of the city of Monterrey, the second manufacturing centre in Mexico. The value of industrial production in Monterrey is 3.6 times that of Guadalajara, the third largest industrial centre. The value of industrial production follows similar patterns in the fourth to eighth manufacturing centres and also in the ninth to thirteenth. Radiating from these centres there are a large number of small manufacturing nuclei scattered widely over the country, also tending towards greater concentration within the northern and central regions.

Table 9

Relative share of various industrial groups in the central region and Federal District in the total value of industrial production, 1950-1960
(Percentages)

	1950	1960
Basic industries	**43.91**	**27.82**
Coal, petroleum and its derivatives	8.76	4.54
Iron and steel	8.04	4.47
Non-metallic minerals	0.16	0.84
Cement and other building materials	10.63	8.53
Non-ferrous metals	9.41	6.00
Generation of electric energy	6.91	3.44
Other manufacturing industries	**56.09**	**72.18**
Food products, beverages and similar products	19.14	23.71
Textiles, footwear and other garments	14.06	11.40
Paper, cellulose and paper products	1.76	3.05
Chemicals and chemical products	6.82	9.65
Metal products, electrical goods, machinery and equipment	4.96	6.97
Transport equipment	2.05	3.72
Sawmills	1.30	0.50
Other	6.00	13.18

The present pattern of industrial development in Mexico, in terms of analytical geometry, can be compared to an equilateral hyperbola whose asymptotes are the co-ordinate axes represented by the value of industrial production and the number of main manufacturing centres.

Finally, the characteristic feature of the industrial centres of Mexico, except for the metropolitan areas of Mexico City and Monterrey, is that they are dependent on a number of industrial branches, generally one or two. (See table 6, which illustrates the industrial structure of the thirty main manufacturing centres.) For example, in Guadalajara, the third ranking industrial city of Mexico, more than 40 per cent of the production value is generated by the food and beverages industry; in Minatitlán, the fourth industrial city, the processing of petroleum and derivatives accounts for 94 per cent of the total production value; in Chihuahua, non-ferrous metals contribute 55 per cent to the total value; in Puebla, food products and textiles represent 83 per cent; in Salamanca, the manufacture of petroleum and derivatives accounts for 93 per cent; in Monclova, the iron and steel industry represents 87 per cent; in Toluca, food products and the processing of chemicals and chemical products account for more than 65 per cent of the total production value.

Of the thirty major manufacturing cities of the country, only the metropolitan area of Mexico City has all fourteen of the selected industrial sectors or branches. Two of the cities have 13 sectors; one has 12, two have 11, five have 10, six have 9 sectors; five centres have 8 sectors; three have 7, four have 6 industrial sectors and one manufacturing city has only 5 industrial sectors.

One result of this situation is that each manufacturing centre is highly sensitive to variations in its own industrial activity, to the detriment of its own economic development. Another result is the limited opportunity for accelerating the process of industrial integration, since most manufacturing production in the various branches of industry tends to be concentrated in a few cities.

Locational sensitivity of industries

In order to determine the extent to which various industries are tied to a given local or the degree of their mobility and its extent, an industrial

location coefficient has been calculated.[20] The following methodological criteria have been evolved:

(a) The manufacturing activity of the country is divided into basic industries and other processing industries, in accordance with the criterion previously mentioned;

(b) The population engaged in industry is grouped by territorial units according to branches of industry, giving also the percentage of each territory's population in the total number employed in industry as a whole. The number of workers per territorial unit is calculated on the basis of the hundred main manufacturing centres;

(c) The number of personnel employed per territorial unit is determined by totalling the number employed in each branch of industry. In this way the number of workers employed in the country as a whole and their percentage distribution in each unit is obtained;

(d) The foregoing data were used to determine the divergence, in the percentages for each state of workers in each branch of industry, from the percentages for the total number of enterprises;

(e) The coefficient of industrial location represents the sum of the divergencies - positive or negative - divided by 100.

Where the coefficient approximates unity, it may be said that there are strong locational factors inducing a particular industry to concentrate in certain territorial areas, and when the coefficient decreases it means that location is more uniform, the relative advantages of operating in any particular locality are slight and the enterprises involved can develop just as profitably in different places. In this way they follow the general pattern of location existing in the country (see table 10).

Examination of table 10 shows accentuated concentration in the following branches of industry: coal, petroleum and derivatives; iron and steel; non-metallic minerals; non-ferrous metals; and sawmills. As a rule, the decisive locational factor in these branches has been the proximity of raw materials. There is a more even geographic distribution in the following branches: cement and other building materials; generation of electric energy; food, beverages and similar products; textiles, footwear and other garments; paper, cellulose and paper products; chemicals and chemical products; metal, electrical and photographic goods, machinery and equipment; and transport equipment. The geographical situation in each branch of industry is described below.

20/ This coefficient has been determined using the process elaborated by G. R. Kolbeck and V. L. Urquidi, op. cit., based on P. S. Florence (1948) Investment, Location and Size of Plant, Cambridge University Press, London, chap. IV.

Table 10

Locational coefficients for fourteen branches of Mexican industry in 1960

	Coefficient
Basic industries	
Coal, petroleum and its derivatives	0.57
Iron and steel	0.53
Non-metallic minerals	0.64
Cement and other building materials	0.22
Non-ferrous metals	0.60
Generation of electric energy	0.35
Other manufacturing industries	
Food products, beverages and similar products	0.21
Textiles, footwear and other garments	0.21
Paper and pulp products	0.28
Chemicals and chemical products	0.21
Metal products, electrical and photographic goods, machinery and equipment	0.20
Transport equipment	0.21
Sawmills	0.88
Other	0.09

Branches in which important locational factors hamper mobility

Coal, petroleum and derivatives. The most important areas are Tamaulipas, Veracruz, the Federal District, Guanajuato and Coahuila. The location of these industries is determined by the accessibility of raw materials and, in the case of petroleum and its derivatives, by the proximity of refineries to the market. Most refineries are situated in the Federal District, which is supplied with petroleum and derivatives by various pipelines for oil, gas and other products coming from the production areas of Tamaulipas, Veracruz and Tabasco.

Iron and steel. The industrial centres engaged in the iron and steel industry are located in Nuevo León, the Federal District and Coahuila, Mexico and Chihuahua (see footnote 18).

Non-metallic minerals. This industry is concentrated in San Luis Potosí, Nuevo León, Coahuila, Sonora and the Federal District. In almost all cases, except that of the Federal District, the location of the enterprises depends on the proximity of raw materials. In the Federal District, proximity to the market of the central region has been the decisive factor in the establishment of a large number of such enterprises.

Non-ferrous metals. The coefficient shows that there is a high degree of concentration in Hidalgo, Mexico, Chihuahua, San Luis Potosí, Guanajuato, Coahuila and Durango. The proximity of raw materials has been the important location factor.

Sawmills. These are located mainly in Durango, Chihuahua and Campeche and, to a lesser extent in Guerrero, San Luis Potosí, Oaxaca and Michoacán. Their location is largely determined by the accessibility of raw materials.

Industrial branches with a more even distribution[21/]

Generally speaking, the location of these industries has been dictated by the market - one of the factors whose influence on the location of Mexican industries has been most noticeable.

Food, beverages and similar products. Since the location of these industries is conditioned principally by the market, most enterprises are located in the Federal District, Nuevo León, Jalisco, Baja California, Mexico, Veracruz, Coahuila and Guanajuato - highly urbanized areas with higher incomes than the national average.

Textiles, footwear and other garments. This branch plays an important role in the country's economic development; it provides employment for more than 250,000 persons and absorbs a large quantity of raw materials. The production plants are located mainly in the Federal District, Veracruz, Yucatán, Aguascalientes, Puebla, Guanajuato, Jalisco and Querétaro, and

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21/ In each branch of industry, only the areas with positive deviation will be quoted. This does not mean that industries do not exist in other territorial units.

are oriented towards satisfying the needs of both the central region and of the rest of the country.[22]

Cement and other building materials. This is one of the most important and rapidly growing industries in the country. Most of the production in terms of value comes from plants located in the Federal District, Nuevo León, Mexico, Hidalgo, Chihuahua and Jalisco. Location is determined basically by proximity to the market (urban concentrations).

Paper, cellulose and paper products. This industry is chiefly located in the Federal District, Mexico, Chihuahua, Jalisco and Veracruz; 70 per cent of the plants are located in the first two areas. Proximity to markets has been the criterion for the location of paper mills; in the case of the cellulose plants, proximity to raw materials has been the predominating factor.[23]

Chemicals and chemical products. Most of these enterprises are located in the Federal District, Mexico, Nuevo León, Jalisco, Michoacán and Veracruz. Except for the petrochemical plants, which have been established near sources of raw materials, industries in this branch have been located near their markets.

Metal and electrical goods, machinery and equipment. The industries in this industrial group are located mainly in the Federal District, Mexico, Nuevo León, Jalisco and Coahuila; about 80 per cent of the total value of annual production is concentrated in the first two territorial units.

Transport equipment. Most plants are concentrated in the Federal District, Mexico and Nuevo León. Automobile enterprises are concentrated in the first two areas; even new plants set up recently to avoid large-scale importation of these products have been located in these areas.

22/ A singular phenomenon is to be noted in the case of cotton textiles. Almost all cotton is produced in the northern region, but most of the textile mills have been established in the central region. This discrepancy is explained by the fact that the pattern of cotton cultivation has changed, while the industry continued to develop in its traditional location. In the middle of the last century, cotton cultivation was concentrated mainly in the centre and the south, where the textile industry was also located; afterwards the new cotton plantations, now of great importance were opened up in the north, without a corresponding change in the textile industry. E. L. Malo, op. cit., p.186.

23/ In 1964, there were 39 enterprises in the paper and cellulose industry, of which 23 were producing paper and similar products; 9 paper and cellulose, and 7 only cellulose.

PROBLEMS ARISING FROM THE PRESENT DISTRIBUTION OF INDUSTRY

Effects of industrial concentration on rural migration and urban development

In general the process of industrialization in Mexico has led to excessive urban development caused largely by an accelerated migration from the rural sector to the towns. This phenomenon is illustrated by the industrial development of the various regions, their urbanization and changes in occupational structure during the decade 1950-1960, as given below:

	Industrial production			
	1950		1960[a]	
	Million pesos	Per cent	Million pesos	Per cent
Northern region	6,729	27.7	8,253	23.3
Central region	13,598	60.0	24,594	69.6
Other regions	2,800	12.3	2,512	7.1

a/ At 1950 prices.

This information gives some idea of the growing industrial concentration in the northern and central regions, as well as of the relative share contributed by the other regions to industrial production. The situation in these other parts of the country is alarming since, in 1960, not only did they have a smaller share in total national production but, at 1950 prices, the value of their manufacturing production had diminished. Furthermore, a comparison of industrial production per worker shows that the productivity of the northern region is twice as great as that of the other zones, excluding the central region; productivity in the latter is 1.5 times greater than in the other regions. In other words, industrial growth in all parts of the country except the northern and central regions, has lagged behind population growth and is relatively stagnant in comparison to the growth of those two regions. The pattern of geographical distribution of industry in 1960 has undoubtedly led to a steadily increasing gap in the development of the various regions, thus making it more difficult for the poorer parts of the country to emerge from centuries of neglect.

Urbanization

Industrialization is an important element in the urban-rural relationship, since industrial development is initially almost always associated with intense urban growth, which drains the population from the rural areas.

During the period 1940-1960, the industrial development of Mexico was characterized by a rapid growth of the urban population, accelerated by a high rate of demographic growth: 3 per cent per year, one of the highest in the world. The intensity of this growth is shown below in percentages of total population:

	1940	1950	1960
Rural population	64.9	57.4	49.3
Urban population	35.1	42.6	50.7

In the period covered by this table the rural population grew in absolute terms. But if the rural population and the urban population are compared in terms of percentages, it will be seen that the latter has grown at a faster pace than the former.

In 1940 two thirds of the total population of the country was living in localities with less than 2,500 inhabitants, whereas in 1960 more than half of the population was living in larger centres; by 1970 the percentage of urban population is expected to reach 53 per cent and 63.3 per cent in 1980.[24/]

The growth rate of the rural population remained more or less constant throughout the period 1940-1960 (1.5 per cent per year on the average) while that of the urban population rose steadily (4.8 per cent per year in the decade 1940-1950 and 4.9 per cent per year in the decade 1950-1960). This phenomenon is the result of internal migratory movements which have brought about substantial changes in the rural-urban structure.

The degree of urbanization caused by migration in the various geographic areas has been indicated above. This increase in the urban population has assumed different patterns in each region. In 1960 the northern and central regions, which had the greatest relative degree of industrial development, were also the most intensively urbanized regions, and the urban population

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24/ G. Cabrera and R. Benitez (1965) La población futura de México, 1960-1980 [The future population of Mexico, 1960-1980], Industrial Research Department, Bank of Mexico S.A., Mexico.

exceeded the rural population. In the other regions of the country the rural population is greater than the urban population, which has a smaller rate of growth than the rural population. (See tables 11 and 12.)

Table 11

Distribution of the urban and rural population by region, 1940-1960
(Percentages)

	1940		1950		1960	
	Urban	Rural	Urban	Rural	Urban	Rural
Northern region	42.5	57.5	52.1	47.9	63.8	36.2
Central region	40.1	59.9	47.7	52.3	55.9	44.1
Other regions	22.4	77.6	27.6	72.4	32.0	68.0

Source: Population censuses, General Directorate of Statistics, Ministry of Industry and Commerce, Mexico.

Table 12

Annual rates of population growth by region, 1940-1960
(Percentages)

	1940-1950			1950-1960		
	Total population	Urban population	Rural population	Total population	Urban population	Rural population
Northern region	3.7	5.8	1.8	3.9	6.1	1.1
Central region	2.7	4.5	1.4	3.2	4.8	1.5
Other regions	2.3	4.5	1.6	2.4	3.9	1.8

Source: Population censuses, General Directorate of Statistics, Ministry of Industry and Commerce, Mexico.

Table 13

Interregional migration, 1950

	Born in the region	In-migrants	Ratio of in-migrants to the number born in the region (percentage)	Regional composition of in-migrants (percentage)
Northern region	2,899,207	801,518	27.6	24.2
Central region	12,400,899	2,112,491	17.0	63.9
Other regions	7,001,088	391,708	5.6	11.9
National total	22,301,194	3,305,717	14.8	100.0

Table 14

Interregional migration, 1960

	Born in the region	In-migrants	Ratio of in-migrants to the number born in the region (percentage)	Regional composition of in-migrants (percentage)
Northern region	4,102,539	1,358,314	33.1	26.1
Central region	16,593,377	3,278,997	19.8	63.1
Other regions	8,803,656	562,778	6.4	10.8
National total	29,499,572	5,200,089	17.6	100.0

Urbanization is largely a consequence of internal migration from the less industrialized states to those with a greater degree of industrial development. (See tables 13 and 14.) In this connexion, a recent study showed that the Federal District, the most highly industrialized area in the country, absorbed about 48 per cent of the migrants from other areas during the period 1950-1960; the states of Baja California, Chihuahua, Mexico and Nuevo León, areas of growing industrial development, absorbed 38 per cent of migrants.[25/] Furthermore,

25/ Ibid., p.12.

a study of the inter-census migratory balances for the period 1950-1980, given below, shows positive balances in the northern and central regions, which have the greatest growth in manufacturing.

Table 15

Inter-census migratory balances, by region, 1950-1980
(Thousands of inhabitants)

	1950-1960	1960-1970	1970-1980
Northern region	174.0	523.1	868.7
Central region	104.3	228.4	180.9
Other regions	-278.3	-751.5	-1,049.6

Source: G. Cabrera and R. Benitez (1965) La población futura de México, 1960-1980 [The future population of Mexico, 1960-1980], Industrial Research Department, Bank of Mexico.

It is precisely the regions that contain the most important industrial cities which attract migrants from regions with lower development in manufacturing. Urbanization has generally grown more rapidly than industrialization, but has usually been associated with this process; however, there are cases of dynamic urbanization without industrialisation. This phenomenon can be illustrated by studying the occupational structure of the various regions in the decade 1950-1960, as shown in table 16.

Table 16

Agricultural and non-agricultural labour force, by region, 1950 and 1960
(Percentages of total labour force)

	Agricultural		Non-agricultural	
	1950	1960	1950	1960
Northern region	49.9	45.0	50.1	55.0
Central region	53.0	47.4	47.0	52.6
Other regions	73.6	74.4	26.4	25.6

From these data it can be seen that the most industrialized regions are those in which a higher proportion of the labour force is employed in non-agricultural activities and, similarly, those in which there has been a more

marked trend towards an acceleration of this phenomenon. On the other hand, there has been a percentage increase in the agricultural labour force in regions where the ratio of the agricultural to the non-agricultural labour force was already very high.

At the national level it can be seen that the proportion of the total economically active population engaged in agriculture tends to decrease, owing to industrialization and urban development, since the decrease of the population in the rural zones and its increase in the urban zones has led to an increase in non-agricultural activity and a relative decrease in agricultural activity. The national agricultural labour force represented 58.3 per cent of the total labour force in 1950 and 54.2 per cent in 1960.[26]

In the country as a whole, the tertiary sector - those employed in transport, commerce and services - has tended to increase its relative share of total employment more than the secondary sector, which is comprised of the processing and construction industries.[27] This situation indicates that the industrial development achieved has not been able to absorb the growing quantity of labour available, so that the decrease in agricultural employment benefits the tertiary sector, including services. The above becomes clearer with the help of a regional breakdown.

Table 17

Labour force in the primary, secondary and tertiary sector, by region, 1950 and 1960
(Percentages of total labour force)

	Primary		Secondary		Tertiary	
	1950	1960	1950	1960	1950	1960
Northern region	49.9	45.0	18.8	22.2	31.3	32.8
Central region	53.0	47.4	17.9	22.3	29.1	30.3
Other regions	73.6	74.4	10.6	9.9	15.8	15.7

[26] F. H. Cardoso and J. L. Reyna (1966) Industrialización, Estructura Ocupacional y Estratificación Social en América Latina [Industrialization, Occupational Structure and Social Stratification in Latin America], paper prepared for ECLA, p.14.

[27] The tertiary sector absorbed 25.8 per cent of the total labour force in 1950 and 26.8 per cent in 1960; in the same years the secondary sector accounted for 15.9 and 19 per cent, respectively.

From an examination of this table it can be deduced that in all regions the tertiary sector predominates over the secondary sector, especially in districts with the greatest urban agglomeration. Though the secondary sector has been greatly stimulated and has become the most dynamic sector of the Mexican economy, it has not been able to absorb a large part of the available agricultural labour, which for the present is being taken on by the tertiary sector.

The reason a large proportion of employment is in the tertiary sector is that this sector includes the branches of the economy that supplement the industrial urban economy. Thus, it is of greater importance in the northern and central regions, which have the highest relative industrial development. On the other hand, the growth of the tertiary sector to some extent reflects the formation of modern urban industrial strata in the social structure. The difficulty of analysing the precise implications of this process springs from the relative lack of knowledge of the marginal sectors in the tertiary sector, consisting of unemployed persons, under-employed persons and the like.[28]

The data presented below in table 18 give an idea of the composition of the tertiary in terms of occupational structure.

Table 18

Labour force in the tertiary sector, by region, 1950 and 1960
(Percentages of total labour force)

	Northern region		Central region		Other regions	
	1950	1960	1950	1960	1950	1960
Commerce	9.8	11.4	9.3	10.6	5.3	5.9
Transport	3.6	4.3	2.7	3.4	1.6	2.0
Services	11.5	15.5	12.4	15.6	6.4	7.6
Others	6.4	1.6	4.7	0.7	2.5	0.2
Total	31.3	32.8	29.1	30.3	15.8	15.7

Source: Population censuses 1950-1960, General Directorate of Statistics, Ministry of Industry and Commerce, Mexico.

[28] F. H. Cordoso and J. L. Reyna, op. cit., p.8.

In all cases, services increased more markedly than the other components of the tertiary sector; this item accounts for a large proportion of the population with very low levels of income and persons working for a less than normal number of days, a situation that indicates the degree of unemployment and concealed unemployment.

Urbanization has created a social stratum consisting of non-manual workers, mainly in commerce and services. The more industrialized the region, the greater the importance of this section of the working population and the lower the number of manual workers. Table 19 gives a breakdown of the manual and non-manual sections of the employed population in the various regions of Mexico and shows that the ratio of non-manual to manual workers is considerably higher in the northern and central regions than in the rest of the country.

This circumstance leads to the conclusion that industrialization in Mexico has been accompanied by considerable urban growth even if the industrial development itself has not always been the direct cause of this increase. On the other hand, it is beyond doubt that the pattern of geographical distribution of manufacturing activity has accentuated regional differences and may constitute a serious obstacle to the economic development of Mexico.

The effects of industrial concentration

Consideration has been given to the effects of the existing pattern of geographic distribution of manufacturing activity on rural migration and urban development. Closer examination will reveal how this pattern is doing intense harm to the rest of the country, even causing imbalances in the regions where manufacturing activity is concentrated.

The analysis will be confined to three indicators considered as the most representative: (a) the level of income, with the aim of identifying the largest concentrations of income from work and capital; (b) regional public investment; and (c) the capital invested by private enterprise in the various zones of the country.

Table 19

Ratio between the non-manual and manual workers, 1950 and 1960

	Northern region		Central region		Other regions	
	1950	1960	1950	1960	1950	1960
Non-manual workers	231,909	424,988	847,877	1,448,903	223,118	347,268
Per cent of total labour force	19.4	23.9	17.8	22.2	9.6	11.5
Manual workers	959,967	1,355,577	3,907,596	5,082,369	2,097,309	2,672,911
Per cent of total labour force	80.6	76.1	82.2	77.8	90.4	88.5
Total	1,191,876	1,780,565	4,755,473	6,531,272	2,320,427	3,020,179
Per cent of total labour force	100.0	100.0	100.0	100.0	100.0	100.0
Non-manual / Manual (Per cent)	24.2	31.4	21.7	28.5	10.6	13.2

Source: Population censuses 1950-1960, General Directorate of Statistics, Ministry of Industry and Commerce, Mexico.

Note: The non-manual category includes professionals and technicians in all branches of activity: management personnel except in agriculture, animal husbandry, forestry, hunting and fishing; office workers in all branches of activity and sales personnel in all branches of activity.

The manual category includes persons employed in agriculture, animal husbandry, forestry, hunting and fishing; it includes workers, artisans and day-labourers directly and indirectly employed in the production of goods and services and paid personal service workers in homes, institutions and enterprises providing personal, recreational or social services.

Level of income[29]

The first essential is to determine the present average income, where it comes from - whether from work or capital, pensions or aid - and to determine the causes of saving and dissaving. There is a basic premise to start from: industry centralized in the cities generates far higher incomes and living levels than agriculture and this imbalance is also demographic. Industrial development feeds on urban concentrations and, in its turn, fosters the growth of the latter. The countryside constantly loses population to the towns, which attract migrants not only because of the better employment opportunities and higher levels of living, but also because of their abundant services, their socio-economic mobility, the pattern of their political life and the opportunity they afford for participation in many other forms of social life.[30]

The monthly income of families in Mexico (1964-1965) and per capita income, are shown in table 20:

Table 20

Monthly income of families and per capita income, by region, 1964-1965

	Total families (thousands)	Total persons (thousands)	Monthly income of families (million pesos)	Monthly per capita income (pesos)
Northern region	1,222	6,688	1,436	215
Central region	4,320	23,168	5,305	229
Other regions	2,023	10,548	1,411	134
National total	7,565	40,404	8,152	202

Source: La Población Económicamente Activa de México [The Economically Active Population of Mexico], General Directorate of Sampling, Ministry of Industry and Commerce, Mexico.

[29] Progress in industrialization constitutes one of the most significant structural changes in production bringing economic development in its wake. However, per capita income is not the only variable associated with structural differences between countries, although it is without doubt the most important one. In other words, although industrialization is a requirement for development and although income growth is always accompanied - at least in the long run - by a more rapid expansion of industrial production, various circumstances influence the degree to which this requirement applies and the extent of the industrialization process. H. S. Valderrama (1966) Planificación del desarrollo industrial [Industrial development planning], Latin American Institute for Economic and Social Planning, Siglo XXI Editores S.A., Mexico, p.9.

[30] A. Palerm (August 1965) Observaciones sobre planificación regional. Experiencias de Israel y la India en planificación regional [Comments on regional planning. The experience of Israel and India in regional planning], Department of Social Affairs, General Secretariat of the OAS, Washington, p.7.

The figures of table 20 show that per capita income is greater in the more industrialized regions and that the lower levels of income are found in the regions where industrial development is in its early stages. (See also table 21.) Accordingly, 47 per cent of the families in Mexico live in regions in which only 28 per cent of the total income is generated. Differences become clearer with an examination of the origin of family income. Thus, income derived from capital and work in the central region is 28 per cent greater than that in the northern region and 57 per cent higher than in the rest of the country; the low incomes from capital and work in geographic areas with less industrial development result from the fact that most of the families are engaged in agricultural work on relatively unproductive land and, obviously, also from the lack of active manufacturing.

In conclusion, the distribution of income is generally related to the level of industrialization; consequently, as national industry is distributed at present, a large portion of the country has benefited only marginally from the development of manufacturing.

Level of public investment

There has also been a concentration of public investment in Mexico, which is one of the factors that have led to the establishment of industry in certain regions. Table 22 indicates the geographic breakdown of public investment by region.

It is clear from this breakdown that the central region absorbs a considerable proportion of the total public investment - a situation that is doubtless the consequence of urbanization and the growth in manufacturing in this region. The northern and central regions together absorb almost 80 per cent of the total investment in industrial promotion (the generation of electricity and industries in which the Government has a share), and more than 85 per cent of social welfare activities. Accordingly, the Government has been obliged to continue to channel resources in this direction since industrial growth itself has created urgent needs for public and social welfare services.

The rest of the country has absorbed a greater amount of investment in the promotion of agriculture and animal husbandry - especially irrigation - and these projects have tended to keep the population in the rural areas. This situation, together with the fact that active industrialisation is not

Table 21

Monthly income of families and per capita income, by states, 1964-1965

	Families (thousands)	Percentage	Population (thousands)	Percentage	Monthly income of families (million pesos)	Percentage	Monthly per capita income (pesos)
Northern region	1,222	16.2	6,688	16.6	1,436	17.6	215
Baja California (Northern)	132	1.7	730	1.8	245	3.0	336
Sonora	169	2.2	971	2.4	273	3.3	281
Chihuahua	263	3.6	1,480	3.8	324	4.0	219
Coahuila	179	2.4	1,018	2.5	150	1.8	147
Nuevo León	235	3.1	1,265	3.1	211	2.6	167
Tamaulipas	244	3.2	1,224	3.0	233	2.9	191
Central region	4,320	57.1	23,168	57.3	5,385	65.1	228
Veracruz	607	8.1	3,158	7.8	494	6.1	156
Puebla	403	5.3	2,174	5.4	280	3.5	133
Tlaxcala	74	0.9	382	0.9	44	0.5	226
Morelos	87	1.2	441	1.1	64	0.9	145
Federal District	1,861	14.1	5,812	14.7	2,823	35.8	485
México	394	5.2	2,150	5.3	306	3.7	142
Hidalgo	213	2.8	1,104	2.7	119	1.5	107
Michoacán	386	5.1	2,118	5.2	264	3.2	125
Querétaro	77	1.0	381	0.9	56	0.7	148
Guanajuato	341	4.5	1,993	4.9	229	2.8	115
Colima	38	0.5	198	0.5	30	0.4	150
Jalisco	582	7.8	2,893	7.2	458	5.6	158
Aguascalientes	47	0.6	273	0.7	29	0.4	106
Other regions	2,023	26.7	10,548	26.1	1,411	17.3	134
Baja California (Southern)	16	0.2	92	0.2	25	0.3	267
Sinaloa	164	2.2	942	2.3	228	2.8	242
Durango	145	1.9	820	2.0	84	1.0	103
Zacatecas	170	2.2	904	2.2	93	1.1	102
San Luis Potosí	212	2.8	1,174	2.9	124	1.5	106
Nayarit	86	1.1	441	1.1	73	0.9	162
Guerrero	263	3.5	1,348	3.3	201	2.5	149
Oaxaca	387	5.2	1,906	4.7	178	2.2	94
Tabasco	103	1.4	556	1.4	102	1.3	184
Chiapas	283	3.7	1,398	3.5	175	2.1	125
Campeche	42	0.6	230	0.6	31	0.4	134
Quintana Roo	13	0.1	67	0.2	9	0.1	133
Yucatán	139	1.8	669	1.7	87	1.1	130
National total	7,565	100.0	40,404	100.0	8,152	100.0	202

Source: La población económicamente activa de México en junio de 1964 y abril de 1965 [The Economically Active Population of Mexico in June 1964 and April 1965], General Directorate of Sampling, Ministry of Industry and Commerce, Mexico.

Table 22

Public investment by region, 1959-1965
(Percentages)

	Promotion of agriculture[a/]	Transport and communications[b/]	Administration, defense, public buildings and services	Industrial promotion[c/]	Social welfare programmes[d/]	Total investment
Northern region	20.7	27.2	10.7	31.1	11.6	23.6
Central region	24.6	41.6	81.8	47.3	76.9	51.7
Other regions	54.7	31.2	7.5	21.6	11.5	24.7
National total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Inversión Pública Federal 1925-1965 [Federal Public Investment, 1925-1965], Directorate of Public Investments, Presidential Secretariat, Mexico.

a/ Agriculture, animal husbandry, forestry, hunting and fishing.

b/ Roads, railways, maritime and air transport and telecommunications.

c/ Fuels, chemicals, fertilizers, iron and steel, mining, food and beverages, paper, wood, publishing and other industries.

d/ Public services, hospitals and welfare centres, education and research, housing and community development.

being promoted, has prevented the rate of growth in these parts of the country from keeping up with that of the country as a whole.[31]

Private industrial investment

A comparison of private industrial investment by region in 1945 and 1960 illustrates the degree of concentration of private investment in the highly industrialized regions; this deprives the rest of the country from the beneficial effects of industrial development (see table 23).

Table 23

Private investment in the extractive and manufacturing industries, 1945 and 1960
(Percentages)

	1945	1960
Northern region	27.4	26.4
Central region	60.4	65.2
Other regions	12.2	8.4

Private entrepreneurs have been prompted to direct their investment to certain regions by many factors, such as the concentration of population, the advantage of external economies, the growing centralization of the public administration and the national banking system or the availability of skilled labour.

Although the country's present industrial structure has been an indispensable means of stimulating economic growth, it has caused marked regional imbalances, since investment has not been directed towards developing the zones that are relatively more backward economically, with the result that the gap between the rich and poor regions of Mexico has been widened.

Moreover, the pattern of geographic location of industrial production is creating difficulties with regard to the supply of urban public services; in addition the biased orientation of public investment is leading to competition

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31/ In this connexion it may be of interest to note one example. The state of Sinaloa, which is not in the northern or the central region, was the site of a large part of the irrigation works carried out by the Government in the period 1959-1965; nevertheless, the level of income and the gross product of Sinaloa are still far below those of the rest of the country.

between enterprises for the acquisition of services. This bias is conducive to a restriction of the domestic market, as a consequence of the unequal distribution of income, and to an increase in prices owing to the constant rise in production costs.

A wider dispersion of industrial activity would stimulate employment; furthermore, higher levels of income and new markets would be created, thus eliminating or appreciably reducing migration from the poor to the rich regions.

GOVERNMENT POLICY AND INDUSTRIAL LOCATION

General industrial policy

Various practical measures - both in the public and private sectors - are being taken to accelerate the development of national industry in Mexico. These measures range from import controls of the protectionist type and the introduction of special fiscal incentives to the establishment of special financial agencies.

In developing countries, the general objectives of industrial policy are to be viewed in terms of the growth and distribution of income to ensure a rapid and continuous rise in the level of living, particularly that of the broad under-privileged masses of the population. As for the geographic distribution of industry, industrial policy is concerned with the location of manufacturing activity in localities that are most suitable from the industrial or integrational viewpoint, and with the formation of dynamic poles or centres of development at the regional level.[32/]

However, the somewhat unfavourable industrial development situation in Mexico and its implicit limitations make it clear that there has so far been no general industrial policy, much less a policy concerned with the geographic distribution of manufacturing activity. The basic cause of this situation has been the lack of a national development plan for the harmonious and integrated growth of the country.

To remedy this situation, an Inter-Ministerial Commission was established in 1962; it consists of representatives of the Presidential Secretariat and

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32/ H. S. Valderrama, op. cit., pp.226-227.

the Ministry of Finance and Public Credit, and its task is to formulate short and long-term national plans for the economic and social development of the country. In the middle of 1966, this Commission formulated the following guide-lines and national objectives for the period 1966-1970:[33]

- To achieve an average economic growth of at least 6 per cent per year;
- To give priority to the agricultural and animal husbandry sector so as to accelerate its development and strengthen the domestic market;
- To stimulate industrialisation and to improve the productive efficiency of industry;
- To attenuate and correct imbalances in development, both between regions and between various branches of activity;
- To distribute the national income more equitably;
- To improve education, housing, health and welfare conditions, and social security and social welfare in general;
- To encourage domestic savings; and
- To maintain a stable exchange rate and to combat inflationary pressure.

In order to achieve balanced growth throughout the country, the Commission also initiated regional planning, incorporating this type of programme into general development plans.

In spite of these considerable advances, a general policy for industrial location still has not been formulated. When regional development plans are available, the Commission will probably define, by territories, the geographic distribution of industry in which the Government participates, and will prescribe measures to promote the growth of private industry in regions of relatively lower economic development.

In recent years the Government has intervened indirectly in the territorial distribution of industry through various economic policy measures that have improved the development of certain zones of the country. This section examines the main measures that have influenced the geographic distribution of industry. It must be stressed that as a rule existing industrial legislation and financial and public expenditure policies have, unintentionally, tended to favour the northern and central regions of Mexico, and particularly the metropolitan areas of Mexico City and Monterrey.

33/ According to a government report by the President of the Republic, Gustavo Díaz Ordáz, submitted to the Congress of the Union on 1 September 1966.

Public action with regard to the geographic distribution of industry has been both direct and indirect; in the first case, government intervention has been modest and of limited scope; in the second case, the economic policy adopted by the Government has promoted the industrial development of certain specific regions of the country. Private enterprise and the Governments of the various states have also intervened increasingly through measures designed to attract industry. The main policies followed by both the public and the private sector to influence the location of industry, and the impact of these measures, are examined below.

Direct measures to influence the geographic distribution of industry

Federal public sector

The establishment of new industrial towns. Early in 1952 the Mexican Government, through the Ministry of Finance and Public Credit, the Bank of Mexico and the National Finance Corporation, made an effort to encourage the decentralization of industry from the metropolitan area of Mexico City by promoting the construction of an industrial town, the Ciudad Bernardino de Sahagún, 104 kilometres from the capital in the state of Hidalgo.

At first, two joint state and private enterprises were set up in this town, one making railway rolling stock and the other motor vehicles. These were later supplemented by a similar joint enterprise producing textile machinery. A state enterprise was organized to construct the town, with authority to erect the industrial buildings and set up the necessary public services, but without authority to initiate measures to attract new manufacturing enterprises.

The town was located in an arid zone, from which there had been a large-scale exodus of the rural population. The area possesses no natural resources and had become impoverished when the pulque industry, the basis of its economy, died out. The efforts of the Government were aimed not only at promoting a better geographic distribution of industry but also at assisting the economic and social development of the region.

As the site lacked the amenities to make it habitable, it was necessary to construct housing, to install a water supply, lighting and drainage, and to set up hospitals, shops and schools. The total area of the town was

1,140 hectares, of which 384 were intended for the urban zone proper and the rest for the industries established. By 1960 the town had a population of 7,000; López Malo estimated that the capital investment had exceeded 1,000 million pesos and noted that funds were still being allotted for expansion, development and maintenance.[34/]

The objective of providing employment for the local population was achieved at the cost of a high capital investment. However, no appreciable development could be achieved in other activities, as the rate of growth in manufacturing was not stimulated sufficiently to accelerate urbanization or to expand the narrow local market. The products of the enterprises have a specialized market and almost all of the essentials for the life of the town come from the Federal District.

According to Yates, the choice of the site was not suitable and the large-scale capital investment was consequently not justified, since other localities might have offered a more favourable environment for industry. Some of these already possessed buildings which could have served as bases for the establishment of a new industrial complex. The use of these localities with their existing services would have eliminated the need to invest large sums in the infrastructure, as was done in Ciudad Sahagún.[35/]

The establishment of industrial estates. Two industrial estates, known as Ciudad Industrial de Irapuato and the Zona Industrial Lagunera, have been set up on the initiative of the Federal Electricity Commission - a decentralized Government body - with the co-operation of the Governments of the states of Guanajuato and Durango.

Even if the stated aim was "to find consumers for this official body's growing output of energy" the basic purpose was to stimulate the industrial development of the province, so as to avoid excessive concentration of industry in the metropolitan area of Mexico City.

The planning and execution of the necessary works, as well as publicity for and sale of industrial sites is being carried out by the Fondo Impulsor de la Construcción, S.A., which manages a trust estate assigned to it by the Federal Electricity Commission in 1957, when work began.

34/ E. L. Malo, op. cit., p.237.

35/ P. L. Yates, op. cit., p.243.

The Cuidad Industrial de Irapuato is situated in an important agricultural region, 355 kilometres from Mexico City. It is in the geographic centre of the Republic, in the central region, is connected by rail and road to the main centres of consumption and has abundant electrical energy to service the industries that are being established.

The industrial estate has an area of 280 hectares and is divided into two large sections, one for light industry and the other for heavy industry. Accomplishments so far include town planning, the provision of a water supply, drainage, road surfacing, electricity and the division of the estate into lots. By 1964 capital investment had reached a total of approximately 30 million pesos, and ten of the ninety lots making up the light-industry section had been sold.[36/]

The Zona Industrial Lagunera is located at Gómez Palacio, a town in the state of Durango, 1,270 kilometres from Mexico City and 380 kilometres from Monterrey. This region was predominantly agricultural, specialising in the cultivation of cotton. However, owing to the lack of water and the over-exploitation of groundwater, it has rapidly become impoverished in recent years, with a consequent aggravation of social problems. It was partly because of this special situation that the Government actively intervened to promote industrial development, the only outlet for the growing number of agricultural unemployed. The Government is also reclaiming land under its irrigation schome, promoting changes in crop structure and redistributing the land to improve the lot of the lower income farmers.

The estate has an area of 265 hectares, of which 224 have been divided into 120 lots. Land development has been carried out and the estate has been provided with the necessary services for industry. By the end of 1964, eight enterprises had been established on the estate.

The National Frontier Programme. The National Frontier Programme, a regional development body, was set up at the beginning of 1961 to develop the frontier zones of Mexico and intensify their social, economic and cultural integration with the rest of the nation. This body has authority to promote

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36/ The lots varied in price between 30 and 40 pesos per square metre; industrialists pay only 5 to 10 per cent of the value of the site on purchase, the rest being spread over a period of ten years at 8 per cent interest on the unpaid balance.

the development of both the northern and the southeastern frontiers of the country. The most pressing need, however, is to incorporate the northern region into the national economy, as most transactions involving manufactures produced in the United States are carried on in that area, to the detriment of national industry.

To enable the Programme to operate, a trust fund of 42 million pesos was set up in the National Finance Corporation, and by 1964 it had increased to 323.5 million. This trust fund is managed by a Technical Committee consisting of representatives of the Government and public and private institutions: the Ministry of Finance and Public Credit, the Bank of Mexico, the National Finance Corporation, the National Chamber of the Processing Industry, the Confederation of Chambers of Industry, the Confederation of National Chambers of Commerce and the Mexican Bankers Association.

To promote competition in the frontier markets, the Ministry of Finance granted two subsidies: a 25 per cent discount on rail, air and ship freight, and a 1.8 per cent reduction in the tax on business income, which is payable to the federal Government. In 1965, the rail freight subsidy was raised to 50 per cent for finished products.

To date, buildings for customs, migration, health and tourist services, supermarkets, restaurants, hotels, shops and schools have been constructed under this programme; highways have been modernized, bridges built and public lighting improved, all benefiting the main frontier cities in the north.

By the end of 1964 the capital investment carried out by the National Frontier Programme totalled 322 million pesos. The subsidies granted to industrialists who shipped their products to the northern frontier zone reached 69.2 million pesos - 29.3 million in business income tax discounts and 39.9 million in rail freight discounts.

Thus far the results achieved have been mainly to the advantage of commerce; the Programme administration has not directly engaged in promoting industries in the region, as its industrialisation committee only carries out the necessary studies to assess the utility and viability of the most desirable industries.

Private enterprise

The construction of industrial estates. In 1960, through promotion by the private enterprise Inmeubles de Querétaro, S.A. and the Banco Internacional

Inmobiliario, S.A., the Zona Industrial de Querétaro was set up in the city of Querétaro, 240 kilometres from Mexico City.

The zone, or industrial estate, has an area of 600 hectares, of which 200 are for industrial use and the rest for shops, parks and workers' housing. The zone is completely developed and has a water supply, sewers and electricity; it is connected by rail and road to the rest of the country.

The industrial plots are sold in areas of two to ten hectares, and prices vary according to location within the zone.[37/] By 1965 eighteen private industrial plants had been set up in the zone, most of them engaged in the production of food items or mechanical and electrical goods.

This industrial zone is developing more rapidly than any other in Mexico. Its location, however, has followed the traditional pattern of industry, namely, excessive concentration in the central portion of the country. This has, nevertheless, helped to advance the economic development of the state of Querétaro, one of the poorest and most backward in the Republic. Although the new industries provide employment for only 800 persons, the multiplier effect of the wages and salaries greatly benefits the region.

State governments

Industrial promotion legislation. To promote the development of manufacturing, the governments of the various states of Mexico have encouraged industrial promotion legislation modelled largely after federal legislation dealing with the promotion and attraction of industries.

The various laws and acts of the states, by which tax exemptions are granted to industrial enterprises established in their territories, might at first sight be considered effective in preventing further aggravation of the problem of geographic concentration of industry (see table 24) within the framework of a general industrial development policy. However, as all states in the Republic have passed laws for the promotion and protection of industry (see table 25), chiefly through fiscal incentives, the entire national territory has been placed on an equal fiscal footing, thus neutralizing the effect of such legislation as a means of attracting manufacturing enterprises to particular areas.

37/ The average price is 26 pesos per square metre for serviced sites and 5 pesos for non-serviced sites.

In addition to deriving no benefits industrially, the states have lost the fiscal income they would have obtained from any new industries in their territories which would have been set up without the incentive of tax exemptions. This is untenable in view of the reduction of their own income and the industrial urbanization work that some states have had to undertake in order to supplement their ineffective legislation to attract industries.[38/]

From another point of view, almost all the state laws offer fiscal advantages to industries that are considered new in the state, adopting a strict criterion in this matter, almost as if each state were a country. This criterion would obviously be uneconomical for Mexico if, for example, an attempt were made to attract a given industry to a particular state by means of tax exemptions, when that industry might be established under optimum locational conditions a short distance outside that state.[39/]

The importance that the establishment of industries - not merely new or necessary industries but any type - may assume for the various states should not be disregarded. State tax exemption laws, however, create obstacles to the economic development of the country as a whole if they are genuinely successful as locational factors, in so far as they reduce the scope of interregional competition and limit the scale of production at which enterprises can operate. In fact, if all existing state legislation achieved its object, there might be a considerable decentralisation of industrial activity, discouraging the development of large plants and favouring the proliferation of small-scale plants. Adopting a purely economic criterion, therefore, it would seem logical to promote the location of industries in places where greater productivity and reduced costs would be ensured by the availability of transport, markets, manpower, electricity and the like. State tax exemptions which, for the sake of fiscal expediency or other reasons, are intended to counter this natural pattern of location, would probably have unfavourable effects on the country as a whole.

38/ J. B. Rey (1964) Justificación y fundamentación económica para una nueva legislación industrial [The justification and economic grounds for new industrial legislation], National School of Economics, National Autonomous University of Mexico (professional thesis), p.23.

39/ C. R. Kolbeck and V. L. Urquidi, op. cit., pp.19-20.

Table 24

Legislation authorizing tax exemption for enterprises, 1940 to first half of 1962

	D	L I T	L F I T	L F I N N	D and L F I I	L I T and L F I T	L F I T and L F I N N	L I T, L F I T and L F I N N	Other	Total enterprises[a]
Baja California (Northern)	-	1	4	-	-	1	1	-	-	7
Baja California (Southern)	-	-	12	-	-	-	-	-	-	12
Campeche	-	-	5	1	-	-	-	-	-	6
Coahuila	-	-	15	2	-	3	1	-	-	21
Colima	-	-	1	-	-	-	-	-	-	1
Chiapas	-	-	2	-	-	-	-	-	-	2
Chihuahua	-	1	12	2	-	1	2	-	-	18
Federal District	11	54	221	32	4	39	18	3	1[b]	383
Durango	-	-	3	1	-	-	-	-	-	4
Guanajuato	1	1	4	3	-	1	-	-	-	10
Guerrero	-	-	2	-	-	-	-	-	-	2
Hidalgo	1	1	3	-	-	-	1	-	-	6
Jalisco	-	3	16	2	1	3	1	2	-	28
México	3	10	58	23	-	6	17	3	1[c]	122
Michoacán	-	-	1	-	-	-	1	1	-	3
Morelos	-	-	-	1	-	1	-	-	-	2
Nayarit	-	1	-	-	-	-	-	-	-	1
Nuevo León	-	9	41	7	-	11	8	1	-	77
Oaxaca	-	-	-	1	-	1	-	-	-	2
Puebla	-	2	9	2	-	-	-	-	-	13
Querétaro	-	1	2	1	-	-	-	-		4
San Luis Potosí	-	1	6	-	-	-	-	1	-	8
Sinaloa	-	-	5	1	-	1	1	-	-	8
Sonora	-	1	12	-	1	1	1	-	1[d]	17

Tamaulipas	-	3	6	1	-	1	-	1	-	12
Tlaxcala	-	-	-	1	-	-	-	-	-	1
Veracruz	-	5	9	-	1	2	-	-	-	18
Yucatán	-	3	1	-	-	-	-	-	-	4
Total	11	97	451	81	7	72	52	12	3	792

Source: Department of Industrial Research, Bank of Mexico, Directory of Industrial Enterprises Granted Tax Exemptions, 1940-1980, and supplements for 1981 and first half of 1982.

Key to abbreviations: D - decree of December 1939; LIT - processing industries act; LFIT - act for the promotion of processing industries; LFIMN - act for the promotion of new and necessary industries.

a/ More enterprises were granted tax exemptions, but some did not make use of them, because they did not manufacture the products for which the exemption was granted, they had been granted the exemption at a time when it was no longer necessary or because they closed down while enjoying exemption. The 792 enterprises include those that closed down after the expiration of exemption.

b/ D, LIT, LFIT

c/ D and LIT

d/ D, LFIT and LFIMN

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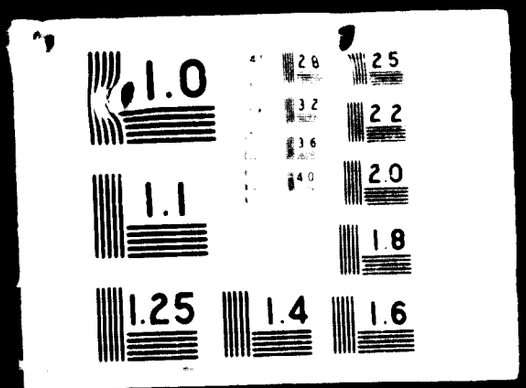

To sum up, local fiscal exemption designed to attract industries is an unimportant locational incentive compared with basic economic factors. Furthermore, if successful, it may hamper the optimum location of industry from the national point of view.40/

By 1965, twenty-eight of the twenty-nine states in the country had enacted legislation to promote the establishment of industries in their territories.41/ Generally speaking, state industrial promotion legislation offers incentives for the creation of new and necessary industries and for the expansion of existing industries. These incentives consist in partial or total exemption from the following taxes: land tax, tax on the transfer of real property, interest on financing capital, and fees for registration in the registry of property. The period in which the exemption is valid varies from two to twenty years; on the average, it is usually between seven and ten years.

Industrial estates. In order to attract industries by more effective means than industrial development acts, some states have promoted the establishment of partially serviced industrial zones or estates, in which lots are offered for sale to manufacturing enterprises interested in setting up business. Estates of this kind have been set up in the states of Jalisco, San Luis Potosí, Guerrero, Tamaulipas and Veracruz. The most important of these zones, in terms of the number of industries already established, is the industrial zone of western Mexico, which was promoted on the initiative of the Government of the state of Jalisco, one of the most dynamic territorial units in the central region.

40/ Ibid., p.20.

41/ The breakdown of this legislation by states is as follows: nine states had an Industrial Promotion Act (Chihuahua, Hidalgo, Jalisco, Michoacán, Nayarit, Puebla, Sinaloa, Tlaxcala and Zacatecas); eight had an Industrial Protection and Promotion Act (Aguascalientes, Guanajuato, Colima, Querétaro, Oaxaca, Tabasco, Tamaulipas and Veracruz); two had an Economic Promotion Act (Baja California and San Luis Potosí); three had an Industrial Protection Act (Guerrero, Mexico and Nuevo León); one had an Act for the Protection of Industry and Investments (Campeche); one, an Act for the Promotion of New Industries and Processing Industries (Chiapas); one, an Act Regulating the Political Constitution of the State (Coahuila); one, an Act on Tax-free Privileges and their Reform (Durango); one, an Act for the Promotion of Investment (Morelos); and one an Act for the Protection of the Processing Industries (Sonora). The only state without industrial promotion legislation is Yucatán.

The zone is located in the immediate vicinity of the city of Guadalajara, the capital of the state, and occupies an area of approximately 2,000 hectares. It is linked by road and rail with the centre and north of Mexico and has abundant water, one of the scarcest resources of the central region. By the end of 1965, two plants producing pharmaceuticals had been established there.

The Federal District

Tax exemption legislation. A large part of the area of Mexico City forms an enclave within the Federal District, which is the seat of the federal administration of the Republic and the most highly industrialized area in the country. At the end of the Second World War, this state pursued a policy of tax exemption to attract industries and thus create employment opportunities and eventually obtain greater revenue from taxes. This type of local exemption system is different from the federal exemption system; federal exemption has no specific locational effects, whereas local exemption is a marginal factor in the location of industry.

Exemption by the Federal District covers two taxes: (a) the land tax on real property intended for use in the exempted industries and (b) the 1.2 per cent payable to the Federal District out of the federal tax on business income. The exemptions may be granted to the so-called "new" industries, that is to say, "those which have initiated or are to initiate the manufacture or production in the country of articles or goods not previously produced there", (article 936, II) and to the "necessary" industries, that is to say, "those whose aim it is to manufacture or produce articles or goods not made in the country in sufficient quantities to satisfy the needs of national consumption" (article 938, III). As a rule, both types of industry receive complete exemption from these taxes during the first three years in which exemption is granted, 50 per cent exemption for three years more and 25 per cent for another three years, the maximum permissible extension being nine years.

The Federal Government has so far granted complete exemption from the following taxes: (a) income tax (b) tax on business income and (c) levies on the importation of materials, machinery, equipment, materials for repairs, ancillary raw materials and semi-finished products, provided that similar articles are not produced in the country. The exemption is granted for ten years to enterprises considered basic to the industrial development of the country, for seven years to those considered "of economic importance" and for five years to others.

Compared with federal exemption, that granted by the Federal District at the end of the Second World War has been insignificant. Its tax exemptions were obviously much less important than those covered by federal exemption and, furthermore, exemption was granted for shorter periods. The tax on industrial profits and the customs duties from which exemption was granted are probably more important alone than all Federal District taxes combined (whether the latter are included in the exemption or not). These two exemptions granted by the Federal Government for a total of ten years carried far more weight in the investment decisions of private individuals than any exemptions granted by the Federal District.[42/]

At the end of 1955, this system ceased to apply in the Federal District and no exemptions are being continued. Of the two taxes from which exemption was granted, the land property tax had a very small yield and its influence on industrial costs was minimal. The tax on business income, although higher, represented no more than 1.25 per cent of sales and, at the same time, a varying amount of profits, depending on the efficiency of the various enterprises.[43/] To sum up, while tax exemption by the Federal District was in force, it did not constitute a powerful fiscal incentive for the establishment of enterprises either in respect of the amount of tax exemption or in relation to the level of industrial profits.

The main branch of industry to benefit from the District exemption law was metal manufactures, with a total of twenty-three enterprises, followed by the chemical industry and the production of electrical equipment and appliances, both with nineteen enterprises, and the production of machinery and accessories with eighteen. Together, these accounted for 54 per cent of the enterprises exempted. The remaining 46 per cent represented sixteen branches of industry and nine enterprises that were not classified. The labour force employed by the exempted enterprises totalled about 15,000, that is, about 5 per cent of the total labour force of the Federal District in 1950.[44/]

Restrictions on industrial estates. At the beginning of 1963, in view of the scarcity of resources for investment and in order to limit the horizontal expansion of Mexico City and thus be able to meet the growing demand for public

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42/ G. R. Kolbeck and V. L. Urquidi, op. cit., pp.53-54.

43/ Ibid., p.59.

44/ Ibid., p.23.

works and services springing from the rapid population growth, the Government of the Federal District revised its building regulations, introducing amendments to restrict the subdivision of lots and to prohibit the establishment of new residential districts. However, instead of mitigating the serious urban problems of this large metropolitan area, these measures accelerated the spread of urbanization to municipalities in the state of Mexico adjacent to the Federal District. Moreover, this policy favours the owners of undeveloped land, agents authorized to divide land into lots and owners of apartment buildings by fostering a constant rise in rents.

Indirect measures to influence the geographic distribution of industry

Federal public sector

Industrial promotion legislation. Another factor that may have motivated or at least facilitated the establishment of industrial enterprises in the country has been the legislation passed for this purpose. The year 1939 saw the enactment of an industrial promotion act, entitled the General Act on Processing Industries, which was amended in 1941 and 1946. Under this act, various exemptions from federal taxation were granted to all new or necessary industries established in the national territory or to established industries that met the relevant legal requirements. The act was repealed in 1955 with the promulgation of the Act for the Development of New and Necessary Industries, whose purpose is to stimulate industrialization through exemption from stamp duty, from levies on imports and exports, business income and private income, for fixed amounts and for periods of ten, seven or five years, according to the merits of each particular case. For the application of these exemptions, industries are divided into new and necessary industries and are further classified as basic, semi-basic and secondary.

Under the act, basic industries are considered to be those producing raw materials, industrial machinery, equipment or vehicles for industry or agriculture. Semi-basic industries are those producing goods to satisfy vital needs of the population, tools and scientific instruments for industry or agriculture, or products for important industrial activities. Secondary industries are those producing luxuries or non-essentials.

For the period 1939-1943 there are no reliable data on the amount of fiscal earnings foregone by the Federal Government in respect of the enterprises that enjoyed such exemption. From 1949 to 1960, however, this loss was slightly less than 1,000 million pesos at current prices - a direct fiscal sacrifice originating from the exemptions, as distinct from the loss of income by the Government on cessation of the importation of certain goods because of the production of similar goods in the country itself, which could be called an indirect fiscal sacrifice.[45]

Initially, and in view of the urgent need to accelerate the country's development, exemptions were granted without making any considerable demands on applicants. The main purpose was to attract investment, whatever its origin, quantity, quality, object and geographic location. With the passage of the years and with the economic progress of Mexico, the Government revised its policy on exemption, passing from a broad degree of liberality to selectivity. Nevertheless, existing legislation still contains no measures aimed at directing industry towards zones which have suitable resources for industrial processing or expanding markets, but which have remained on the fringes of industrial development.

Between 1940 and the first half of 1962 a total of 792 enterprises were granted tax exemptions under the various industrial promotion acts;[46] 505 (64 per cent) were located in the Federal District and in the state of Mexico, 77 (10 per cent) in the state of Nuevo León and 210 (26 per cent) in the rest of the country. Thus, the Federal Government has indirectly and accidentally favoured certain regions of the country through its general tax exemption policy. This means of industrial promotion might substantially aid the development of manufacturing and help to ensure better use of the resources available in the various regions, if the legislation provided for measures to

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45/ General Directorates of Financial and Press Studies, Ministry of Finance and Public Credit (1960) La Hacienda Pública Federal [Federal Public Finance], p.39.

46/ In actual fact, more enterprises were granted tax exemptions, but some did not make use of them, because they were not fully established, did not manufacture the products to which exemption applied, had been granted the exemption at a time when they no longer needed it or because they closed down while enjoying exemption. The 792 enterprises include those that closed down after the expiry of their exemption. See Department of Industrial Research, Bank of Mexico, Directory of Industrial Enterprises Granted Tax Exemptions, 1940-1960, and supplements 1961 and first half of 1962.

achieve a better geographic distribution of national industry. Table 4 shows the geographic location of the exempted plants as well as the industrial sects under which they were exempt.

The main industries enjoying exemption are: those that produce metal goods, electrical goods, machinery and equipment, with 265 enterprises (33 per cent of the total); those producing chemicals and chemical products, with 119 plants (15 per cent); those producing food products and beverages, with 104 enterprises (13 per cent); and the iron and steel industry with 45 plants (6 per cent). See table 25.

To permit the renewal of equipment of each enterprise the reinvestment of 10 per cent of the distributable profits has been allowed since 1949. In 1954 the percentage was increased by a further 20 per cent, which means that 30 per cent of the profits may be reinvested without any corresponding payment of taxes.

In addition to this industrial promotion policy there are measures to protect established industries under the General Import Tariff Act which imposes high to prohibitive charges on the import of goods produced in the country, thus inducing the consumer to choose domestic products. At the same time, raw materials that must be imported are either taxed lightly or not at all, and direct control of imports is ensured by prohibitions and special licences. On the other hand, the General Export Tariff favours the export of finished or semi-finished goods rather than raw materials, in order to encourage processing within the country.[47] None of these laws, however, includes measures affecting the geographic distribution of industries.

The National Finance Corporation. This is the chief agency for industrial promotion in the country. It was established in 1934, benefiting from the experience of the investment bank founded in Europe during the second half of the nineteenth century and of the first development banks.

In 1941 the corporation was assigned its present task of promoting economic development, at first by sponsoring projects designed to offset the scarcity of products arising out of the war and by intervening in the stock market to capture a large portion of domestic savings. There is no doubt that

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47/ S. M. Sánchez (1965) La concentración industrial en el área metropolitana de la Ciudad de México [Industrial Concentration in the Metropolitan Area of Mexico City], National School of Economics, National Autonomous University of Mexico (professional thesis), p.56.

Table 25

Industries enjoying tax exemptions, by branch of industry, 1940 to first half of 1962

	BASIC INDUSTRIES						OTHER MANUFACTURING INDUSTRIES								Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Baja California (Northern)							5			1	1				7
Baja California (Southern)												1		11	12
Campeche							6								6
Coahuila		4					4			3	9	1			21
Colima							1								1
Chiapas								1		1					2
Chihuahua		5		1			8		1	1	1			1	18
Federal District		9	2	7	10		26	20	7	52	178	14	1	57	383
Durango		1					2							1	4
Guanajuato			1	1			4			1	3				10
Guerrero							1	1							2
Hidalgo				2							1	1	1	1	6
Jalisco		1		1			5	4	2	4	6	1		4	28
México		12		7	6		5	13	8	28	31	6		6	122
Michoacán										3					3
Morelos				1						1					2
Nayarit							1								1
Nuevo León		8	1	13	1		4	1	2	6	29	3		9	77
Oaxaca				1					1						2
Puebla		3	2	1				2			4			1	13
Querétaro							2	1			1				4
San Luis Potosí							2		1	5					8
Sinaloa				1			3	1				2	1		8
Sonora				2			12			1		2			17

	BASIC INDUSTRIES						OTHER MANUFACTURING INDUSTRIES								Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Tamaulipas							5			6		1			12
Tlaxcala							1								1
Veracruz		2					6		3	2	1	1		3	18
Yucatán							2						2		4
Total		45	6	38	17		105	44	25	115	265	33	5	94	792

Source: Industrial Research Department, Bank of Mexico, Directory of Industrial Enterprises Enjoying Tax Exemptions, 1940-1960, and supplements for 1961 and first half of 1962.

Note: The figures 1 to 14 of the column headings indicate the following branches of industry: (1) Coal, petroleum and its derivatives; (2) Iron and steel; (3) Non-metallic minerals; (4) Cement and other building materials; (5) Non-ferrous metals; (6) Generation of electric energy; (7) Food products, beverages and similar products; (8) Textiles, footwear and other garments (including hard-fibre textiles); (9) Paper, cellulose and paper products; (10) Chemicals and chemical products; (11) Metal products and electrical goods, machinery and equipment; (12) Transport equipment; (13) Sawmills and (14) Other.

the industrial progress made by the country in recent years is largely the result of the work of the National Finance Corporation which, through its banking and promotion activities, has channelled resources and established enterprises in branches of industry that contribute to the economic integration of the country, in addition to undertaking large infrastructural investments.[48]

Notwithstanding its resources and powers, the National Finance Corporation has not directly intervened in the geographic distribution of industry except with regard to the founding of Ciudad Bernardino de Sahagún. However, it has promoted the establishment and expansion of a large number of enterprises in the central and northern regions of the country. As shown in table 26, 46.9 per cent of the loans granted by the National Finance Corporation up to 1963 went to the Federal District and the state of Mexico and 14 per cent to the states of Coahuila and Nuevo León.

The work of this agency, which has considerable resources and is empowered to carry out systematic industrial promotion studies, will probably be more effective when its programmes form part of a national industrialization plan, which the country still lacks.

Guarantee fund. The Guarantee and Promotion Fund for medium- and small-scale industry was set up in 1953 to meet the credit needs of small- and medium-scale manufacturers through private credit institutions, and particularly deposit banks and finance companies. It has been of outstanding assistance in stimulating the industrial development of Mexico.

The fund grants loans for equipment and repairs to small- and medium-scale manufacturers according to their needs and the book value of the enterprise's capital. The small-scale industries established in the metropolitan areas of Mexico City and Monterrey, which are considered zones of industrial concentration for the purposes of fund operations, must have a book-value capital of not less than [illegible],000 pesos. In the case of small-scale industries established in the rest of the country, a minimum of 25,000 pesos is required. However, this difference is so slight that it has not significantly affected the geographic distribution of enterprises.[49]

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[48] V. P. Salas (1963) Las instituciones nacionales de crédito; México - 50 años de Revolución [National Credit Institutions, Mexico - 50 years of Revolution] 1, La Economía, Fondo de Cultura Económica, Mexico, pp.431-432.

[49] It is interesting to note that 60 per cent of the loans granted by the fund were not greater than [illegible],000 pesos and that the average was 85,000 pesos.

Table 26

Geographical breakdown of the main financing activities of the National Finance Corporation

Balances for 31 December 1963

	Number of enterprises	Amount of finance (thousand pesos)	Per cent
Baja California (Northern)	6	371,439	4.3
Baja California, (Southern)	1	10,547	0.1
Coahuila	5	779,403	9.0
Chihuahua	7	192,346	2.2
Federal District	35	3,670,656	42.2
Durango	1	7,585	0.1
Guanajuato	2	8,780	0.1
Guerrero	5	57,714	0.7
Hidalgo	4	1,121,556	12.9
Jalisco	7	181,789	2.1
México	17	4 0,253	4.7
Michoacán	1	2,571	0.0
Morelos	1	2,939	0.0
Nuevo León	6	434,974	5.0
Oaxaca	4	264,950	3.0
Puebla	3	18,185	0.2
Quintana Roo	1	14,380	0.2
San Luis Potosí	3	130,519	1.5
Sinaloa	8	122,581	1.4
Sonora	1	2,075	0.0
Tobasco	1	2,500	0.0
Tamaulipas	2	105,562	1.2
Veracruz	12	783,222	9.0
Yucatán	1	8,791	0.1
Total	134	8,705,417	100.0

Source: National Finance Corporation (1963) Annual Report.

By 1965, the fund had granted financial support to 3,559 enterprises, of which 1,971 (55.4 per cent) were located in the Federal District and in the state of Mexico, and 226 (6.3 per cent) in the state of Nuevo León. Of the total loans granted, 88.4 per cent went to the ten most highly industrialized areas in the country[50] (see table 27) benefiting about 3,000 enterprises and giving employment to more than 130,000 workers. Thus, the fund has fortuitously helped to promote the growth of industrial development in the most highly industrialized areas, contributing to further congestion of manufacturing activity.

Public works policy. The public sector indirectly influences the location of industrial enterprises through its infrastructural works policy. In the period 1959-1965, total gross capital investment in Mexico was 167,000 million pesos, 38.4 per cent being in the public sector and the remaining 61.6 per cent in the private sector.[51] Public action is basically directed towards promoting productive activity, and particularly the construction of roads and railways, irrigation systems, the generation of electricity and industrial development. These categories have accounted for about 72 per cent of total capital investment by the public sector in recent years. Furthermore, in the last decade there has been a relatively large increase in public investment for social development projects such as schools, housing, hospital and welfare facilities, the supply of drinking water and the construction of sewers.

Thus far public investment has not been incorporated into a national development plan so as to permit more harmonious development of the country. The government's most pressing concern in recent years has been to obtain foreign exchange in order to maintain the high rate of economic growth, which is indispensable if the domestic market is to be substantially expanded for the benefit of industrialization.

As a result of this situation, investment has been directed mainly towards states that offer the greatest possibilities for economic expansion, because

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50/ These areas are: the Federal District, Mexico, Nuevo León, Veracruz, Coahuila, Jalisco, Chihuahua, Tamaulipas, Guanajuato and Puebla.

51/ Directorate of Public Investments, Ministry of the Presidency (1964) México: Inversión Pública Federal 1925-1963 [Mexico: Federal Republic Investment 1925-1963], Mexico.

Table 27

Geographic breakdown of loans granted by the guarantee and promotion fund to medium- and small-scale industry

(Cumulative figures for the period April 1954 to 31 December 1965)

	Number of enterprises	Per cent	Amount (thousand pesos)	Per cent
Federal District	1,729	48.6	689,218	52.5
Aguascalientes	34	1.0	13,819	1.1
Baja California	19	0.5	6,485	0.5
Chiapas	77	2.2	6,186	0.5
Chihuahua	53	1.5	20,691	1.6
Coahuila	62	1.7	20,244	1.5
Colima	7	0.2	2,590	0.2
Durango	23	0.6	10,177	0.8
Guanajuato	277	7.8	69,660	5.3
Guerrero	16	0.4	4,564	0.4
Hidalgo	10	0.3	7,050	0.5
Jalisco	145	4.1	42,943	3.3
México	242	6.8	180,971	13.8
Michoacán	32	0.9	8,768	0.7
Morelos	19	0.5	14,635	1.1
Nayarit	2	0.1	521	0.0
Nuevo León	226	6.3	78,634	6.0
Oaxaca	227	6.4	9,830	0.7
Puebla	73	2.1	37,105	2.8
Querétaro	13	0.4	4,263	0.3
San Luis Potosí	58	1.6	12,443	0.9
Sinaloa	31	0.9	9,699	0.7
Sonora	84	2.4	20,859	1.6
Tabasco	4	0.1	1,771	0.1
Tamaulipas	33	0.9	13,062	1.0
Tlaxcala	12	0.3	10,805	0.8
Veracruz	42	1.2	10,643	0.8
Yucatán	8	0.2	5,011	0.5
Zacatecas	1	0.0	500	0.0
Total	3,559	100.0	1,313,147	100.0

Source: Guarantee and Development Fund for Medium- and Small-scale Industries.

of abundant natural resources that can easily be exploited, or a relatively developed infrastructure which has favoured a degree of industrial growth that should be further stimulated. Under these circumstances, it is logical to suppose that the most industrialized territorial units obtain the greatest volume of public investment, as is illustrated in table 28 following.

Table 28

Percentage of total public investment intended for the most industrialized federal states in 1959-1965

	Total investment	Promotion of agriculture and animal husbandry[a]	Industrial promotion[b]	Social welfare[c]
Federal District	21.7	2.5	6.7	64.8
Mexico	4.2	5.1	4.1	3.4
Nuevo León	2.7	1.5	3.7	1.3
Veracruz	9.7	2.4	16.7	2.1
Coahuila	4.6	2.8	7.3	1.8
Jalisco	3.0	2.2	3.2	1.4
Chihuahua	3.6	4.3	2.4	1.6
Tamaulipas	6.7	5.0	11.7	2.7
Guanajuato	2.6	2.3	4.1	0.7
Puebla	2.7	0.5	4.2	0.8
Total	61.5	28.6	64.1	80.6

a/ Agriculture, animal husbandry, forestry, hunting and fishing.

b/ Fuels, chemicals, fertilizers, iron and steel, mining, food and beverages, paper, wood, publishing and other industries.

c/ Public services, hospitals and welfare centres, education and research, housing and community development.

In the light of these figures, it is not surprising that the national industry has tended to be concentrated in a few territorial units of the country, excluding the rest of the country from the beneficial effects of industrialization. Unfortunately, as has been pointed out in earlier sections, until a few months ago there was no national development plan in which to integrate the growth of subdivisions of the territory; there is still no

comprehrensive industrial development programme that would make it possible to orient the geographic distribution of manufacturing activity within the general objectives of Mexican industrial and social development policy.

In the future, public investment policy could play a predominant role in the geographic distribution of national industry by encouraging and introducing incentives in the less developed areas in order to create a climate favourable to the development of manufacturing. Otherwise, it will be difficult for the country to continue the rapid expansion of the domestic market, an essential requirement for maintaining the acceleration of economic growth achieved in recent years.

Policy on electric energy and fuels. The state has actively intervened in the production of electricity and fuels and, at the moment, has complete control of these important sectors of the national economy. Before the industry was nationalized in 1960, electrification tended to be determined by economic growth in the more rapidly expanding sectors or zones of activity rather than by a deliberate promotion plan. Hence, the enormous concentration of electrical installations in the main centres and their relative stagnation in the less dynamic zones (see table 29). Accordingly, the main features of national electricity development up to that date were: an imbalance in the regional growth of the electricity industry, scant progress in rural electrification, and little electrification of new zones or sectors.[52/] The pattern of electricity charges was one of low average prices per kWh in communities with greater demographic concentration and higher prices in the small communities with a lower degree of economic development. The situation was thus biased in favour of the most highly industrialized states, with the largest per capita incomes.

Nation-wide rates were introduced at the beginning of 1962 in order to standardize electricity prices for the same type of service throughout the country. However, this is not equitable as the richer zones with high per capita incomes are specially favoured. Consideration is now being given to the possibility of setting different prices per kWh according to the capacity of the consumers to pay and the degree of development of each region; this

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52/ C. L. Beautell (1960) La industria de energia elétrica; México - 50 años de Revolución [The electricity industry; Mexico - 50 years of Revolution], La Economía, Fondo de Cultura Económica, Mexico, pp.251-255.

Table 29

Installed generating capacity of power stations in the Republic of Mexico, 1960

Political divisions	Thousand kW	Per cent
National total	2,918.3	100.0
Aguascalientes	12.2	0.4
Baja California (Northern)	7.1	0.2
Baja California (Southern)	8.4	0.3
Campeche	8.0	0.3
Coahuila	79.7	2.7
Colima	4.4	0.2
Chiapas	14.5	0.5
Chihuahua	131.6	4.5
Federal District	165.4	5.7
Durango	137.2	4.7
Guanajuato	61.3	2.1
Guerrero	27.5	0.9
Hidalgo	18.0	0.6
Jalisco	134.7	4.6
México	545.0	18.7
Michoacán	177.3	6.1
Morelos	15.1	0.5
Nayarit	12.0	0.4
Nuevo León	238.0	8.2
Oaxaca	175.0	6.0
Puebla	287.8	9.9
Querétaro	8.3	0.3
Quintana Roo	1.6	0.1
San Luis Potosi	34.4	1.2
Sinaloa	85.2	2.9
Sonora	108.3	3.7
Tabasco	15.0	0.5
Tamaulipas	124.1	4.3
Tlaxcala	1.0	0.0
Veracruz	225.5	7.7
Yucatán	24.3	0.8
Zacatecas	30.4	1.0

Source: Reports of electricity enterprises and power stations of the Mexican Republic, Federal Electricity Commission, Mexico.

should be a considerable incentive for promoting the industrial development of regions that are relatively less developed economically.

Through the decentralized agency Petróleos Mexicanos, the state is responsible for the production and national distribution of gas and petroleum products. Natural gas is so cheap in comparison to any other source of energy that its occurrence or absence is a determining factor for the installation of various industries. A large proportion of the industrial growth of Monterrey is attributable to the fact that it has had natural gas since 1926, that is, almost twenty-five years earlier than any other city.[53/] Up to 1950, the market for natural gas was limited to this city and to the frontier communities of Ciudad Juárez, Nuevo Laredo, Naco and Piedras Negras. Between 1950 and 1962 the structure of the market for natural gas changed when pipelines supplying the central region of the country were brought into service.[54/] In the last year of this period, 51 per cent of national consumption was absorbed by the metropolitan area of Monterrey, and 33 per cent by Valle de México, the remaining 16 per cent being distributed among other localities.[55/] The network of pipelines for gas and other products has been extended from the production zones to Monterrey, Torreón and Chihuahua in the northern region and Mexico City, Salamanca and Guadalajara in the central region, with branches to supply major industries.

To sum up, the Government policy with regard to electricity, gas and petroleum products has favoured the growth of manufacturing in the northern and central regions of the country, again leading to a greater degree of industrial concentration.

Transport policy. Because of the topography of Mexico, rail and road transport predominate. Industrial development requires a widespread network of roads and railways, a rapid delivery service and reasonable freight charges.

Areas with the best rail links are in the central region, and especially the metropolitan area of Mexico City, from which almost all railway lines and

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53/ P. L. Yates, op. cit., p.166.

54/ R. G. Gómez (1964) Producción y mercado del gas natural en México [The Production of Natural Gas in Mexico and its Market], National School of Economics, National Autonomous University of Mexico (professional thesis), p.36.

55/ Ibid., table 40.

the most important roads originate. Consequently, raw materials can easily be sent to the centre from all points in the country. It should be pointed out that the rail freight tariffs have been formulated in such a way as to force industry towards the central regions; as a rule, raw materials, especially minerals, pay the lowest rates, while finished products and dangerous products pay the highest rates. The rationality of this pattern has been disputed for many years because it favours the long-distance transport of raw materials and restricts finished products to short distances, resulting in a concentration of processing industries in the principal centres of consumption, despite the distance from sources of raw materials.[56] This freight pattern is an unfortunate reminder of the days when railways operated for the benefit of the mining enterprises, and it has been unsuitable for the requirements of national development and has encouraged the centralization of industry.[57]

Policy on other matters. Policy on other matters has undoubtedly been of importance with regard to the geographic distribution of manufacturing activities, particularly policies concerning wages, industrial training and higher education in science and technology.

Industries tend to be established in areas where there is cheap labour - that is, cheap in terms of output, or, in other words, in terms of the quantity of output per unit of wages. Accordingly, the manufacturer is sometimes more interested in "expensive" labour, owing to its greater productivity. Even though there may be a more abundant and cheap supply of labour in the rural districts, labour may be more economical in the large cities, because it is more adaptable to new processes and because the workers are already trained. It would, therefore, seem that the fundamental consideration in the location of Mexican industries has been not the relative cheapness of labour but the availability or non-availability of skilled labour to carry out industrial processes with efficiency.[58]

All these factors suggest that the attraction of the low wages in certain zones has not been sufficiently powerful to divert the flow of new enterprises

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[56] N. D. Lees (1965) Localización de industrias en México [The Location of Industry in Mexico], Industrial Research Department, Bank of Mexico S.A., Mexico, pp.51-52.

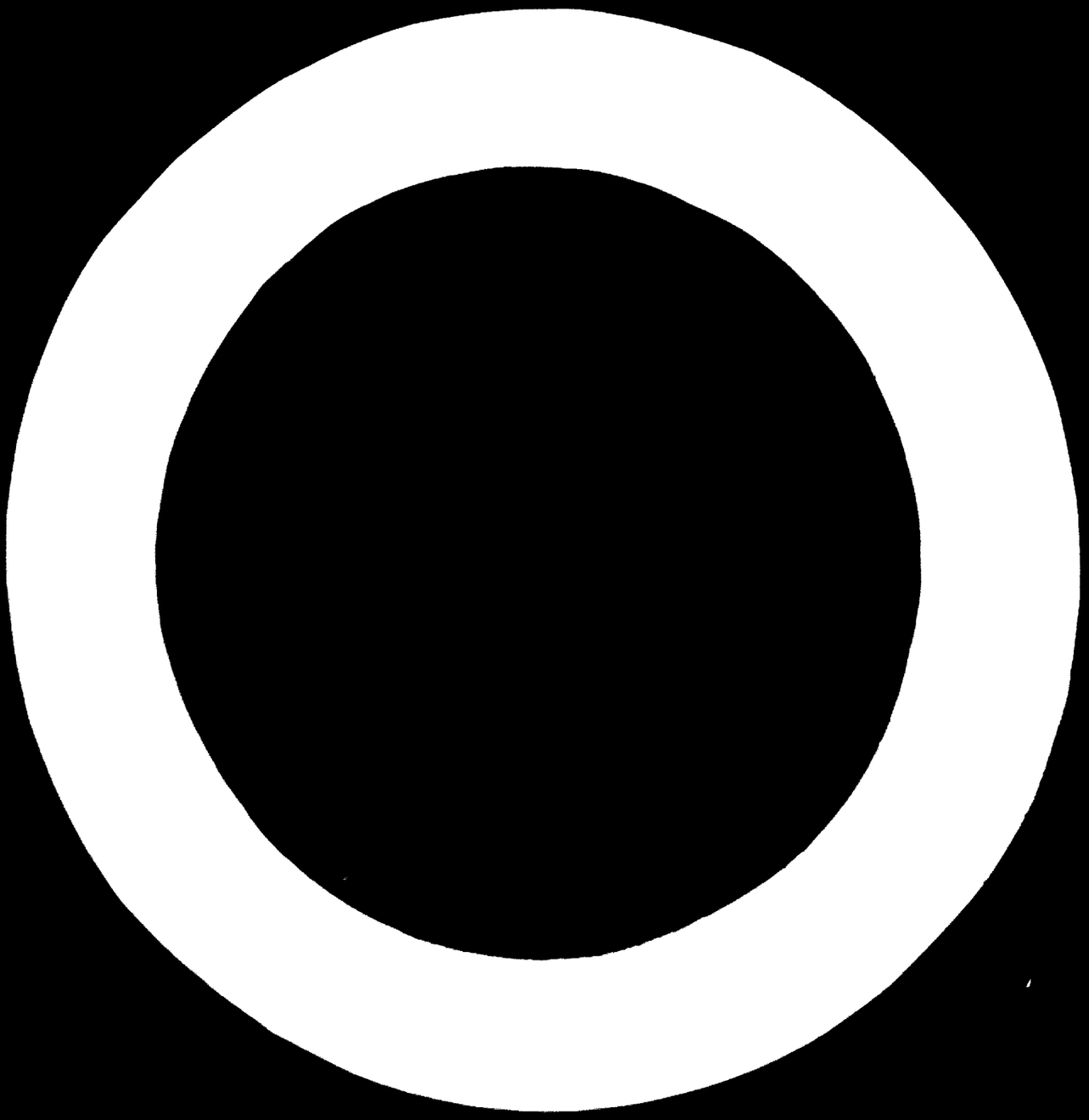
[57] F. L. Yates, op. cit., p.171.

[58] G. R. Kolbeck and V. L. Urquidi, op. cit., p.38.

towards such zones, and that industries have been drawn to centres with skilled labour rather than to zones with cheap labour.

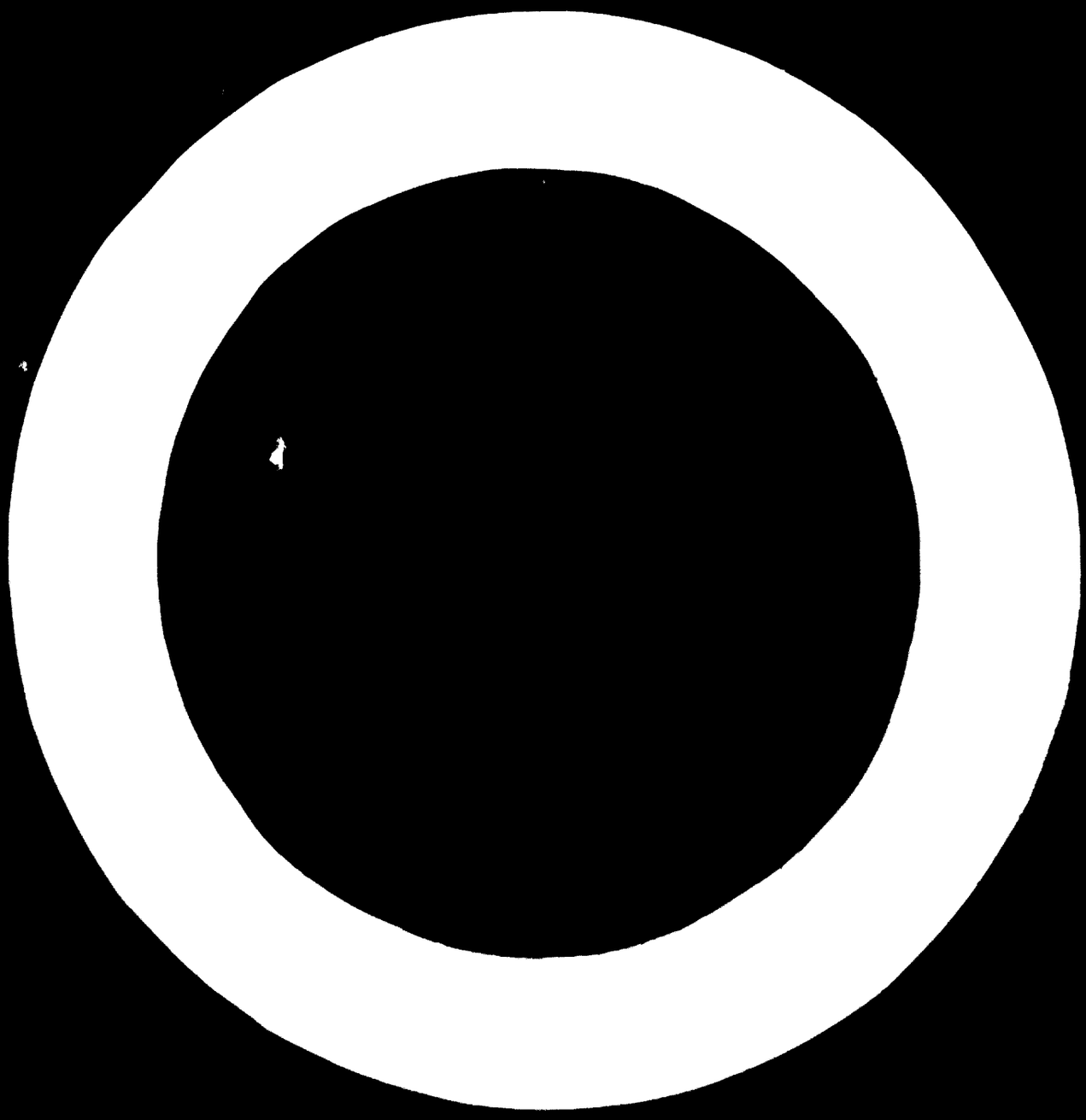
This process, by encouraging the concentration of the various branches of industry in two or three main territorial divisions, has helped to build up a labour force geared to industrial work and has tended to increase and perpetuate concentration in the more highly developed areas, particularly the Federal District.

Through its policy of training industrial manpower the federal Government has indirectly helped to accelerate the above-mentioned process by establishing its industrial training centres in the most highly industrialized areas. In fact, of the ten training centres existing in 1965, four were in the Federal District and one in each of six areas: Jalisco, Nuevo León, Guanajuato, Coahuila, Puebla and Veracruz, that is, those with the highest degree of manufacturing development. Thus, the industrial development of areas with relatively less economic development has not been promoted but rather the expansion of the most developed areas. The most highly skilled technical personnel have been channelled towards these areas and the professional skill of manpower employed in industry has been raised.



PART V COUNTRY EXPERIENCE

1. Industrial location and regional development in Chile, by ODEPLAN
2. Patterns and problems of industrial location in Pakistan, by S. M. Husain
3. Industrial location and regional development in Ghana, by the Ministry of Economic Affairs, Accra, Ghana
4. Industrial location and regional development in Burma, by Khin Saw



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1. INDUSTRIAL LOCATION AND REGIONAL DEVELOPMENT IN CHILE[1]

The development of the economy of Chile has been characterized by a progressive concentration of economic activities in a few centres, especially in the capital city of Santiago. Because the location of industrial activities has brought about a marked imbalance in the stages of development of the various regions of the country, in recent years efforts have been made to remedy this imbalance by introducing systematic planning of the national economy, particularly planning at the regional level.

A regional development policy has been set up based on the establishment of development priorities for each region of the country. The functions of a system of development poles have been defined, and the establishment of regional considerations have been taken into account in the programmed development of the various sectors of the economy. Within this policy, a fundamental role is played by the various aspects of the location of industrial activities, which is the moving force in development. Priorities have been determined that specify regions and urban centres where various industrial groups should be located, and implementation measures have been prepared for securing compliance with these priorities. Among the promotional measures, the most important are those concerned with the policy of establishing industrial estates and the policy of granting certain privileges to industrial enterprises according to the activity and the region involved.

Although regional planning and programming of industrial location is comparatively recent in Chile, the policies referred to above have been well established and work continues on the preparation and development of new methods of analysis and programming.

1/ Presented by ODEPLAN, National Planning Office, Office of the President of the Republic of Chile.

Characteristics of the country

Of all South American countries, Chile is the most distant from Europe and the Mediterranean. Its "off-the-beaten-track" position is accentuated by strongly marked natural boundaries: to the north the country is separated from Peru by one of the most arid deserts in the world; to the south is the meeting point of the Atlantic and Pacific Oceans; to the east Chile is separated from Bolivia and Argentina by the Andes; and to the west lies the Pacific Ocean. The fabled Easter Island (Rapa-Nui), which could be a strategic point for future air links with Polynesia and Asia, is owned by Chile.

The insular position of Chile kept the country out of the great migration streams of the nineteenth century, but at the same time it has fostered the formation of a homogeneous people with distinct national characteristics through the blending of Spanish and indigenous Chilean stocks. These ethnically, linguistically and culturally homogeneous people, living in one of the most remote areas of the world, have been obliged to struggle to overcome natural adversities and thus have developed a strong spirit of enterprise. Although Chile is larger than most European countries, it has a population of less than nine million.

The comparatively low population density is partly accounted for by the fact that 50 per cent of the land area of Chile is made up of deserts, mountain ranges and other types of terrain unsuitable for habitation. Chile is 4,200 kilometers long (equivalent to the distance between Stockholm and Morocco), but its average width is only 190 kilometers.

The political stability of Chile has helped to achieve a continuity in the application of recommendations made by planning bodies and various government ministries.

System of planning

Although various sectoral plans were prepared in Chile in the past for industry, power, transport, and agriculture and stock-raising, they were, for the most part, unco-ordinated. The realization of the need to co-ordinate plans within a national development plan brought about the establishment of the National Planning Office (ODEPLAN) in 1965.

ODEPLAN is responsible for the entire planning system of Chile and advises the President of the Republic directly, prepares the national development plan, regional development plans, and orients and harmonizes sectoral plans. Financing of the national development plan is administered by the Ministry of Economic Affairs and the Central Bank of Chile. At the sectoral level, planning is carried out by the planning and budget departments within each of the ministries responsible for the sectors such as those of agriculture, mining, public works and transport, housing and town planning, education and health.

With the preparation of the national and sectoral plans, regional development plans, dovetailing with the sectoral plans, are prepared for the various geo-economic regions of the country (figure 1). Planning at this regional level is carried out directly by ODEPLAN through its regional planning offices located throughout Chile.

The systematic incorporation of regional planning within the general planning system has made it possible to give the objectives of the national plan a geographic aspect, thus making them more concrete and realistic and ensuring a balanced and integrated development of each region and of the country as a whole.

Regional development policy

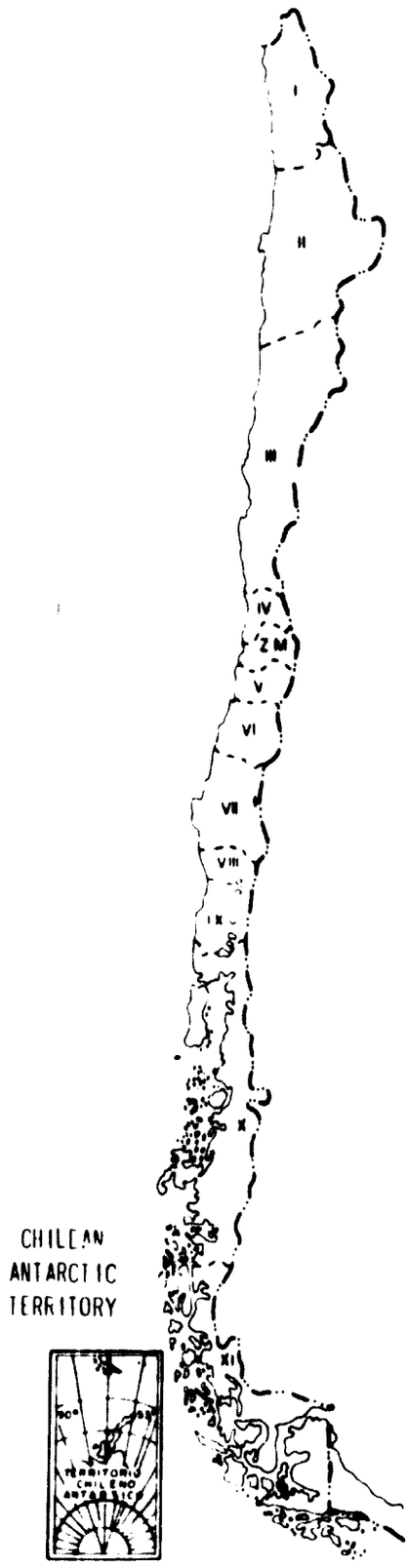
Chile, like many other Latin American countries, suffers from the excessive concentration of industrial investment in a few urban centres. In Chile there are three such centres including Santiago, the capital.

Excessive concentration, which has resulted from heavy investment in industry and in other sectors, both public and private, has been aggravated by the concentration of innumerable service activities. Urban development has been so extensive that it has practically halted the growth of rural areas.

Technological advances in the industrial sector, which is the most dynamic and which provides the largest number of jobs, have made it necessary to establish large plants in order to effect economies of scale. These large plants tend to be located only in centres that offer the specialized services essential for their operation, and where there is ready access to markets for the sale of their goods.

Figure 1

Geo-economic regions of Chile



REGIONS:

I TARAPACA

II ANTOFAGASTA

III ATACAMA
COQUIMBO

IV ACONCAGUA
VALPARAISO

Z.M. SANTIAGO

V O'HIGGINS
COLCHAGUA

VI CURICO
TALCA
MAULE
LINARES

VII ÑUBLE
CONCEPCION
ARAUCO
BIO-BIO
MALLECO

VIII CAUTIN

IX VALDIVIA
OSORNO

X LLANQUIHUE
CHILOE
AYSEN

XI MAGALLANES

Source: National Planning Office, Santiago, Chile, 1968.

The rapid development of transport, particularly the construction of highways, has added large consumer areas to those that can be reached at economical rates.

The excessive concentration of industrial investment in a few urban centres has helped to weaken the peripheral regions, which represent the major part of the territory of Chile. The imbalance between the regions of the country is characterized by pronounced inequality of development and aggravated by marked emigration, particularly of young people moving to the capital area. The peripheral regions are constantly seeking aid from the central Government to combat the weakening of their economies.

The response to these regional requests has often been determined by political or circumstantial reasons, giving rise in some regions to industrial development of an artificial type based on exaggerated tax or customs exemptions granted by the Government in order to attract investors from foreign countries or from other areas of Chile.

This procedure seriously jeopardizes the future development of the country and involves a high social cost which has to be paid by the whole community.

In order to establish a basis for a more practical type of industrial growth and to fulfil the development requirements of the various regions of Chile within the national context, a regional development policy has been formulated at the national level based on poles of development, regional priorities and functions determined for a multi-sectoral development.

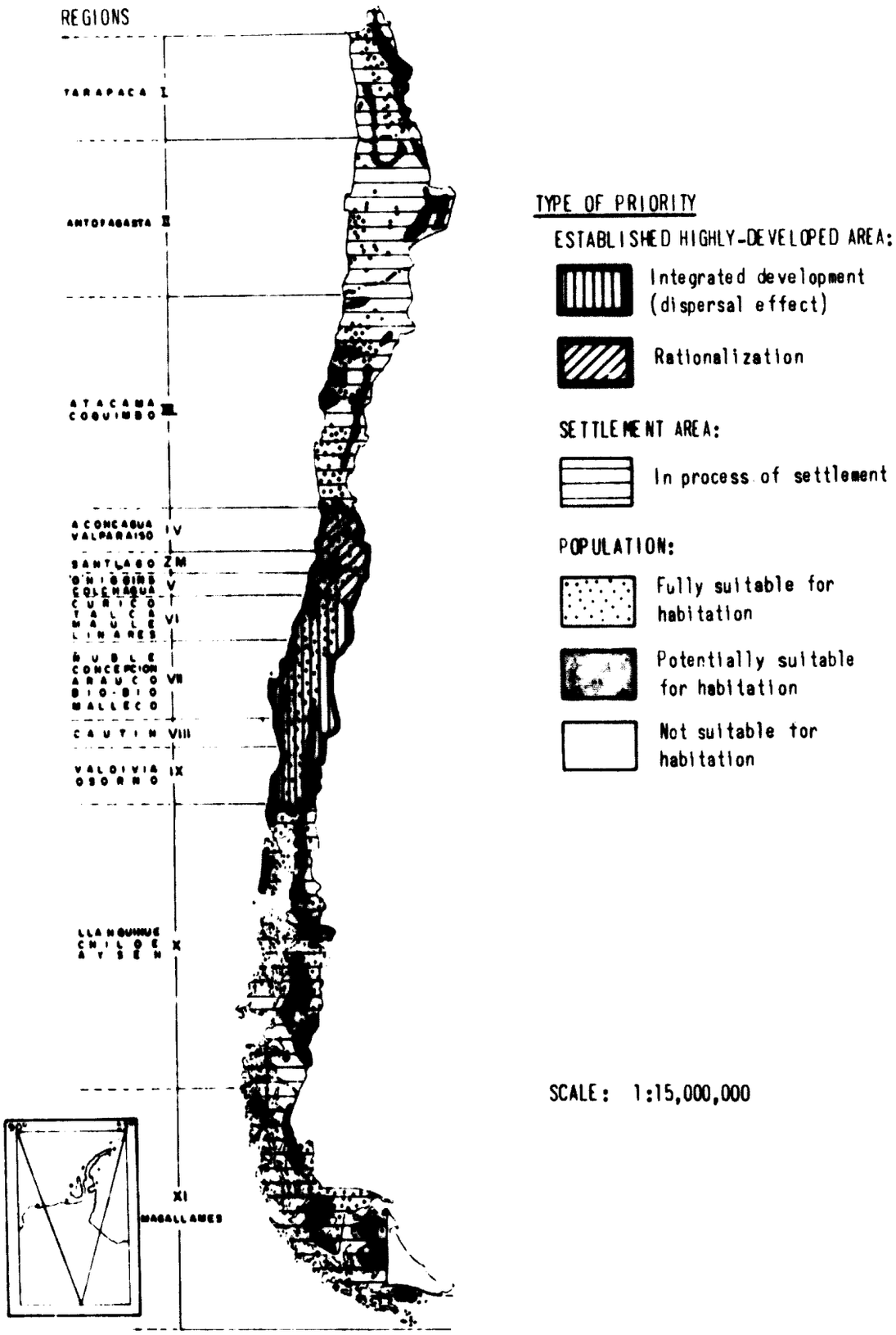
Regional priorities

The type of policy to be applied as a matter of priority in the regions of Chile must be defined in the light of the various levels and types of regional development (figure 2).

A policy of "integral development with a dispersal effect" is proposed for the four geographic regions of the central valley which extend from the region of Maule to the region of Los Lagos. Agriculture and stock raising predominate in this large area, but important urban centres are also located there, thus the potential exists for a more dynamic development in terms of new industries and the creation of specialized services. The policy aims to achieve integral development on a multi-sectoral basis in agriculture, fishing,

Figure 2

Types of development priorities



Source: ODEPLAN, Regional Planning Department, National Planning Office, Chile, 1968.

forestry and manufacturing, and to establish systems of transportation and communications that will link the poles of development with their respective areas of influence.

Basic industries processing raw materials that are expensive to transport must become established in these regions and develop into modern, dynamic development agents. Among such industries are paper and cellulose, beet sugar, fruit and vegetable canning and packing, slaughter-houses with cold storage facilities, and industries derived from agriculture in general. Other developments should include small and medium-scale industries whose products can advantageously take the place of regional imports or which use semi-finished products of basic industries of national importance located in these regions, such as products derived from steel or oil.

Such a policy will benefit 30 per cent of the population of Chile in an area where 23.5 per cent of the gross national product is generated and where 18.0 per cent of the industries employing more than 50 persons exist.

A policy of rationalization and regulation of urban development must be applied in the greater central area, where there is natural but disordered growth, particularly in the city of Santiago. The greater central area, which extends from Aconcagua province in the north to Colchagua province in the south, contains 50 per cent of the population of Chile, generates 60 per cent of the gross national product, and contains 70 per cent of all industries employing more than 50 persons. The establishment of new industries in this area must be restricted to those industries requiring a high level of technology and a variety of services found only in the capital city.

Finally, the regions earmarked for settlement, which are located in the extreme north and south of the country, are characterized by low population density, with the inhabitants concentrated in a few urban or mining centres. For these regions the Government must formulate a development policy that includes special incentives and provides for the establishment of financially independent development corporations. These stimuli must not lead to an artificial development, but rather to a true development and a profitable exploitation of the natural resources found in these regions.

Poles of development

Owing to the fact that approximately 70 per cent of the population of Chile is concentrated in urban centres, the establishment of a properly ordered

system of poles of development that are piority locations for integrated urban/regional development (particularly for the establishment of new industries) is a fundamental measure in regional development policy. Such poles of development could accommodate almost all secondary and tertiary activities that have a direct influence over areas whose size will be in proportion to the potential of the development pole or centre. Consequently, integration of the national territory will be secured through the interrelationship of these poles of development. The order of precedence of these poles is:

(a) Pole of development of national importance: Santiago, because it is the seat of the Government and of institutions that serve the entire country.

(b) Poles of development of multi-regional and national importance: Antofagasta, Valparaiso and Concepción, because they are cities which, by their own self-sustaining dynamism, form effective counterweights to the growth of Santiago in the north, centre and south of the country.

(c) Poles of development of regional importance: Urban areas with a population of 100,000 inhabitants or more, relatively distant from the poles of development of national importance. These regional poles differ according to the area they serve and discharge different functions depending on their size and location; they are Arica, Iquique, Serena-Coquimbo, Rancagua, Talca, Temuco, Valdivia, Osorno, Puerto Montt and Punta Arenas.

Regionalization of multi-sectoral development

In accordance with the investment priorities decided at the national level and the potential capabilities of the various regions to meet these priorities in terms of increase of production, regions are classified as follows:

(a) Regions of high dynamism - those that maintain a rate of growth exceeding the national average: Antofagasta, Aconcagua-Valparaíso, Santiago, O'Higgins-Colchagua and Bío-Bío;

(b) Regions of medium dynamism - those that tend to have a rate of growth similar to the national average: Norte-Chico, Maule and Magallanes;

(c) Regions of low dynamism - those whose rate of growth is below the national average: Tarapacá Cautin, Los Lagos and Los Canales.

Industrial location policy

General background

The industrial sector in Chile has been one of the most dynamic sectors in promoting general economic development, having grown at double the rate of

the gross national product. From 1957 to 1966, industrial production increased on an average of 7.5 per cent per year, while the economy as a whole increased less than an average of 3.5 per cent per year. Chilean industry has now finished the stage of "easy substitution" of imports which was initiated after the world crisis of the 1930s and stepped up during the Second World War because of the difficulties of securing supplies from abroad.

At the present time, industry provides employment for about 550,000 persons, some 18 per cent of the working population. It should be noted, however, that the industrial sector has lost importance as a massive source of jobs in the last twenty years, particularly because of the technological character of the latest industrial investments. On the other hand, industrial production does generate 25 per cent of the gross national product, which is more than any other sector of the economy.

The manufacture of ordinary consumer goods not requiring complex production techniques plays an important role in the industrial production of Chile. Industries such as those producing foodstuffs, beverages, tobacco, textiles, clothing and footwear, furniture, leather and wood represent 60 per cent of national industrial production with the artisan sector playing an important role in the production.

Second in importance is an intermediate group of industries producing items such as paper and cellulose, petroleum products, non-metallic minerals, basic metals, chemical products and rubber. These goods, which require advanced technology, represent 20 per cent of total industrial production and are produced in large plants usually financed by the Government.

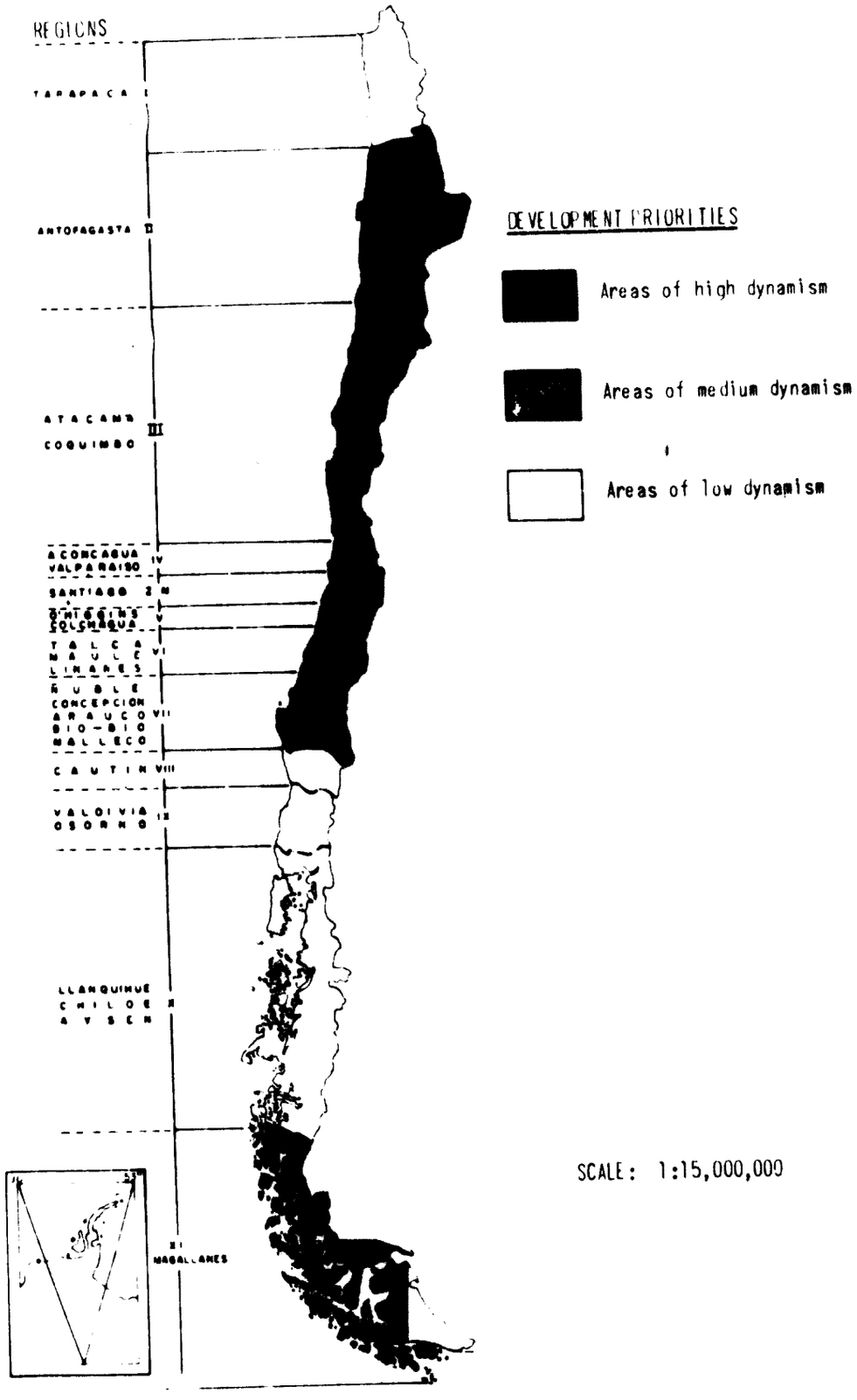
The group of industries producing consumer durables and capital goods or machinery accounts for 10 per cent of total industrial production. Finally, the residual group made up of printing, publishing and other manufacturing industries is responsible for another 10 per cent of industrial production.

Chile has ample scope for making its industrial structure more dynamic by increasing the production of durables through expansion of the intermediate group of manufacturing industries. This would mean entering the "difficult substitution" stage of import substitution.

The tendency towards geographical concentration of industry in Chile has been obvious in the past few years and continues to be strongly maintained in spite of government measures to achieve dispersal.

Figure 3

Priorities for future regional development



Source: ODEPLAN, Regional Planning Department, National Planning Office, Chile, 1965.

An area comparison of the industrial product in 1965 with the number of workers employed in industry in 1960 reveals the following:

	Industrial product - 1965 (per cent)	Workers employed in industry - 1960 (per cent)
Northern area: Regions I, II and III	6.6	6.2
Greater central area: Regions IV and V and Metropolitan area	71.4	71.3
Southern area: Regions VI, VII, VIII, IX, X and XI	22.0	22.0
Total	100.0	100.0

Objectives of industrial location

An adequate industrial location policy closely allied to a regional development policy is a key measure for developing countries.

Industrial location can be strongly influenced by factors completely outside national realities, such as the provision of direct capital or investments from abroad which seek a maximum financial return in the shortest possible time. This purely economic criterion often does not coincide with social aspects and long-term objectives of the country.

In the majority of developing countries examples can easily be found of exaggerated industrial concentration involving technology that calls for intensive use of capital but offers employment to comparatively few workers. Such industrial development is accompanied by rapid urbanization that is completely out of proportion to the employment opportunities created by the industries.

The absence of industries in peripheral regions, the disordered process of urbanization, and serious social problems are the consequences of the kind of haphazard industrial location that puts private interests first.

Factors influencing industrial location may be related to raw materials, industrial supplies, infrastructural services, availability of labour, access to markets or legal incentives. Improvements in transport and industrial technology effect continuous changes in the relative importance of locational factors making it difficult to establish rigid criteria for optimum industrial location. It is necessary therefore to analyse each project separately, keeping in mind the locational objectives pertinent to that particular project.

In Chile, as in many developing countries, there is a tendency for industries to be located near the large centres of consumption rather than close to sources of raw materials. Because of the exaggerated industrial concentration in the city of Santiago, an industrial location policy has been formulated with the following objectives:

(a) The fundamental objective of the policy is to secure a "concentrated dispersal" of industrial development. This means that industry must be dispersed from Santiago, but at the same time new urban centres with their respective industrial areas must be consolidated so that new industries can be brought together to reduce costs. To achieve this objective, priorities will be set for the establishment of poles of development and for the location of industrial estates;

(b) The locational criteria applied must achieve lower production costs for industrial projects whose output must compete on international markets, particularly Latin American integration markets;

(c) Projects of national and regional importance, as well as those whose location is not a deciding factor, must be guided towards suitable centres in regions where there is a sufficient potential of working population, adequate infrastructural services and access to markets and supplies of basic items;

(d) Industrial location must bring about substitution of regional imports, particularly those of medium and small-scale industry, provided that the local market can be fully satisfied and that the cost of production is competitive with other industries in the rest of the country.

Regionalization of industrial development

Background details regarding location. Guiding the location of future industries is one of the most important measures for promoting the regional development of Chile. Although a regional development policy can promote development through the use of capital supplied to those poles where development is projected, it is nevertheless desirable to provide some direct facilities to make the locations favoured by the development programme attractive, especially an adequate infrastructure. Within this infrastructure, which must include transport facilities and a supply of basic industrial requirements such as power and water, it is of great importance to provide industrial areas or estates.

Industrial growth centres. A system of centres of industrial concentration for Chile has been mapped out in a definite order of priority. In view of the present preponderance of the metropolitan area of Santiago, one policy will be laid down for this area and its adjacent areas, and another policy for the rest of the country. This system of priorities can be taken as the official expression of the proposed industrial growth to be assigned to each centre.

Industrial development of the greater central area. The policy to be followed must be that of guiding future industrial growth from the metropolitan area towards the large urban centres of adjacent areas, with the object of achieving rationalization of the production process and improved management at the urban level.

The industrial growth of the greater central area is to be concentrated within a radius of 70 km with its centre at Santiago, which includes the areas of Rengo-Graneros, San Antonio, Quilpué-Quillota-Calera, Concón-Ventanas and San Felipe-Los Andes.

Industrial development of the rest of the country. The industrial development of the rest of the country is to be oriented in the light of the consolidation of three important urban nuclei. These industrial centres are to provide large areas with specialized services previously sought only in Santiago.

For the northern area, a first-priority project is to cover Antofagasta, while a second-priority project in this area is to cover the cities of Arica, La Serena and Coquimbo. A third-priority project may be assigned to the cities of Iquique and Copiapó. In view of the enormous size of this area, its very low population density and the small probability that the population will increase, it has not been considered advisable from the industrial point of view to assign first priority to the consolidation of more than one centre, Antofagasta.

In the south, except for Magallanes, the present growth and planned investments are such that a first-priority project must be assigned to the Concepción area.

Although none of the remaining towns in this area are eligible for the assignment of a first-priority project, the population density between Concepción and Puerto Montt justifies consideration of the possible need to develop another industrial centre in this area as a matter of first priority.

A second-priority project could be assigned to the towns of Valdivia and/or Puerto Montt. It is probable that one of these two towns could develop later into a centre rating higher priority. A third-priority project should cover the towns of Talca, Temuco and Osorno. Talca might be the most advantageous location because it is situated midway between Santiago and Concepción.

Temuco has been experimenting with development that is basically of importance for the growth of agricultural activity within its area of influence. Its present dynamism could enable it to achieve even greater development. Osorno is an important centre for industries based on agriculture and livestock and its position should be consolidated.

For some industries location in an area in which important future development is to take place is an attraction. The primary fundamental activity in the northern area will be mining, while that in the southern area will be agriculture. It is therefore important that industries concerned with the manufacture of agricultural or mining machinery should be located in areas where agriculture or mining are predominant.

Finally, the Magallanes area, because of its lack of integration with the rest of the country, must be considered apart. Its development will be governed by the projects existing in the basic sectors, and industrial development must be based on the processing of the raw materials produced in the area (petrochemicals, animal products etc.). Industrial development attracted to an area by the local consumer market must be of a scale suitable to the area.

Action priorities regarding industrial estates

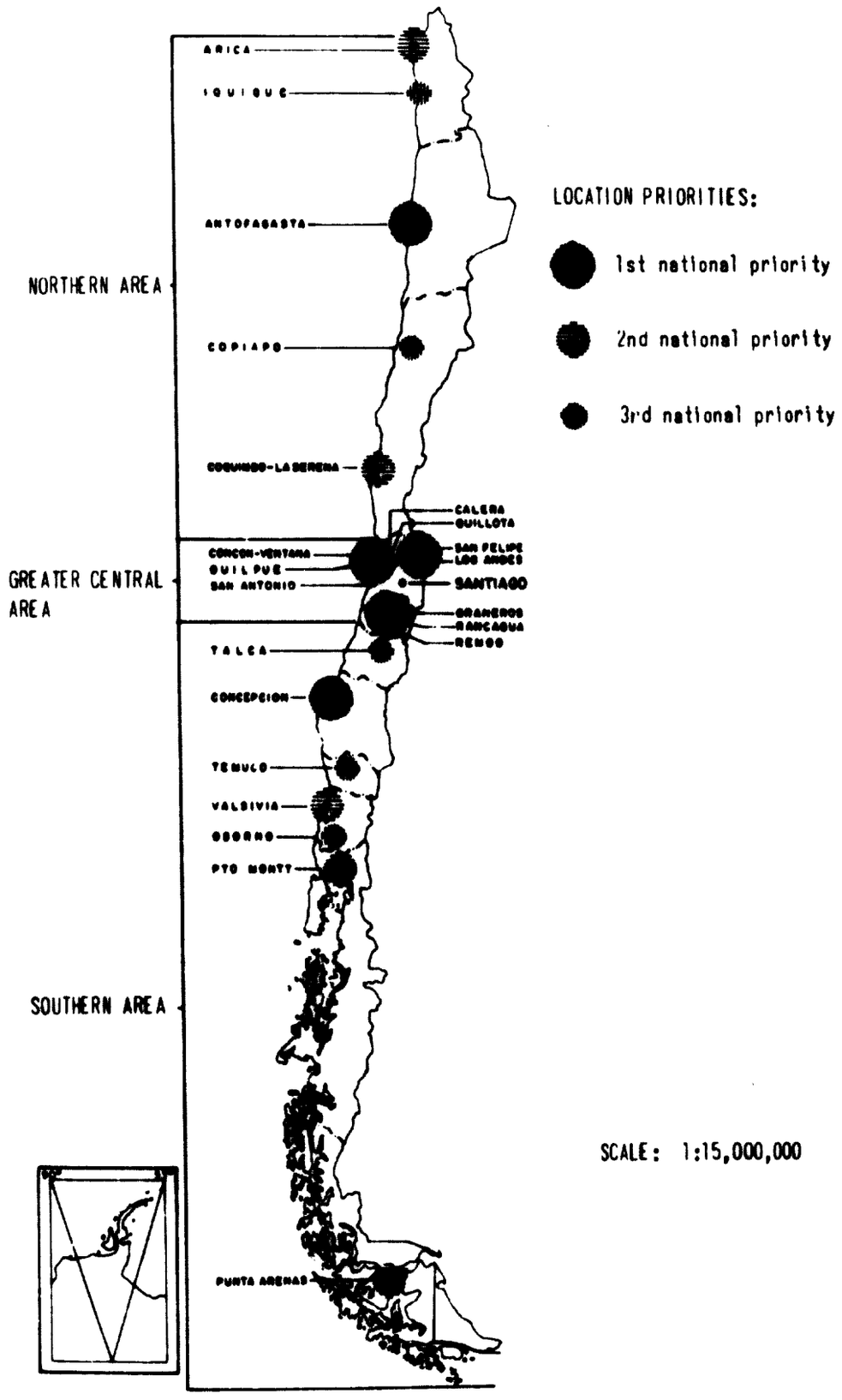
In view of the above-mentioned importance of setting up industrial areas and estates, it is desirable to establish a relative scale of priorities for the various urban centres of the country for the establishment of such facilities (figure 4).

The regional development policy is most fully justified when it operates as a multiple-objective policy aimed at improving the conditions for national integration in all its physical, economic and socio-political aspects.

Internal economic integration means the development of the capacity of the economic system to assure entrepreneurs equal profitability of all factories, regardless of location. In order for this to be possible, a high degree of mobility of resources is required, which depends, to some extent, on the degree of physical integration. In Chile, inadequate physical integration has acted as a brake on mobility, and this, together with the special nature of the resources of many regions, has had two consequences: (a) some regions have an economic structure that is highly unbalanced in sectoral terms; and (b) the imperfect mobility of resources has led to the channelling of resources to only

Figure 4

Location priorities for industrial estates



Source: ODEPLAN, Regional Planning Department, National Planning Office, Chile, 1968.

a few points, bringing about excessive concentration of activities and economic duality at the national level. In view of this situation, the reason for disproportionate returns from factories in different areas becomes obvious.

Industrial location policy must seek to harmonize the objectives of industrial growth with those of regional growth. To promote regional development, resources must be channelled towards points where there is industrial growth potential but where dynamism is lacking.

The fact that resources are limited, plus the requirement for concentration that characterizes the sector, means that action priorities must be established. A general approach would be to channel resources in the first stage towards the points of first priority in each group of regions. In the second stage, resources would be channelled towards points of second priority, and so on.

This programme forms the basis for the following scale of priorities, which refers to the degree of industrial concentration, as part of the action undertaken to ensure the equality referred to:

(a) First national priority: Antofagasta, Rengo-Graneros, San Antonio, Quilpué-Quillota-Calera, Concón-Ventanas and San Felipe-Los Andes, Concepción;

(b) Second national priority: Arica, La Serena-Coquimbo, Valdivia and/or Puerto Montt and Punta Arenas;

(c) Third national priority: Iquique, Copiapó, Talca, Temuco and Orsono.

It is not sufficient merely to establish priorities for action. The nature and degree of the action must be specified and industrial development measures taken that are commensurate with the sectoral dynamism displayed by the areas where priority action is being carried out.

The establishment of industrial estates in the greater central area is of extreme importance from the point of view of rationalization of production, urban decongestion, and for the beneficial effect rationalization will have on the socio-economic problems in the localities around greater Santiago.

The orientation of industrial estates

As previously stated, the industrial development that is expected to take place in the greater central area will be, to a considerable extent, brought about by the development of industries that manufacture durables.

Small-scale and artisan industry must become complementary to medium and large-scale industry, and should not under any circumstances try to compete with it.

If it follows this orientation, small-scale and artisan industry will operate in a field favourable for its development, primarily within the durables manufacturing industry, and only to a much smaller extent within the everyday consumer goods or intermediates industry.

Since, in most cases, medium and large-scale industry is in a position to finance its own infrastructure and basic services, the establishment of an industrial estate within an industrial area must be oriented particularly towards providing facilities for small-scale and artisan industry, or, if the estate is to be for all levels of industrial activity, there should at least be a difference in the repayment periods.

The above factors make it advisable to establish industrial estates in the greater central area with facilities intended primarily for small-scale enterprises producing durables.

Industrial development prospects and locational trends

The industrial development plan that is being applied in Chile provides for a growth of approximately 7 per cent per year over the period 1967-1971. Within this over-all growth major importance is assigned to the growth of durables production (growth rate of 12 per cent) and intermediates production (growth rate of 10 per cent). It is envisaged that traditional industry will grow at an annual rate of about 5 per cent during this period. About 55 per cent of the programmed investments are being made in the intermediates group in connexion with projects for cellulose and paper production and steel and petroleum products manufacture. These projects will be located in areas where they can be close to their raw materials, but they will generate less than 10 per cent of the expected total of jobs, because of the high density of capital which they require.

The durables group involves about 25 per cent of the investments, but generates approximately 60 per cent of the new jobs. Important activities in this group are the production of parts and units for the automotive and electronics industries and the manufacture of metal products in general. The locational trend of this group is strongly oriented towards the metropolitan area of Santiago.

Finally, the traditional group involves about 20 per cent of the programmed investments and generates 30 per cent of the jobs. The preferred locations of projects in this group show a tendency to be scattered over the main urban centres of the country.

In the foregoing analysis it was noted that the location of industries in the intermediates group is determined mainly by the location of raw materials and basic services such as power, water and transport facilities. In Chile this factor favours areas possessing these raw materials and service facilities, such as the Bío-Bío area. The direct impact, as far as the number of new jobs is concerned, however, is low in relation to the total amount of investment required.

The traditional group of industries tends to be located in the main urban centres with a preference for the central area, near to consumer markets, which results in low distribution costs.

The durables group, which is the main generator of jobs and which uses raw materials supplied by the intermediates group, tends to be located in Santiago, partly for marketing reasons, but basically because of the specialized services which this type of industry requires and because of the interdependence of the various stages in the production process of durables. In this type of industry, quality and production costs are of vital importance in competing with other firms, particularly as such industries may face competition from abroad through the integration process or may be in direct competition themselves on foreign markets.

Moreover, the majority of enterprises embarking on the production of the new items required by the automotive or electronics industries, which are the two fastest developing lines, have always been located in Santiago and have already produced similar products, so that they need only add new production lines in their factories. They can use the same general system of management and production control and the same financing channels. Entrepreneurial capability, a scarce commodity in developing countries, can be found in Chile in the enterprises already established and expanding in the Santiago area.

The Government has some measure of direct control over enterprises in the intermediates group, and can influence their location, but not the industries of the traditional group and the durables group. Most of these industries belong to the private sector and are in many cases bound by obligations to

foreign interests which exert pressure to secure the establishment of factories at locations that seem most profitable to them. No consideration is given to the social costs that the Government will have to bear and which, in the final reckoning, is borne by the whole community.

Because entrepreneurs often employ pressure of various kinds to achieve their objectives, the Government should activate an industrial location policy that seeks to harmonize private interests with those of the entire community.

From the analysis that has been made of the locational tendencies of the three industrial groups, it is clear that in order to avoid excessive concentration in Santiago, the policy to activate is one that affects mainly the traditional group of industries and the group manufacturing durables. These industrial groups generate the largest number of jobs and enjoy the greatest locational freedom.

The Government is applying an industrial location policy that promotes the dispersal of industry away from Santiago through the establishment of industrial estates, the designation of areas with special privileges in the extreme north and south of the country, the granting of government loans, and the enactment of special legislation to grant custom rebates on the importation of machinery and equipment. These measures are differentiated according to the industrial sectors and regions to which they apply.

Efforts will be made to apply this set of measures in a co-ordinated manner on the basis of uniform criteria, by setting up committees whose members include representatives of the various agencies for promoting industrial development.

The stimuli intended to orient industry towards desired locations in the regions are set out in a government decree providing for a sliding scale of exemption from import duties on machinery and equipment for industrial activities in various regions of the country.

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2. PATTERNS AND PROBLEMS OF INDUSTRIAL LOCATION IN PAKISTAN

by S. M. Husain[1]

Pakistan, a country of 110 million people, consists of two separate provinces or areas: East Pakistan and West Pakistan, each of which contains developed, developing and undeveloped regions, thus presenting an interesting variety of conditions for study in the field of industrial location. The division of the country into two parts with almost equal population is the predominant factor to be considered in all industrial investments, whether in the public or the private sector.

The industrial policy of Pakistan as contained in its Plan is implemented through two instruments. First, the industrial investment schedule which sets the physical and investment targets of the private sector in both East Pakistan and West Pakistan; and second, the public sector programmes of industrial investment, also prepared for each province separately, and implemented through the respective industrial development corporations. Accordingly, the provincial location of any planned industrial investment is pre-decided. A national policy to accelerate industrial growth in East Pakistan favours that province by a comparatively greater allocation of resources. In both provinces, the application of economic and administrative policy in the location of industry remains the responsibility of the provincial Government.

Two types of factors have influenced industrial location in Pakistan, physical and institutional. Physical factors are: concentration of consumers, availability of infrastructure, suitability of land, and supply of labour. The institutional factors relate to financing, creation of external economies, attitude of entrepreneurs and government incentives. These factors have exerted varying influences during the history of industrial location in Pakistan which may be divided into two periods. 1948 to 1958 and 1958 to 1968. The first period is characterized by the absolute freedom exercised by the private

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1/ Industries, Commerce and Mineral Resources Department, Government of West Pakistan.

sector in choosing industry and locating industrial undertakings; the second period is significant for the inducement offered to the private sector to move from congested areas into less developed parts of the country. During both periods physical and institutional factors affected the location of industry with varying emphasis according to the requirements of time and place.

First period, 1948-1958

After gaining its independence in 1947, Pakistan announced its first industrial policy a year later in which entrepreneurs were invited to set up any industry in any part of Pakistan. The promoters who appeared in the four years after the announcement of the policy were generally those who had migrated to Pakistan after independence and were looking for profitable lines of investment. They depended largely on the Government for the completion of preliminary arrangements, including the choice of location. The Government was at that time motivated largely by the national objective of rehabilitating refugees so promoters were induced to set up industries in areas where the bulk of the refugees had settled. The factors of the availability of raw materials and infrastructure, however, were also taken into account. Influenced by these considerations, industrial investment in the early years of independence was well distributed.

At that time promoters were chiefly concerned with the availability of raw materials, suitability of land and the supply of labour. Industries were located near sources of raw materials, particularly when such materials were weight losing and cost of transporting them exceeded the cost of transporting the finished goods. Some such industries were grain milling, cotton ginning, cotton textile and cement and sulphur processing.

In 1952 Pakistan's foreign exchange position became difficult and the Government could not maintain its customary level of imports, particularly of finished consumer goods. While imposing restrictions on imports, the Government announced that entrepreneurs willing to produce consumer goods at home, would be allowed to import necessary equipment and raw materials. This provided the strongest impetus to the industrialization of the country. In the following five years equipment in great quantities was imported and industries were set up to produce textiles, hydrogenated oils, toilet goods, leather and rubber goods, drugs and pharmaceuticals, processed fruits, and chemicals. Most of

these industries were owned by businessmen who had previously imported the same type of goods they were now manufacturing. These businessmen did not want to close down their merchandising at once, but preferred to locate their new industrial undertakings in or near the area or city of their import business. They planned to use the distribution and financing systems they had already developed when their new industrial units began production. As most of the businessmen were located in Karachi and Chittagong, the new industries were located there also.

The preferences of entrepreneurs, the established institutional framework, and the availability of infrastructure strongly favoured Karachi and Chittagong for location. Of the new industries established between 1952-1958, approximately 90 per cent were located in these areas.

Second period, 1958-1968

After the revolution in 1958 the Government exerted great effort towards the dispersion of industries. This action created a number of new institutional factors which influenced location. Some of these are:

(a) Tax holiday. New enterprises were granted in 1959 an exemption from payment of income tax, which amounted to about 50 per cent of net profits, for periods varying according to the development of the area concerned; developed areas received a four-year exemption; all other areas, or about 80 per cent of the total area of Pakistan, were given exemption for six to eight years;

(b) Financial assistance. Through executive measures, the Government ensured expeditious financing for units established in the interior areas. Specialized financing agencies were set up on semi-autonomous lines or within the departments engaged in development work;

(c) Legislation. The Government promulgated an act to regulate the establishment and expansion of industries in order to direct industries to desired areas;

(d) Institutional facilities. The Government set up a small industries corporation to aid small investors residing in underdeveloped areas, to select industries, prepare projects, arrange finance, provide technical assistance and guidance in the marketing of finished products;

(e) Industrial estates. To attract promoters to less developed areas, the Government developed large tracts of land into sites for factories by providing water, power, sewerage and other facilities;

(f) Administrative policy. The Government developed a system of administrative direction aimed to induce the private sector to move into less developed areas.

Although these measures have helped to disperse industries, 70 per cent of the investment sanctioned in the last decade has, nevertheless, been for Karachi and Chittagong. The collective effect of the government institutional measures has reduced concentration 20 per cent compared to the last decade. Progress may appear slow, but traditional factors weigh heavily in favour of these areas and there is still no shortage of developed land. Water supply is posing some problems which the local authorities hope to solve in time; other infrastructure is underutilized and the supply of labour is abundant and ever increasing. Financing and banking arrangements are more efficient than elsewhere in Pakistan and entrepreneurship is still firmly located in these cities because they offer an economic, social and cultural life. Foreign private investment particularly prefers these locations and the agglomeration economies that have been developed constitute the greatest attraction for industrial investment. In such developed areas small plants have expanded into large units. Many new small plants have been set up to cater to large plants or to further process the materials produced by the buyers. Specialized agencies or transaction centres have been established and industrialists have developed their own financing machinery, clearing houses, research laboratories and transport pools.

Compared to these factors, the institutional factors sponsored by the Government are less effective, particularly in the initial stages. Despite the tax holiday industries continue to be established in Karachi and Chittagong. Tax holiday, however, did play an important role in industrializing areas in which transport, water, power and other facilities were already under development compared to those areas in which such facilities were non-existent. In isolated areas offering weight-losing raw materials suitable industries were established and enjoyed the advantageous tax holiday.

Financing facilities were provided for setting up small units, but these were established mostly in developed areas because they were strongly linked with established factories, were oriented entirely to export, or were established to produce new types of goods for which the market was localized in these areas.

Efforts were made to link the supply of finance with the development of industrial estates and the provision of technical assistance. When a promoter wished to establish an industrial undertaking, he approached the small industries corporation of the Government. This corporation controls some industrial estates and has an effective control in the sanctioning of loans. The

corporation, therefore, assumed responsibility for the preparation of the promoter's project, making financing arrangements and providing a location site. This co-ordinated effort has helped to accelerate regional industrialization and in recent years, particularly after 1965, most of the small units sanctioned have been set up either in industrial estates or in the less developed areas of the country.

Some observations

It is too soon to judge the extent to which institutional factors can prevent the geographic concentration of industries. If these measures were intensified and applied more strictly such concentration would be minimized, but it cannot be said with certainty whether the resources so saved would be channelled into the industrialization of less developed areas; they might be employed in big cities in construction, insurance, banking and other non-industrial activities. However, if they continue to be loosely applied, the development of undeveloped areas will be delayed indefinitely. Fortunately, the experience of 20 years in industrial location has provided certain lessons which can be generalized and used for formulating a more scientific procedure for regional dispersal of industries, as considered below.

By placing too much emphasis on industrial location, a developing country may interfere with the growth rate of its economy. Industrialization is a part of the general process of economic development and should be treated as such. It should be introduced and propelled in a sector or in an area where it can use available resources to maximum advantage in the shortest possible time. The benefits derived should be included in the sum total of the advantages accruing from the process of economic development. Any attempt at regional preference that does not maximize the available resources would not be in the interest of economic progress.

Because of the inadequacy of social overheads in less developed areas, industries tend to concentrate around points where infrastructure and other allied facilities are available. When infrastructure is taxed to capacity, industries spill over into the neighbouring areas.

At this stage the Government should direct the dispersal of industries. Because new social overheads must be provided by the Government in any case, such direction can be exercised effectively and new areas distant from the already developed areas can be selected.

This approach would provide a compromise between social, political and economic aims on the one hand and would expedite industrialization on the other. However, such an approach can be followed effectively only in areas that are relatively small and geographically homogeneous. East Pakistan would benefit from it but West Pakistan will have to wait considerably longer for the improvement of its industrially undeveloped areas which are outside the Indus Basin zone. The public sector must move into these areas to develop mining industries as the private sector development is not likely to reach them in the foreseeable future.

The Government incentives of tax holiday, freight concessions and sale subsidies help in the dispersal of industries, but because of limited means, these incentives cannot be provided to an extent great enough to offset the advantages arising from agglomeration economies, geographic concentration and multiplicity of entrepreneurial controls.

From these observations it can be inferred that the location pattern in the early decades of industrial development in Pakistan has been influenced mostly by economic forces. Geographic concentration of industries was inescapable and any attempt to correct this situation may retard growth. Given secondary importance, location factors can be advantageously exploited when industries begin to expand into the periphery around developed areas; but here too extreme caution is necessary. It would not be desirable to locate industries too far beyond the periphery in areas that are poorly equipped. At the same time there would be little sense in permitting them to be located immediately outside the precincts of developed areas. From this reasoning has evolved a policy of industrial location.

Policy of industrial location

A country should be divided geographically into the following regions: (a) industrially developed tracts, (b) areas in the neighbourhood of developed tracts, (c) growth points, and (d) isolated regions.

One approach is to select isolated regions, according to their potentials and their social and political requirements, and to concentrate investment in social overheads in these regions. Experience has shown that such a method requires a large, continuous flow of funds from the public exchequer. The Government makes such arrangements only under pressure of urgent national need

such as in the Indus Basin replacement works or because of a promise of immediate return as in the case of Sui Gas. Available funds applied according to this approach are distributed a little too thinly for normal economic development, because of the non-economic considerations which have to be taken into account.

Another strategy is to identify growth points along the power, communication and transportation lines joining two developed areas or on the periphery of a developed region. Once these growth points have been identified, the funds available for normal provision of social overheads are spent mainly on these points.

A good location policy should not wait for infrastructure to evolve but should compel the Government to provide it quickly. In particular, a growth point should be developed at a greater speed than the contiguous areas of developed industrial centres. Unless this is done the private sector will not be interested in setting up industries at the growth point.

As not all industries can be established at growth points, a careful selection should be made in relation to the potentials of the growth points. The industries so selected should be oriented to one or more of the following factors: (a) availability of raw materials; (b) proximity to gas, power and transport lines; (c) market; (d) transport costs; and (e) distribution junctions.

As far as possible, pilot projects at growth points should be oriented to the source of raw materials; other factors will assume importance in due time. Industries which locate near the pilot project will develop rapidly if they have strong linkage effects in the sense that they use the output of pilot plants as their input or produce goods for the pilot industry's final or intermediate use. These linkage effects may also spread into other sectors of the economy and extend beyond the geographic or administrative boundaries of the growth points. Thus an expansion along the main infrastructure lines on either side of the growth points or in the periphery would result. If such progress should continue for a decade or more, the developed areas and growth points would have expanded so close to each other than an industrial belt running through the region would be created. This is perhaps the best method of developing interior areas with minimal expenditure and without running the risk of retarding the growth rate. Social and political demands would also be

satisfied because the belt would undoubtedly pass through most of the administrative division of the region. The growth points, when developed, would become a medium through which the undeveloped areas of their respective divisions could be developed. This process of sequential investment speeded up by provision of essential infrastructure and by administrative support could ultimately result in the dispersal of industries over the entire region.

Any industrial location policy must be part of the economic planning in general and of industrial planning in particular. Within the framework of economic development location policy should plan an over-all pattern of geographic distribution of industries and then identify potentials and possibilities for the establishment of specific industries. Also it should be remembered that location has relevance to time. A wrong location may become "right" with the passage of time, but the delay can be avoided if an industry is set up in the right place at the right time. A wise choice of product, place and time ensures faster development of a growth point than of the areas contiguous to a developed centre which would then develop more according to traditional considerations.

3. INDUSTRIAL LOCATION AND REGIONAL DEVELOPMENT IN GHANA[1]

Industrial location policies in Ghana may be traced back to 1943 when a West African Institute of Industries, Arts and Sciences was established. One of the functions of the Institute was to conduct research and experiments on the location of secondary industries and the training of Africans for their management. Although the Institute was short-lived, by 1945 it had succeeded in establishing a brick and tile factory, a pottery manufacturing industry and a cotton and textile industry in Ghana.

A more fundamental step was taken by the Government of Ghana in 1947 when it established an Industrial Development Corporation (IDC) to conduct feasibility studies into potential industries and to aid African businessmen in industrial ventures. Although the IDC was instrumental in fostering the establishment of a few industries in the country, it was only later, in 1953, with the publication of a report[2] for the Government of Ghana on the industrialization policy of the country, that more positive industrial location policies began to emerge.

Industrial location policy

The report outlined three categories of manufacturing activity that could be profitably undertaken in the country and the locational factors to be taken into account with regard to each group of activity. The first group deals with the processing of basic raw materials for export; the second considers manufacturing products for the home market; and the final category concerns manufacturing for export.

For the processing of basic raw materials for export, the report emphasized that, apart from low costs of labour, transport and fuel that should be

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1/ Prepared by the Ministry of Economic Affairs, Accra, Ghana.

2/ W. Arthur Lewis (1953) Report on Industrialization and the Gold Coast, Government Printing Department, Accra, Ghana.

considered in the location of industry, the decisive factor should be whether or not the raw material would lose weight in the manufacturing process. If there would be no loss of weight during manufacture, it might be more profitable to export the material in its raw state. In Ghana, there would be loss of weight in the timber industry through sawmilling, in the palm oil industry through processing before export, and in the minerals field by removing the precious stones from the ore.

In the case of manufacturing industries producing for the home market, factors to be taken into account with regard to the location of a new industry would be low wage cost, the size of the market in relation to the minimum size at which production could be economically undertaken, and the transport factor. The transport factor becomes decisive if the industry uses heavy raw material available on the spot and if local manufacture is protected against imports to the extent of the cost of transporting the raw material. Examples of industries of these types are the cement and beer industries. Another field in which the transport factor becomes important is in the case of a manufactured product that is more bulky than the materials from which it is made, whether or not these materials are imported, providing there is similar protection against imports. The furniture industry and most assembly works are typical examples.

With regard to the final group of manufactures, manufacturing for export, the determining factors for the location of such industries would be cheap fuel, weight-losing raw materials and low labour cost.

In summary, the factors that were recommended in the report as vital in decisions regarding the location of new industries were: low labour cost; low transport cost; low fuel cost; availability of local raw materials and the size of the market in relation to the production capacity of the industry. The pattern of industrial development that has emerged in Ghana, both in the public and private sectors, has been influenced considerably by the proposals of the report. However, three factors have been predominant, namely, the availability of local raw material on the spot, the transport factor and urbanization economies. This is not to argue that political considerations have not also been responsible for the location of industries in Ghana.

Industrial location practice in Ghana

Attention will now be given to those industries that have been located in a certain place because raw material was available on the spot, transport costs were low and it was economic to take advantage of the forces of urbanization in effect there.

Table 1 shows industries whose location was influenced by the availability of raw material on the spot.

Table 1

Raw material-oriented industries

Industry	Raw material	Location
Glass factory	glass sands	Tarkwa
Timber and plywood company	timber	Samreboi
Akuse sugar factory	sugar cane	Akuse
Komenda sugar factory	sugar cane	Komenda
Meat processing factory	cattle	Bolgatanga
Pineapple processing factory	pineapple	Nsawam
Tomato processing factory	tomatoes	Pwalugu
Mango processing factory	mangoes	Wenchi
Rubber tire factory	rubber	Bonsaso
Gold refinery	gold	Tarkwa
Ceramics factory	clay	Saltpond
Vegetable oil mill	copra	Denu
Vegetable oil mill	palm oil	Esiama
Brick and tile factory	clay	Accra
Match factory	timber	Kade
State boatyard corporation	timber and sea	Sekondi
Coir fibre factory	fibre	Saltpond
Coir fibre factory	fibre	Axim
Coir fibre factory	fibre	Half Assini
Bamboo factory	bamboo	Axim
Rattan factory	cane	Knawkaw
Rattan factory	cane	Bo'nkuma
Rattan factory	cane	Opon Valley
Rattan factory	cane	Asanwinso
Alumina[a]	bauxite	Kibi
Pulp and paper factory[a]	bagasse	Akuse
Nanli cement factory[a]	limestone	Nauli
Ferro-Manganese factory	iron ore and manganese	Tarkwa

a/ A planned industry.

Although the location of these factories was predominantly influenced by the availability of raw materials on the spot, cheap transport, labour and fuel costs were also taken into account.

The facilities provided by the two principal ports of Ghana have been responsible for the location of certain types of industries that must import their raw materials or export their finished products. Table 2 shows the port-oriented industries of Ghana.

Table 2

Port-oriented industries of Ghana

Port	Industry	Raw material
Tema	Valco smelter	bauxite
	Vertical integrated textile mill	grey bath
	Textile printing factory	grey bath
	Electronics products	parts
	Asbestos cement factory	clinker
	Television assembly plant	parts
	Solo motor assembly plant	parts
	Aluminium cutlery factory	aluminium sheets
	Steel drum factory	steel
	State steel works	scrap
	Oil refinery	crude oil
	Cocoa products corporation	cacao
Takoradi	Cement factory	clinker
	Paper conversion factory	pulp
	Pioneer tobacco factory	tobacco
	Cocoa products corporation	cacao

In addition to these port-oriented industries, which must import their basic raw materials, some factories have been located at the ports of Ghana to facilitate the export of their products. An example is the cocoa products corporation located both in Takoradi and Tema, which manufactures cocoa butter and chocolate for export.

Apart from the port-oriented and raw material-oriented industries, there are others whose location has been influenced by the existence in certain urban areas with auxiliary industries and services that render the location of new industries profitable. The three main towns that have provided these urbanization economies are Accra-Tema, Kumasi and Sekondi-Takoradi. These urban centres attract new industries because they have reasonably reliable infrastructural facilities and social services such as good transport and telecommunications, water supply and power, schools and other cultural facilities. In addition, these towns command the best of the country's labour supply, both skilled and unskilled. Examples of the situation described are

the garment factory in Accra, the mattress factory in Tema, and the Pioneer Biscuit factory and the jute bags factory in Kumasi.

Locational factors have not been taken into account in all instances in the siting of industries in Ghana. Purely political considerations and the desire to raise the standard of living of a backward area have also influenced the location of industries. A classic example of a locational policy based on political considerations is the location of a tannery about 400 miles from an existing meat factory in the northern part of Ghana and 200 miles from an existing shoe factory. Were locational factors alone considered, it would have been better to establish an integrated factory to process meat, tan hides and manufacture shoes at one and the same location.

It is [illegible] that, although the pattern of industrial location that has emerged in Ghana may be considered a pattern guided by rational locational considerations, the centralized nature of the planning machinery has made it possible for the Government to determine where a particular industry should locate. In effect, no industry can establish in the country without the prior approval of the Government.

Regional development policy

In the field of industrial location policy in Ghana, it has been possible to discern, to some degree, certain distinct patterns of development. This has not been the case with regard to regional development policy. This might be a result of the fact that regional development as a technique for over-all economic development planning in developing countries is a relatively new concept. This does not, of course, mean that development of regional resources or river basin development is a completely new idea in Ghana.

The Volta resource basin development

After the discovery of large deposits of bauxite in Ghana in 1913, the Government drew up a plan in 1924 for the construction of a dam across the Volta River and for the generation of hydroelectric power for the manufacture of aluminium from the local bauxite. The 1924 plan also considered the possibility of lake transportation on the Volta, the irrigation of the Accra plains and the construction of a harbour for ocean-going ships at Ada in the Volta estuary. Apart from the multi-purpose approach that was adopted towards the

development of the Volta Basin, nothing concrete was begun until 1956, when a more comprehensive development programme was prepared for the Volta Basin.

The 1956 plan for the Volta project covered practically all aspects of a multi-purpose river basin development project. Apart from the main project of power production, the planners also considered associated industrial and agricultural possibilities that could result from the construction of the dam. These included irrigation agriculture on the Accra plains, Volta Lake transportation, resettlement of residents of flooded areas, fishing on the Volta Lake and the health problems that would arise from the formation of a new lake in Ghana's interior.

Five constituent elements were considered for the power production project:

(a) The bauxite mines and the mining village;

(b) The railways linking the bauxite deposits with the smelter and the smelter with the port;

(c) The dam and power project at Akosombo;

(d) The smelter at Tema which was originally to be sited at Kpong;

(e) The port at Tema.

Since the 1956 plan the following development has taken place: a dam 370 feet high has been constructed in Akosombo for the generation of 512,000 kW; a new harbour has been built in Tema as well as a smelter for the production of 135,000 tons of aluminium; and Volta power has been extended from Akosombo to cover the whole of southern Ghana.

In addition to the purely engineering achievements of the Volta project, the resettlement of 80,000 flood victims of the Volta Basin presented planners with the opportunity to introduce regional planning techniques in the location of new towns and villages and in planning for modern forms of agriculture, industry and transportation. For the location of the new towns and villages, seven planning areas were proposed in the Volta Basin; each planning area was to have three types of settlements, namely, a central town, a service centre village and satellite villages. The central town, with a population of 10,000, was to perform the functions of industry, trade, service and government in each of the seven planning areas. Each central town was located where the best combination of bulk water supplies for industry, road transportation, water transportation, accessible minerals and agricultural raw materials was available. The service centre villages, with an average population of 8,000 and not less

than [illegible], were to be the local centres of trade, education, post and indigenous industry. Each village would serve a radius of ten or fifteen miles of smaller settlements and perform service functions for the surrounding agricultural and marine industries. The satellite villages were to be located in areas of intensive agricultural activity, where some secondary agricultural processing industries drawing upon local agricultural raw materials would be established. Six of these satellite villages would have populations of 4,[illegible].

On the basis of these regional locations of new settlements, 52 resettlement towns and villages were located throughout the Volta Basin. Although the physical location of the [illegible] flood victims in the new resettlement sites has been completed, the industrial and agricultural programmes have not been as successful as planned because of lack of finances.1/

Important lessons have been learned from the Volta Basin development exercise because it has offered Ghanaian planners the opportunity to experiment with techniques of regional development planning in their country. Apart from the regional approach adopted in resettling the 80,000 flood victims, it was possible, within the framework of regional development, to identify potentially viable projects that were committed for further detailed feasibility studies. These include a study on lake transportation on the Volta Lake; on irrigation agriculture on the Accra plains; on a charcoal industry in the Volta Basin; on an alumina plant; and on the fishing industry in the Volta Lake. Although some of these projects have not yet been implemented, the fact that detailed studies have been conducted on them makes them eligible for financing, through either local or international financial resources. The Volta Basin exercise, therefore, has permitted the identification of potentially viable projects within the context of regional development planning.

New machinery for regional development planning

The Ghana Government has been attempting to apply the experience gained from the resource development region of the Volta to the rest of the nine administrative regions of Ghana. Since the change of government in 1966,

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1/ C. D. K. Kudiabor (1965) "Volta Resettlement Planning and Development, The Regional Context", Ghana Trade Journal, August issue.

regional planning committees have been established in the various administrative regions of the country. The policy of regionalization is part of an over-all government policy to decentralize development planning work. In line with government policy on decentralization, sector programming units have been established in the key ministries of the Government to prepare programmes for the sectors of agriculture, industries, mining, power, transport, housing, education, health, forestry and communications. The programmes of these sectors and of the regions would become the basis for the future development plans of Ghana.

The objective behind the setting up of regional planning committees has been to ensure that the process of decentralization would be extended beyond the ministerial sector programming units in Accra to the respective regions of the country. In addition, the regional planning exercise is meant to supplement the sectoral programming work of the operating ministries. The system of planning being evolved is a two-dimension one; a vertical system involving the major ministries of the Government and a horizontal system consisting of the respective regions of the country.

The membership of the regional planning committees is made up of private citizens in the regions and regional representatives of government agencies and departments. Other committee members include university lecturers not necessarily resident in the region, farmers, private businessmen with sufficient regional patriotism, and private professionals such as engineers, lawyers, doctors, bankers and teachers. The primary aim of making the membership of these committees so diverse is to arrive at a concensus on local needs and objectives by bringing together both government officials and technicians and individual leaders of the local population. It is hoped that a forum will be created through these committees at which government technicians and the local people can discuss all matters affecting the development of their region.

The chairman of the regional planning committee is the current political leader in the region. The secretary is a professional regional planner posted to the region from the Ministry of Economic Affairs, the central planning agency in Accra. The regional planner is the main link between the rural areas and the Ministry of Economic Affairs. It is anticipated that similar administrative measures will be extended to the various districts in each region.

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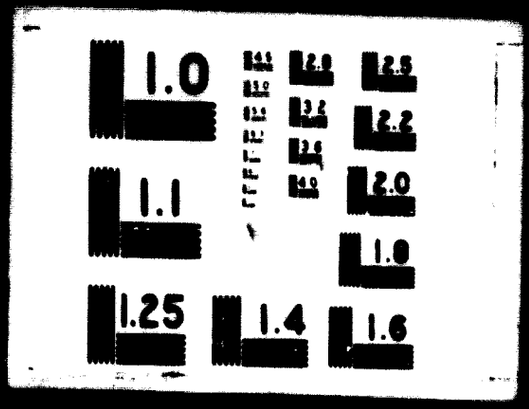

Very broadly, the functions of the regional planning committees are to co-ordinate development planning work for the key sectors of the regional economy, to keep an eye on all public and private projects in the region in order to detect bottlenecks that might retard the execution of development projects, and to find means for speeding up the implementation of these projects. More specifically, the committees are to collect data on local resources, submit proposals for the utilization of these resources to the Ministry of Economic Affairs and the ministerial programming units, and to report on a quarterly basis on all development activities of the region to the Ministry of Economic Affairs.

Methodology for regional development planning

As has been pointed out, regional development planning, as it is evolving in Ghana at present, is directed towards creating machinery through which development can be effectively co-ordinated at the regional level and also towards creating a framework within which projects can be easily identified. Most planners in Ghana today accept the fact that the slow progress or even the outright failure of Ghana's national development plans has been caused, not so much by inherent weaknesses in the formulation of the previous development plans, but rather by the failure of the plans to identify feasible projects for development. It is also being recognized that individual projects are the building blocks of any aggregate national plan. For this reason the primary function of the new ministerial programming units is the identification of viable projects within their respective sectors; the regional planning committees, in addition to making policies for and co-ordinating development projects at the regional level, are also responsible for identifying new projects.

The methodology that has been adopted so far for regional development has been the co-ordination of development of the various sectors of the regional economy through quarterly reports on both the financial and physical progress of all public sector development projects in each region. This method has been dictated by the lack of experienced regional planners. To date, each of the nine regions of Ghana has only one professional regional planner posted to it from the Ministry of Economic Affairs. As more regional planners become available it will be possible for them to assume fuller responsibility for identifying viable regional projects that can be incorporated into the development plans of the country.

In spite of this handicap, some of the working committees of the regional planning committees have already taken the initiative to review their respective development problems and to prepare tentative programmes for the development of their regions. In the upper region of Ghana, for example, the regional planning committee outlined its pressing development need, a sound infrastructural base for both agricultural and industrial growth. It recommended that during the two-year development plan period from July 1968 to June 1970, the emphasis in the upper region should be on the provision of good transportation facilities; good postal and telecommunication facilities; construction of small dams for irrigation purposes; provision of good drinking water; improvement in the existing health and educational facilities; provision of electricity; and provision of good housing for the growth centres (Bolgatanga, Bawku, Tumu and Wa). The committee is of the opinion that the realization of the above proposal would, by the end of the plan period, have created an economic atmosphere conducive to the development of industry and its ancillaries.4/

In the Volta region, on the other hand, where infrastructural facilities are not as backward as in the upper region, the main objective of the regional planning committee has been the intensification of agriculture and the establishment of small-scale industries using either local or imported raw materials. The idea of introducing small-scale industries in the area is based on the availability of local craftsmen and metalworkers in certain parts of the region. Within the context of the whole region the regional planning committee has identified projects such as a shell button factory in Keta based on sea-shells from the area; a small metal factory at Alavanyo based on a number of enterprises manufacturing guns, brass, musical instruments etc.; a brick and tile factory based on local clay; a starch factory based on cassava and on the possibility of developing industrial alcohol from the cassava starch.

The Volta regional planning committee proposed that for the 1968-1970 plan period the central Government make budgetary allocations for detailed feasibility studies on the projects identified within the region. On the basis of these studies, a decision would be taken as to whether to go ahead with the projects. It is the conviction of the committee that a viable project would attract its own investors.

4/ Regional Planning Committee of the Upper Region, Feasible Development Projects, 1968-1970, Annual Plans - Upper Region, Ministry of Economic Affairs, February 1968.

In order to give sufficient encouragement to the work of the regional planning committees, the Government set aside a certain portion of the development budget for 1968-1969 and subsequent budgets for the sole use of the regional planning committees for projects evaluated as feasible. It is also proposed to reserve some funds for loans to co-operative societies for development in the regions.

Conclusion

In conclusion, it may be pointed out that the experience of Ghana in the field of industrial location and regional development policy has not in the past been an integrated policy of the Ghana Government. Policy for industrial location has taken advantage of location factors operating in particular areas, such as the availability of local raw materials and the presence of basic infrastructural facilities and services such as transport, communication and harbour facilities.

Experience in regional development in relation to industrial location in Ghana can be regarded as still in its infancy. This is because the integration of regional development planning with national economic development planning began in Ghana only after the change of Government in 1966. It would appear, however, that the institutional arrangements already made and the functions being performed by the regional planning committees will make it possible for an integrated policy for industrial location and regional development to evolve and become part of the planning machinery of Ghana.

Although it is still too early to forecast the eventual pattern of regional development in Ghana, it is becoming evident that the future role of regional development in relation to industrial location policy will consist of locational studies of potentially viable projects identified within the various regions, especially for the sectors of agriculture and mineral resources. In this way regional development would be important in identifying new areas of economic activity that could become new centres of population concentration.

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4. INDUSTRIAL LOCATION AND REGIONAL DEVELOPMENT IN BURMA

by Khin Saw[1]

Priority objectives for industrial development

Burma is basically an agricultural country. Agriculture accounts for 45 per cent of the gross national product and 75 per cent of the export trade, and employs 67 per cent of the labour force as compared to 7.6 per cent in industry.

The importance of increasing productivity in agriculture cannot be over-emphasized. Progress in agriculture is also essential for industrial growth and a steady increase in export earnings. Because of the vital importance of agriculture in the development process, every effort is made to give high-priority support to programmes in this sector, particularly with respect to the introduction of scientific methods and mechanization in the cultivation of agricultural crops.

The general development plans of the Government of Burma include plans for all sectors of the economy and are based on the fact that agricultural and industrial development are essentially complementary. While modernizing agricultural production, which is the main basis of the economy, industries suited to the natural resources and capabilities of the country will also be developed.

In programming industrial development plans, the basic criteria, in order of importance, are to establish industries that will:

(a) Support the development of agricultural production;

(b) Use agricultural products as main raw materials to be processed and manufactured into consumer goods;

(c) Support the prospecting and exploitation of natural resources;

1/ This paper was presented by the author in his personal capacity as a participant in the seminar and is not an official presentation of the Government of Burma.

a. Manufacture import-substitute products;

b. Ensure that the economy is self-sufficient in essential consumer goods;

c. Increase exportable surpluses of crops and materials.

To meet these objectives, the following public industrial projects are underway: fertilizer plants are to be completed in the near future; tractor assembly and farming implements manufacturing plants are already in the pipeline; spinning and weaving factories and textile plants, sugar mills, paper plants, cement factories, glass factories, brick factories are completed or in the process of implementation.

Observation of industrial locations before 1962

The choice of location for an industrial plant frequently determines the success or failure of the commercial operation of the plant. Therefore, this decision should be based on careful consideration of all factors pertinent to the business of the enterprise in question.

Although industry in Burma developed steadily from only 5 per cent of the gross domestic product in 1951 to 10 per cent in the period 1958-1962, the country had not had an established objective for choice of industrial location. Most manufacturing activities were in the hands of the private sector of the economy. The practice in industrialization was to set up import-substitute economies, established mostly by private entrepreneurs. Although the arguments for replacing imports with domestic production were generally sound, the import-substitute policy was not without shortcomings. Domestic production of what had previously been imported did not always reduce dependence on imports, because raw materials, machinery, spare parts and other capital goods and supplies had to be imported for new production.

Industries tended to concentrate in areas with the best marketing prospects and with well-established transport and power facilities. The "enclave import" nature of those private enterprises (that is, those entirely based on imported raw materials) caused the factories to be located mostly in the city of Rangoon.

There was no proper spatial co-ordination of industrial and urban growth. The rate of urban growth in Burma is higher than the rate of industrial growth. Especially in the already congested metropolitan areas, there is an agglomeration of urban population that is not justified by the level of economic activity.

In the past this encouraged the location of additional industries in areas that were already congested. Although the newly located industries created new jobs in the metropolitan areas, they did not change conditions in other parts of the country. As population increased, the marginal yield of these areas decreased. Rents rose, as did the cost of supplying the city with food, water and other necessities from increasingly greater distances. The cost of travelling to work increased, and streets and other facilities became congested. The Government began to realize the problem of urban congestion and envisaged control over the location of industry as a means of remedying what it saw as a maldistribution of industry.

Present objectives of industrial location

Today, the approach to industrialization entails a careful choice of enterprises. Industrial projects that satisfy the criteria referred to above and would use domestic raw material are given top priority; this approach greatly facilitates planning of industrial location. It is not necessary to locate industries in the vicinity of the ports or cities as was the case before 1962. For instance, the new cotton spinning and weaving mills are being located in central Burma where cotton is grown, and the paper mill in the southeastern region where the bamboo forests are located. If the prospects for raw material availability and sources of supply are equal, the less developed region is invariably preferred.

The past six years have witnessed a change in the institutional structure of economic activity. There has been a transfer of production activities from the private sector to the public sector of the economy, the latter now comprising 53 per cent of total industrial production. All new industries are to be implemented only by the Government. The planning machinery for the rational analysis of the national economy and for the programming of industrial development plans is thus improved because it is now based on a firm view of industrial location objectives and on a long-term outlook for regional development.

Industrial location objectives generally established for new industries are as follows:

(a) New industries may not be established in Rangoon or in cities already developed;

(b) New industries are to be located near the main raw material sources;

(c) New industries using raw materials from various sources will be located at the most advantageous point with respect to transport costs;

(d) Prospects for raw material availability and sources of supply being equal, the less developed region will be given priority;

(e) New factories are to be sited near villages or smaller towns as yet industrially undeveloped but with potential for industrial development.

Factors determining industrial location and site

The objective of an industrial organization is economy in over-all costs of manufacturing and distribution. This is, of course, a major consideration of the planners and executives in selection of plant location.

The main factors taken into consideration in the general evaluation of industrial plant location in Burma are the following:

(a) Raw material sources;

(b) Market for finished products;

(c) Product characteristics;

(d) Transport and communications;

(e) Physical facilities, such as the land available and its topographical conditions;

(f) Water sources;

(g) Fuel and power sources;

(h) Special factors, such as waste disposal facilities;

(i) Climatic conditions;

(j) Recruitment and training of labour.

Plant location studies are carried out continuously so that any tendency towards obsolescence owing to depletion of raw materials, changes in transportation facilities, changes in processes requiring a different location, or other important factors will be observed. Thus, existing plans will be revised in the light of new information and future plans made with these changes in mind.

The type of raw material to be used plays an important part in the choice of plant location. For instance, fertilizer plants are located in the central regions where natural gas is available. Thus, whether industries are to be located at the source of raw materials depends on the special characteristics of the materials themselves. The present industrial location policy in Burma gives major consideration to raw material sources.

With respect to economy in procuring materials, nearness to a point of raw material supply is of significance in certain industries, such as the

fertilizer, sugar, paper and cement industries. In contrast, nearness to source of raw materials is of little significance in the location of shoe, soap and silk factories.

With respect to the influence of raw materials on choice of plant location, the following considerations are fundamental:

(a) The source of raw materials is likely to be the controlling factor when the materials are bulky and of relatively low unit price.

(b) Factors other than the source of raw materials are influential when the materials are small in bulk and high in unit price.

(c) When the raw materials are greatly reduced in bulk by the manufacturing process, the plant is usually sited near the source of supply.

(d) When the raw materials are perishable and manufacture makes them less so, the manufacturing plant is usually at the source of supply.

The choice of location of a plant in relation to marketing is preceded by a study of the market to be served. However, the influence of the market factor of finished products is not a deciding factor in selecting the plant locations of state industries.

Because Burma is a small country, marketing is not generally a great problem. However, with certain industries - for instance, textiles or consumer goods - care must be taken that not all the factories are located at the raw material source, but that there is a balanced geographical distribution of factories for marketing the finished products, especially the consumer goods, within a certain region of the country.

The problem of determining the desirable characteristics of an industrial plant must include consideration of the product to be made and of the processes and machinery to be used. The major factors explored in such a study are the following:

(a) Nature, size and value of the product;

(b) Production processes - continuous, intermittent, interrupted;

(c) Manufacturing machinery - heavy or light;

(d) Auxiliary manufacturing equipment required;

(e) Special manufacturing requirements.

From the foregoing discussion it is possible to formulate a principle of industrial plant location: the most advantageous location of a plant for an industrial enterprise is that which results in minimum costs of manufacturing and distribution.

Of the ten important general factors for determining industrial location, the first two - the availability of raw materials and the marketing of finished products - are closely related to transportation, that is to the total transport costs of supplying inputs and distributing outputs. Thus, it is not just the location of raw materials, but also the economy of short hauls and low freight rates that determine the location of plants near the source of raw materials.

Under these circumstances, waterways are important and have had a profound influence on certain industries in Burma. However, for industries using raw materials from a number of sources in the country, a comparative study of ton/mile haulage costs is made for various possible locations and the most economical location is selected.

The factor of physical facilities, such as land and water, has become more important in the past few years in deciding where to locate industries. Recent measures envisage selection of rural centres for development. These are areas that clearly have development potential because of their location and natural resources, including spacious and level ground, reasonably easy transport and access to plenty of fresh water for both industrial and domestic purposes.

The deciding factors in the selection of an industrial location are ordinarily infrastructural factors, such as electricity, transport and communication, labour and social amenities. If the proposed site meets other, less important, criteria, but poses problems with respect to transport and communication, electricity and social amenities, roads and railways are constructed to bring the location into the orbit of the normal transport network, and electric power lines are connected from the national grid. As far as labour is concerned, the technical and managerial staff is moved to the factory area no matter how far it is from the city; an unskilled labour force is generally available within the local area. To facilitate industrial settlement, state plans are co-ordinated to ensure a full range of infrastructure to which the state agencies concerned will contribute in their appropriate development plans. Even development costs for specific fields are included in the total planned investment cost of each industrial project.

Last but not least to be considered are special factors, such as that of waste disposal, which can be a tremendous problem for some industries, such as paper mills, alcohol distilleries, breweries and textile finishing plants. Climatic conditions can also be a problem because they affect certain consumer

goods industries, although the role of climate in industrial location has become less important than the role of water resources.

The elements that should be taken into account in assessing location advantages and disadvantages vary according to the branch of industry. The technological and economic peculiarities of the given branch are reflected in the relative importance given to the various location factors.

Full consideration must also be given to certain trends that are now discernible in plant location. This factor occasionally outweighs those normally involved in plant location.

The first trend in industrial location is the tendency to locate plants away from cities, in the suburbs, in smaller towns or even in the countryside. These latter areas can be equipped to offer practically all the advantages, facilities and services supplied by cities. Ample land is usually available in the more sparsely settled areas. The need for industrial safety has also intensified the trend away from metropolitan areas.

The cost of land for industrial location is not a serious problem in Burma, but the cost of developing the land is crucial. Such development must ensure room to spread out the plant, allow for expansion and provide special loading and unloading facilities.

The second trend in plant location in Burma is towards the decentralization of large-scale plants into smaller units at different locations. In recent years a new motive for decentralizing and for the building of smaller plants is a recognition of the awkwardness of managing large plants, which are characteristic of mass-production industries in highly developed countries. A large plant is not necessarily more efficient than a smaller plant; on the contrary, a large plant frequently becomes unwieldy, difficult to manage and subject to inertia. The management of such a factory is usually so far removed from the operating functions that its decisions become impersonal, and management tends to lose its perspective on plant problems. The scope of administrative control of any one top executive or group of executives is usually so all-inclusive that, regardless of the assistance of subordinates, the top management of an extremely large plant is often unable to comprehend clearly the complexities of the plant under its control. The management is faced with the difficulty of providing a tremendous staff along with all the social amenities for the workers. The transportation, servicing and maintenance problems are also intrinsic to the operation of a large plant. These factors of large

plant management, personnel and facilities have been experienced and are now clearly recognized in the industrial management problems of Burma. Consequently, the mass-production industries are spreading out their plants on the theory that N plants in different locations, each producing X units, are preferable to one plant producing NX units.

Given the assumption that a smaller plant must be of economic size, several smaller and scattered plants are frequently easier to manage than one extremely large plant. Smaller plants also have the advantage that production will not be completely tied up by human problems or natural disasters such as storms, earthquake or fire at any one point. In other words, several smaller plants avoid the risks attached to a large "all-eggs-in-one-basket" plant and, at the same time, help to further the development of various regions of the country.

Methods of programming and measures to promote industrial location

Within the framework of the above-mentioned objectives, factors and trends, there are three main steps to be taken in the location of a plant.

The first is the selection of the region or general area in which the plant is to be located. Here the main influencing factor is raw material sources.

The second step is the selection of the particular community or township that can best satisfy the needs of the individual enterprise. It is at this stage that the factor of transport costs is considered, because this establishes the basic framework for determining general location. The comparative cost approach is used, and the variation in costs between different locations is examined for the type of plant selected. Comparative calculations and analyses are carried out on: expenditures for transport of capital goods based on the amount of the building materials, machinery and equipment needed for the plant (usually in weight units, such as tons); the mileage to be covered in transportation to the site; the means of transport; the transportation rates (say per ton per mile) and number of handlings involved; transportation costs of raw materials, fuels and finished goods. Meteorological, hydrological and geological surveys are carried out at the same time. The health department is consulted for water sanitation and the town planners for regional development.

The third step is the selection of the exact plant site in the favoured community or township. Alternate sites in other townships are often considered

in case an adequate plant site cannot be found in the first community selected. In the search for a site the principal consideration is land. Is it of adequate size with room for expansion? Is the topography appropriate to the type of building desired and are the soil and drainage such as to provide the proper foundation? Is the land already occupied for, say, crop cultivation? If the first choice for a plant site is cultivated land, the usual practice is to choose one of the alternative sites instead.

Other important questions relate to transport, communication and power. Is the potential site readily accessible to rail, roads and water? Can electric power be connected as may be required? Will the cost of bringing in power and other utilities, such as water and sewerage, be prohibitive? Development costs, if any, of transport, communication and power facilities are surveyed and compared.

There are also considerations pertaining to the site's surroundings. Will employees consider it a good place to work? Can the workers from surrounding areas conveniently reach the plant? What are the prospects and requirements for housing, town development and social amenities? Comparative cost studies are made for these facilities.

The fulfilment of industrial location objectives requires a wide variety of measures: adequate programmes for land usage and public investment in physical facilities, such as roads, water conservation, reclamation and drainage.

A region on the threshold of industrialization probably lacks an appropriate base for new industries and has a relatively undeveloped transport and communication system and a more scattered, poorer and less educated population than the already industrialized regions.

Industrial location in post-war Burma before 1962 presented sharp contrasts. On the one hand, there was disproportionate growth of a few large-scale industries in a few selected areas and, on the other hand, there was a virtual absence of such enterprises in most of the country. Such lopsided industrial growth had adversely influenced income distribution and the relative standards of living of the people in different parts of the country.

Today, the approach to industrial location in Burma includes basic physical, economic and social considerations. A good example is the location plan for the town of Bilin in the southern part of the country. The objective is to integrate the existing small town and the proposed sugar mill estate into

a large homogeneous unit. In other words, the sugar mill site and its perimeter are to be developed as an extension of Bilin, rather than as a separate unit. The geological formations of the area are surveyed and soil strata and topography are mapped out. A geographical study is made, followed by a brief history of the town. In collecting statistics about the population, its trend and structure (by age and sex) are determined as a basis for projecting the quantity, quality and character of the labour force. Next, consideration is given to social factors: what are the housing facilities, the income distribution and expenditure pattern, and the basic supporting economy of the local population? Since a sugar mill is involved, what are the prospects of the sugar cane plantation? Is there a cheap and efficient means of transport of the cane to the mill? What are the educational and health facilities? The plans also envisage, among other things, the proper and efficient use of the available land for various purposes, including housing for the workers in the newly settled industries, as well as for the expected increase in the indigenous population.

Experience has shown that it is not always wise to build a new town for every new industry. It is sometimes advantageous to build the factory close to an existing village and to treat the new industrial settlement as part of the village. Such a procedure is justified from many aspects. From the social viewpoint, it is desirable to integrate the industrial and local residents in order to avoid a possible social differential. Economically, the initial outlay for the construction of a new satellite settlement will be enormous, and the cost per housing unit will be comparatively much higher than that for a mere extension of the existing town or village.

The establishment of such industrial settlements requires effective capital programming which consists of the proper phasing and financing of the various projects included in the plan. Then comes the question: who is to finance the housing project? Where the Government is to contribute, the funds will come from the social and housing budget. The expenditure on public housing for industrial workers is charged to the housing budget of the Ministry of Housing, rather than to the capital investment of the industry concerned. The Ministry of Housing and Public Works takes care of the planning and implementation of the housing projects. However, the recent trend requires that each industrial project provide industrial housing for essential personnel, which may constitute from 20 to 30 per cent of its total employees.

Geographic distribution of industrial activity and its influence on regional development

It can be said that Burma has no separate regional development plans since such plans are within the scope of industrial planning. However, present objectives, measures and activities directed towards the industrial locations of various government industrial projects do have an effect on the development of various regions of the country.

One of the necessary conditions for the proper solution of the problems of industrial location is the elaboration of a programme of regional economic development, coupled with comprehensive national programming, the latter being the framework for the macro-economic approach. Until recently, the mode of industrialization was a traditional micro-economic and short-term approach as a means of alleviating localized unemployment, taking for granted the existing distribution of population and economic activity.

However, the present government development plans for industry, transport and communications and electric power, although implemented by various government agencies within the scope of their own plans and financing and not grouped as one complex plan for regional development, are actually directed by various means toward the end effect of over-all regional development.

The industrial plan to be implemented on the west bank of the Irrawaddy River in Burma is a typical macro-economic and long-term industrial location plan that is designed to change the existing distribution of population and economic activity for the benefit of the regional development of that area. The Irrawaddy, joined in the north by the Chindwin River, is the principal inland waterway of Burma. It flows southward 1,300 miles through the length of the country. At present the eastern banks of the Chindwin in the north and of the Irrawaddy in the centre and the south, with their fertile lands and main highways, are fairly well developed socially and economically. The western bank areas remain comparatively underdeveloped, although there exist a few towns and industries there. Some new industrial projects along the western bank will help the development of its areas. They are: an extension to the only existing cement mill in Thayetmyo; an agricultural implements and tractor assembly plants project which was recently completed; a fertilizer plant project and a cigarette factory project which are under implementation; and other new projects in the planning stage. As these industrial plans and projects are implemented, power development plans are being carried out by the

government agency responsible for the electric power supply. Development of roads and highways is being planned and implemented independently by public works authorities. The area is served by water transport with low operating costs for large-scale bulk movement. The construction of a motor highway running along the west bank of the Irrawaddy further increases the transportation facilities.

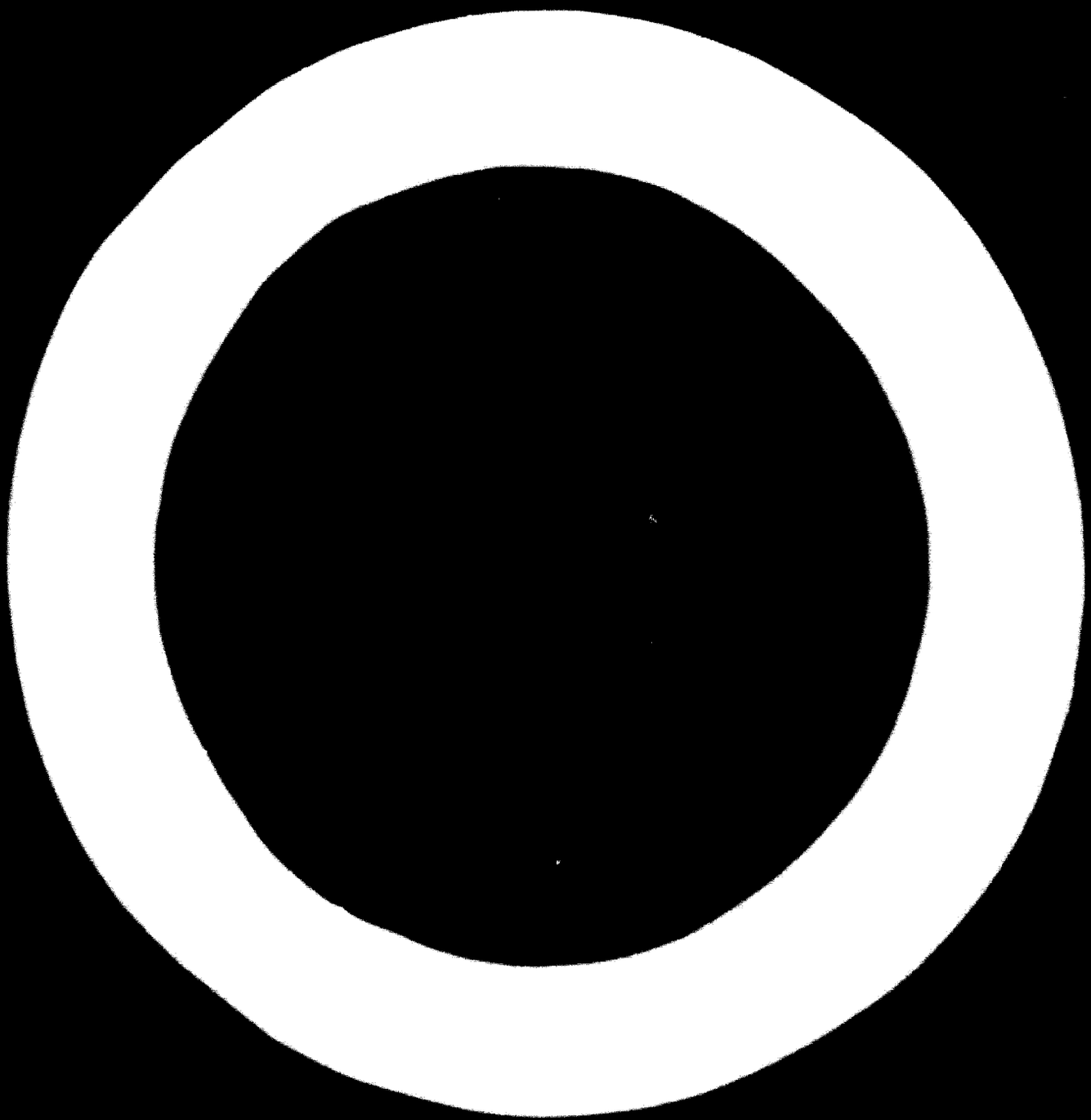
Other industrial projects located in other parts of the country, taken together with development plans of other activities, are affecting regional development as in the case of the west bank example.

ANNEX

REPORT OF THE AD HOC ADVISORY EXPERT GROUP MEETING ON REGIONAL INDUSTRIAL PLANNING

Geneva, 29 May – 2 June 1967

Contents



1. This report is the result of five days of intensive discussion by nine outstanding experts in the field of industrial location and regional planning. The ad hoc advisory expert group met in Geneva from 29 May to 2 June 1967. Of ten experts invited to the meeting by UNIDO, nine were able to attend. They represented current trends of thought in the field of industrial location and regional planning. Each had previously co-operated with the United Nations in some capacity. The conclusions and recommendations which follow may be considered as a consensus by the experts on the subjects discussed.

2. The work of UNIDO in regional industrial planning stems directly from the activities of UNIDO's predecessor, the Policies and Programming Division of the Centre for Industrial Development (CID), beginning late in 1965. These activities of CID were focused primarily on the organization of an Interregional Seminar on Industrial Location and Regional Development, held in 1966, and on the preparation of related studies. Building on the know-how gained by the CID, UNIDO has been able to devote increasing attention to technical assistance activities in regional planning and programming. It is envisaged that in the near future technical assistance will form the bulk of UNIDO's activities in this field.

3. The meeting was convened in order to submit the work programme of UNIDO to the scrutiny of the experts, to benefit from their views on the relative importance of various regional planning problems, and to solicit concrete proposals for a relevant and effective technical assistance programme in industrial development.

4. Examination of the items on the agenda led to complete agreement on major conclusions and recommendations as set forth below.

Conclusions

5. Although the conclusions were considered to be generally valid for developing countries, the experts stressed that most concrete regional planning and location choices must take into account the specific characteristics and objectives of the respective developing country.

General conclusions

Regional development should be viewed as a total problem and not simply as a problem of location of individual industrial plants severally considered.

At early stages of development there is a very strong economic and technological tendency for industry to concentrate geographically. In reaction

inequality of regional incomes may occur only at high levels of industrialization. Policies directed to counteract the tendency towards geographic concentration of industry in developing countries, for whatever national objectives, should take into account the possible detrimental effects of industrial decentralization attempts upon the achievement of other national objectives.

Transportation

A developing country should not attempt, at early stages of development, to create a comprehensive transportation network.

Within the constraints posed by the indivisibilities of transport investment, such investment should precede as little as possible investment in other activities. The appropriate objective in transport investment, and in investment in infrastructure in general, is to ensure a level of infrastructure capacity that is in line with projected needs without at the same time freezing an excessive amount of resources.

No investment in transportation to "frontier" regions (beyond the minimum required for effective exploration) should be undertaken before exploration has shown that there is sufficient economic justification for such investment.

Labour

In developing countries it is extremely difficult to obtain voluntary movement of skilled labour to underdeveloped regions. When rational location of an industrial project calls for inducing such a movement of labour, the necessary preconditions must be created and the costs of doing so weighed carefully.

Inter-industry relations

Owing to the characteristics of modern technology, the external economies arising out of the linkages between interrelated industries have become one of the most important factors of industrial location and must be taken into account in regional planning. There are a number of reasons why the existence of inter-industry relations is a powerful stimulus to geographic concentration of industry, particularly in developing countries.

Urbanization

In the evaluation of urban programmes, consideration should be given not only to the higher costs associated with large cities, but also to the benefits to be derived from urban facilities. However, little empirical evidence is available on the relationship of economic costs to the benefits of city size. A thorough investigation of this important relationship is needed.

When urban facilities are provided, for whatever purpose, at a price different from scarcity price, the hidden subsidies or implicit taxation should be made explicit, and their incidence apportioned in such a way as to avoid distortions in the relative use of factors of production.

Regional planning

Development of a region should be viewed as part of national welfare. The broad objective of national planning is to increase national social

welfare. All components of social welfare are interdependent. An important component of social welfare is the balancing of present consumption with future consumption in accordance with the time preference of the country, that is, the determination of the path of national economic growth. Another component consists of the achievement of the desired type of personal income distribution. A third component of social welfare is regional consumption needs, which should be balanced with other national objectives, and particularly with the national economic growth objectives. This is one necessary view of the problem of regional planning. A second necessary view of regional planning relates to the identification of that pattern of geographic distribution of investment that is likely to be most conducive to the fulfilment of the national objectives. Regional planning is thus also a means to fulfil national goals.

Social profitability rather than commercial profitability is the appropriate yardstick for evaluating regional planning decisions.

For effective regional planning, not only economic but also sociological factors should be recognized.

In the planning of industrial development, sectoral and regional planning should, in principle, be done simultaneously. This is very difficult in practice. Nevertheless, whether a sectoral or a regional approach is used primarily, the interdependence between regional choices and sectoral choices must at all times be recognized, and the feedback effects implied in planning of the iterative type must be taken into consideration.

Planning tools and techniques of regional planning should be adapted to the low level of information availability and the level of planning skills prevailing in developing countries. Costly and complex planning tools should be used with great caution. Simple techniques and indicators, especially when used in conjunction with one another, may often be preferable, in a developing country, to sophisticated methodology.

Recommendations for action by UNIDO

The experts agreed on the following recommendations for action by UNIDO:

UNIDO should strongly promote an improved understanding of the spatial dimension of industrial development and a wider use of efficient techniques for industrial location and regional planning. This complex task should be carried out through a well-balanced combination of research, promotional activities and operational activities. Research activities should, as far as practicable, be kept separate from other UNIDO activities, although they should be designed to provide substantive guidance to the UNIDO technical assistance programmes.

Research activities

Directly relevant research is indispensable for a productive and coordinated promotional and operational programme in regional planning as it is in the more general field of industrial development. The experts agreed on a list of several priority topics that UNIDO should research in the future, as time and budget permit, in addition to the research necessary for direct support of specific operational activities.

Technical assistance activities

The preparation of an operations guide on regional industrial planning is an extremely useful and urgent project. UNIDO should attempt to construct a comprehensive, detailed, and fully operational guide and should disseminate technical information on regional planning and development to developing countries. The possibility of directly undertaking training activities in this field deserves serious consideration.

UNIDO should explore the possibilities of creating permanent multinational centres for research and training in regional development and planning. As a first step, regional planning sections should be formed within existing industrial development centres.

Separate categories of "Regional Industrial Planners" and "Industrial Location Experts" should be introduced in UNIDO's roster of technical assistance experts. Efforts should be made to include as many competent experts from developing countries as possible.

Industrial location in developing countries

Industrial location and regional development

7. The study on "Industrial Location Planning" (ID/CONF.1/12), prepared by UNIDO for the International Symposium on Industrial Development held in Athens late in 1967, provided the substantive framework for the discussion of industrial location factors and problems of regional economic development. The substance and positions of the paper met with the general approval of the group, although a number of criticisms were raised.

8. The experts' consensus was that regional development must be viewed as a total problem and not merely from the standpoint of industrial location, because regional development itself affects, and is affected by, the location of industry. Thus, regional planning cannot deal only with industry but must use an integrated approach, incorporating all economic activities that contribute to a region's development. Nevertheless, it was felt that the group's discussion, as well as UNIDO's work programme could profitably focus attention on industry and examine other factors from the standpoint of their impact on regional industrial planning.

9. It was also felt that a dynamic approach to industrial location and regional planning should be employed, taking into account not only current short-run and structural characteristics of regions in developing countries, but also projected changes in these characteristics, including those that can be brought about by conscious location policy decisions.

10. Most of the experts agreed that, though the problems of industrial location and regional economic development and planning in developing countries

differ from those in more industrialized economies, the problems were equally if not more relevant. Developing countries cannot afford mistakes in the geographic location of industrial projects because of their generally limited economic resources. Also, many fiscal policy instruments, formally available in developed countries, may not be available to the governments of developing countries. Thus, industrial decentralization policies may have to be used as substitutes for other income redistribution policy instruments. Several experts were of the opinion that there is greater scope in developing countries for long-term regional planning because so much less over-all investment has taken place compared with similar investment in industrialized countries. As a result, the broad choice of changes in the pattern of geographic distribution of industry is, in developing countries, affected to a lesser degree by pre-existing facilities than in developed countries, and greater long-run policy freedom exists. On the other hand, it was agreed that in the short run and for specific projects, the choice of location is severely limited in developing countries because cost differentials among alternative locations are usually much larger than in advanced economies.

11. There was general agreement that in developing countries attempts to locate industries in underdeveloped regions are likely to be costly in terms of national economic growth. Industrial decentralization policies should be undertaken with caution. The difficulties of decentralizing industry are compounded by controversies as to the type of industries that should, on an *a priori* basis, be considered suitable for location in underdeveloped regions. Often *ad hoc* solutions are sought. It was reported, for example, that in Poland this procedure is followed: if the competent ministry cannot prove that it is absolutely necessary to locate an industry in a specific region, the industry is located in an underdeveloped region.

12. Some experts noted that it is easier to establish small-scale industries in underdeveloped regions because such industries are usually locationally oriented towards local markets. On the other hand, it was felt by other experts that, from the standpoint of the long-run growth of developing regions, fast-growing, large-scale industries should be located there. For example, in France, fast-growing, large-scale industries have been given incentives to locate outside the Paris area in hope that their impact on related activities will contribute to the creation of growth poles in the periphery. (However, in the case of Grenoble, a fast-growing centre was created through small-scale industries.) While inter-industry relations in general tend to lead to concentration

of economic activity, they can also be exploited to create regional centres of economic activity, to avoid concentration in one centre, and thus to pursue a policy of decentralization. However, several experts pointed out that the example of France is misleading, as it relates to a highly industrialized economy. The decentralization of large-scale industries in developing countries is severely limited and costly, because of the limited over-all economies.

Factors of industrial location in developing countries

13. The factors affecting industrial location and regional economic development were discussed to determine the direction and mode of their influence on the pattern of spatial distribution of industrial activity in developing countries. Several factors were examined. The time devoted to the discussion of each factor did not necessarily reflect its relative importance in the geographic distribution of industry. Rather, the discussion reflected the experts' efforts to clarify the role of location factors whose impact is ambiguous or controversial. Thus, for example, little attention was devoted to natural resources as a factor affecting industrial location since their importance was considered as self-evident.

Transportation

14. The importance of transport costs as a location factor varies with the size, terrain and population density of a country. Despite recent technological advances which have lowered over-all unit transport costs, these costs are still a crucial location factor in developing countries, much more so than in industrially advanced countries.

15. The experts pointed out a number of reasons why, with economic development, transport costs as a factor of industrial location tend to decline. Increasing production makes possible greater utilization of the existing transportation network, thus reducing unit transport costs. This fuller utilization means the use of two-way traffic, avoiding empty hauls in one direction. More generally, development is accompanied by an increase in the value added component of production and a relative reduction in the raw material input component. As a result, transport costs as a location factor declines in relative importance to other factors. It was also noted that transport costs exert a different influence on different industries; in some industries transport costs are relatively so low that they can be safely disregarded.

16. One expert believed that the widespread use of air transport might, in certain instances, reduce transport costs to outlying areas and offset to some extent the tendency of industry to concentrate. He also pointed out that the cost of infrastructure for air transport can be low for local services. Several experts noted, however, that new technology in shipping and air transport involves the use of larger ships and larger planes; these require larger port facilities which can be established only in one or a few central points.

17. The experts were in general agreement that recent technological progress in transportation media and the structural characteristics of existing transportation systems in developing countries are major factors leading to geographic concentration of industry in these countries. In most instances, existing transportation routes branch out from the main urban centre, with no interconnecting links to regions in the periphery, thus increasing the economic distance to and from these regions and inducing economic concentration.

18. The role of the main urban centre as a dominant transportation node in developing countries may be greater if the urban centre is the principal port. In this case, transportation routes converge on the centre to a greater extent, since most imported goods must come through it. One expert argued that the substitution of domestic for imported raw materials in industrial production might result in the establishment of industries away from the main port and near domestic raw material sources. Such substitution would act as a stimulus towards industrial decentralization. However, several experts pointed out that in producers' goods industries, substitution of imported raw materials would not lead to decentralization, since such industries have a stronger locational orientation towards related industries, or towards markets, than towards raw materials. Industrial contacts and certainty of delivery are more important to them than proximity to a raw material source.

19. Due to the continuing importance of the transportation factor in developing countries, a major problem of economic development is to determine the magnitude, nature and timing of investment in transportation facilities and in infrastructure in general. Most experts agreed that filling the "missing links" in the transportation system should be the first objective of investment in transportation. All experts stressed that a country is likely to waste a great amount of resources if it attempts to construct a comprehensive, modern transportation system during the early stages of industrial development. Criteria of technical "completeness" should have no place in the planning of transportation for economic development of developing countries.

20. Most experts believed that, within technologically feasible limits, investment for transportation should be undertaken only slightly ahead of investment in immediately productive facilities, and in close conjunction with expected utilization of the transportation system. As development proceeds, a higher degree of utilization of transportation facilities can be envisaged.

21. The timing of transport investment relative to investment in productive facilities met with the general approval of the group. In the first stage damaging gaps or missing links in the transportation system should be filled. In the second stage, transport investment should branch out; transport building should be a "searching device" for new development possibilities. Only in the third stage, at advanced levels of development, should transport investment be designed to achieve the completeness and the over-all consistency of a transportation network.

22. The choice of a specific mode of transportation depends on the nature of the goods to be transported, the nature of the terrain and other similar factors. One expert noted that the value of traditional forms of transportation in developing countries is usually underestimated, though these forms can perform an important function. Traditional forms of transportation are particularly valuable in tropical countries, where climatic conditions may make the construction and operation of modern forms of transportation very expensive.

23. Considering the two main modes of land transportation - roads and railways - the group showed a general preference for roads because:

(a) Road capacity can be expanded continuously as the expansion of a road network does not require a large investment, while that of a railway network does;

(b) Both the utilization and the physical characteristics of road rolling stock are more flexible and adjustable to the transportation needs of a developing economy than those of railroad rolling stock;

(c) In many developing countries railroads have pursued pricing policies that have often been detrimental to economic development.

24. Several experts stressed the fact that, at present, there is an undesirable bias in developing countries in favour of railroads, for which international financing agencies are partly responsible. Until recently these agencies have normally financed only the foreign exchange component of investment, which has been relatively easy to obtain for projects with a high foreign exchange component. Since this component is higher in railroad investment, there has been a tendency among developing countries to seek international assistance for the building of railway networks. Furthermore, because the loan discount

rate of these agencies is much lower than private or government discount rates in developing countries, there has been an artificial stimulus towards investment in projects with large construction costs, such as railroad construction, and a bias has been built up against investment in projects with smaller fixed capital requirements.

Labour

25. The importance of labour as a location factor, like other location factors is intimately related to geographic distribution, as well as to the degree of labour mobility. If labour skills were evenly distributed throughout a country, or if the mobility of labour were high, local availability of labour would have little bearing on the location of a plant in one region or another. However, under conditions of imperfect labour mobility, the regional distribution of labour in general and of different kinds of labour skills in particular, is an important factor affecting industrial location.

26. Most experts agreed that in developing countries the largest supplies of skilled, technical and professional labour are to be found concentrated in one or a few metropolitan centres. In addition, labour's propensity to move to underdeveloped regions is generally low in most countries and particularly limited in developing ones. As a result, industries requiring large amounts of skilled labour tend to be highly concentrated in developing countries. Furthermore, since a country's development often involves the establishment of industries utilizing progressively larger amounts of skilled labour, this tendency towards industrial concentration is apt to become stronger.

27. Some experts pointed out that a major cause of low labour mobility to underdeveloped regions is the absence of housing, educational and recreational facilities in these regions, and a lack of the amenities associated with metropolitan life. Mobility of skilled labour, in particular, tends to increase in direct relation to the provision of such facilities outside the main urban centres. In this context, one expert suggested that the creation of "company towns" may provide a strong inducement to the movement of labour to outlying areas. Another expert observed that the creation of company towns may be a stimulus to labour mobility, but that their construction is costly. In fact, such construction requires exactly those skills that are particularly scarce in developing countries. It was noted that the construction of urban-type facilities is advantageous only if there are large economies of scale, in that the cost of construction per worker transferred is lower when large numbers of

workers are moved. There was general agreement, however, that previous availability or the creation of urban-type facilities in underdeveloped regions is usually not a sufficient condition to induce skilled labour to move to these regions. Even in a relatively advanced country such as Italy considerable salary premiums are also necessary.

28. Another expert pointed out that inducing skilled personnel to move to underdeveloped regions is only part of the problem as they must also be induced to stay. Employment of skilled personnel in outlying areas is normally subject to high turnover which adds significantly to operating costs. Since the turnover of local personnel in underdeveloped regions is much lower, it was suggested that the problem of low interregional mobility of skilled labour could be circumvented by establishing industrial training facilities outside the main centres. Creation of such training facilities in underdeveloped regions may offer the benefit of generating a progressive atmosphere conducive to the development of these regions.

29. One expert believed that a movement of skilled personnel to an underdeveloped region may also have similar beneficial effects in the sense of creating an "industrial mentality" in the region by raising the standards of work, and thus generally improving the social framework within which industrial development can be achieved. Other experts noted, however, that the same, or greater, effects may be achieved at less cost by temporary migration of local labour abroad or to the more advanced regions of the country.

30. In general, the problem is posed whether to establish a new industry in an underdeveloped region and train local unskilled labour (with the help of the "industrial mentality" induced by the skilled personnel who move with the industry), or to provide incentives, explicit or implicit, for the temporary movement of the unskilled labour of underdeveloped regions to the training facilities of the main industrializing centres. As both operations are costly, the experts emphasized that the selection of one is difficult to make. The costs of different policy-mixes in each case must be carefully weighed in light of the characteristics and objectives of a specific developing country.

31. Some experts also remarked that mobility of labour in general would increase if a "frontier spirit" existed or could be generated in the country at large. It was reported that such a spirit was, for example, instrumental in increasing the mobility of labour towards the outlying regions of the United States in the nineteenth century and in the Union of Soviet Socialist Republics

in more recent times. One expert emphasized the importance of spreading information on labour markets as a stimulus to interregional labour mobility.

Scale economies

32. Existing empirical evidence was interpreted by most experts as an indication that industries in which economies of scale are important (typically, large-scale industries) have a tendency to be geographically concentrated; similarly, that small-scale industries are likely to be local-market oriented and consequently relatively dispersed. A few experts, however, felt that no such clear-cut distinction could be drawn and that some industries in which small plants predominate are not geographically dispersed; also that economies of scale and external economies should be analysed jointly.

33. The majority of experts felt that, as economic development proceeds, the adoption by developing countries of sophisticated production techniques and the installation of heavy industry in which economies of scale are prominent will exert a strong influence towards further concentration of industrial activity.

Inter-industry relations

34. The group discussed several theoretical and empirical factors which suggest that inter-industry relations have become one of the major influences on industry location and regional growth. First, industries tend to be attracted to localities endowed with ancillary facilities, or to industries whose output can be used as inputs. Second, the establishment of a new industry stimulates related industries, increases demand for products to be used as inputs and raises the incomes of the factors of production, thus indirectly increasing the demand for the output of consumer industries. If the new industry operates under increasing returns to scale, it tends to reduce costs and to stimulate the establishment of industries using its output as input.

35. All of these stimuli attract other industries to locate in the vicinity of the newly established one. Supplier industries can often reduce their prices by locating near the market. Also, if a new industry provides cost reductions to related activities through internal economies of scale, these activities tend to locate closer to the new source of cheaper inputs. Finally, higher incomes of the factors of production are, in most instances, spent locally on products

local market-oriented consumer industries. This spending causes such industries to cluster around the major producing units.

. The external economies arising out of the complex network of inter-industry relations were thus considered by most experts a major factor leading to concentration of industrial activity.

Urbanization

. The existence of external economies arising out of urban agglomerations was also recognized by the experts as imparting a further stimulus towards centralization of economic activity. The reasons are many and varied. Plants located in major urban centres are able to use the services of laboratories and universities, enjoy the advantages of easy contacts with the banking and commercial world and benefit from the proximity of government apparatus and relative abundance of infrastructural facilities. On the other hand, the agglomeration of population and industry in large urban areas can be held responsible for many implicit and explicit costs, economic as well as social, for the country as a whole. Pollution, high prices for urban land, traffic congestion, overcrowded housing, all require the provision of more and better facilities, thus necessitating large investment in infrastructure, housing and administration. To place limitations on city expansion would deprive many people of whatever benefits are associated with urban life.

. The expense of providing low-income housing at subsidized rates was cited by one expert as an example of large implicit costs associated with urban population increase. The hidden costs of subsidized low-income housing consist of the distortions in the relative use of factors of production generated by the reduction of visible labour cost below the social value of labour to industries in urban areas. All experts agreed that such subsidization should be prevented from generating unwanted economic distortions, and that governments ought to exert great care in uncovering hidden subsidies, or implicit taxation in the provision of urban facilities.

. Some countries have decided that the social costs of rising urban concentration exceed the social benefits and have pursued policies to limit city size. It was reported that the Union of Soviet Socialist Republics, for example, has prohibited new industrial construction in cities with a population exceeding one million because of uneconomical results due to rising infrastructure costs in those cities. However, most experts believed that in most developing countries

the "large" cities are still, with some notable exceptions, far below the size at which urban costs will exceed urban benefits. There was general agreement that very little "hard" information is available at present concerning the actual costs and benefits of urbanization. An extensive empirical investigation of these costs and benefits would be needed to provide the solid factual basis to form urbanization policies.

Regional planning in developing countries

The nature of underdeveloped regions

40. Although regional development problems are common to many developing economies, the experts stressed that it is erroneous to think that a uniform diagnosis or planning solution can be offered for all. Regional objectives and problems vary from country to country and these differences must be taken into account for effective regional planning.

41. The nature of regional problems (and thus the policy prescriptions) varies also according to the type of region with which the problems are associated. The experts noted that underdeveloped regions within a country can be of three broad types: depressed regions, less developed regions and frontier regions. A depressed region is defined as one that has experienced economic growth in the past but which, for various reasons, has stagnated in recent times. This type of region is prevalent in industrialized economies. A less developed region is defined as one whose growth has been slower than the national average; it is prevalent in developing countries. A frontier region is defined as a sparsely populated area, with an unexplored natural resource potential, the exploitation of which could lead to rapid development of the region and to faster national economic growth.

42. There was unanimous agreement among the experts that development of any kind of underdeveloped region should be viewed as part of the attainment of national objectives. Regional planning is thus a means of implementing national planning objectives.

The regional dimension of national plans

43. Planning has as its broad objective the increase of national social welfare benefits. The general role of planning is thus to specify, reconcile and achieve the several social welfare objectives of a country. There are three basic stages to planning; first, social goals and objectives must be set and

an acceptable balance achieved among them. Second, consistent approaches and possible optimum solutions to the attainment of the multiple goals should be explored. Third, deviations from the planning model, stemming from organizational and institutional constraints which affect planning implementation, should be identified and, if possible, corrected.

44. There was a consensus among the experts that long-run growth in per capita output, although probably the principal goal in most developing countries, is never the sole objective. A broader definition of national planning objectives should include: (a) the attainment or maintenance of the desired balance between present and future consumption; (b) the attainment or maintenance of the desired pattern of income distribution; (c) the attainment or maintenance of some relationship between regional consumption and national growth, and (d) other objectives such as defence, national cohesion and providing for unforeseen fluctuations.

45. The experts emphasized that at any time, future consumption can be increased through decreases in the current consumption. It may be possible to identify the limits below which current consumption cannot be cut, and hence establish a maximum rate of growth, as well as a minimum rate of growth that would be politically acceptable. The difference between these two rates of growth, which is often quite large, defines the range of feasible growth. The actual growth rate planned for will lie between these limits. When undertaking the formulation of national plans, administrators should plan for that particular rate of growth which most accurately reflects the country's preference between present and future consumption.

46. Attaining the desired type of personal income distribution must also be weighed against the objective of national growth. It is possible that measures correcting income inequalities can be detrimental to growth of economic output. The experts also stressed that the goal of income distribution should not be confused with the goal of maintaining a balance between regional consumption and national growth. Obviously, the basis for redistributing income should be people and not regions. Measures designed to decrease income inequality among regions do not always reduce over-all income inequality among people. Often the measures increase inequality by increasing personal incomes within regions.

47. The attainment or maintenance of some relationship between regional consumption and national growth is a third independent component of national social welfare. This component might take the form of securing regional income differentials; or of maintaining comparable growth rates among regions; or, more

generally, of ensuring that minimum consumption levels are achieved in all regions.

48. Discontent arising from economic stagnation of underdeveloped regions can threaten national unity or cohesion. Thus a politically motivated demand for regional development may arise. Similarly, defence considerations or the desire to guard against fluctuations in income or in foreign exchange earnings might dictate the development of an underdeveloped region. In the latter instance, a country might decide on a policy of product diversification, particularly with respect to exportable commodities, in order to protect itself against severe change in income or foreign exchange earnings resulting from reliance on only a few commodities. Such a policy could lead to a regional development decision which may not be justified on strict grounds of economic efficiency, but which may be rational as protection against financial uncertainty.

49. It is important, the experts emphasized, to realise that non-economic considerations often play a crucial role in deciding the development of an underdeveloped region and may, under special conditions, justify incurring the high costs involved in attempts to decentralise industry in a developing country. It was also noted, however, that where such non-economic considerations bear little relation to the accepted national objectives, they should not be allowed to interfere with the regional planning process.

50. The experts were in unanimous agreement that the main role of regional planning in developing countries is to facilitate the achievement of the multiple national objectives, and in particular the objective of striking a balance between regional and personal consumption needs on the one hand, and national growth on the other hand, that most closely reflects the over-all preferences of the country.

Methodological approaches to regional planning

51. A basic condition for the effectiveness of planning, whatever the objectives, is the adoption of a correct planning approach. There was agreement among the experts that a balanced approach to planning is desirable so as to account for inter-industry relations, solve the problems of interaction among economic units and make national social profitability rather than commercial profitability the basis for national resource allocation.

52. There was general agreement that, in principle, the choice of sectoral projects and the choice of location of each project should be undertaken simultaneously. In practice, lack of precise information and the existence of

institutional obstacles make simultaneity difficult, particularly for long-term planning. Thus, for the long run an iterative approach to planning is indicated. However, such an approach must at all times recognize the interdependence between regional and sectoral decisions. It must also make full use of all available feedback cross-information deriving from sectoral or regional development.

53. The experts emphatically stressed that it is essential to maintain consistency between the sectoral and regional plan breakdowns of the national plan. This is difficult to attain, often because of institutional reasons. In many developing countries sectoral planning is carried out by the national executive organs while regional goals and planning receive more attention in the legislative branch, with little consultation between the two. Nevertheless, some consistency must be attained. The penalty is the failure of the sectoral as well as of the regional plans.

54. A national plan can be broken down into sectoral or regional plans. The sectoral plans provide a disaggregation of the national plan by sectors of economic activity, the regional plans according to the economic activities undertaken in each region. In addition, national planning provides regional planners with those basic parameters (such as the social discount rate, the shadow prices of inputs and the shadow exchange rate) which regional planners cannot set themselves. Some experts observed that most developing economies employ sectoral breakdowns of their national plans, but use only crude approximations of regional breakdowns. There is thus a real danger that regional objectives are neglected at the planning stage because of exclusive reliance on a sectoral planning approach. One expert saw as the main fault of the sectoral (branch) approach the fact that, in a sectoral model, it is not possible to determine the influence of industry location on the expenditure level in many other industries, so that, as a consequence, the sectoral optimum may not coincide with the national optimum.

Techniques of regional planning

55. A correct approach to regional planning must be complemented by effective tools and techniques of planning. All experts agreed that these instruments of planning should not be applied blindly but be adapted to the conditions prevailing in developing economies.

56. The general planning difficulties caused by the lack of detailed data in developing countries are particularly serious in the case of regional planning. Most analytical techniques and theoretical planning models are developed in the

advanced countries and assume a set of informational prerequisites which cannot be met in most developing economies. The introduction of these sophisticated tools into planning in developing countries, without adaptation to the prevailing data availability conditions, poses grave dangers for the accuracy of forecasts and for the relevance of projections, thus imperiling the entire factual basis of policy decisions.

57. Where data are partial or imperfect, the cumulative effect of errors associated with the use of multivariable and complex analytical models may give a naïve type of technique greater predictive value than a far more sophisticated one. One expert remarked, for example, that interregional input-output techniques should be used with great care. The input-output technique assumes an integrated economy with substantial sectoral relationships, which do not, in general, exist in developing countries. Thus, the use of input-output for analytical planning at the regional level is severely limited, as it requires the impossible task of matrix inversion when as much as 90 per cent of the matrix cells are empty. Similarly, the use of input-output as a descriptive tool is limited because the familiar problems of aggregation and changing technical coefficients are much more serious in developing economies.

58. Another drawback of sophisticated models is that their very complexity creates a greater danger of misuse, in view of the limited skills of planners in developing countries.

59. Furthermore, with a very complex model, where the planner introduces the data at one end and gets the final results in terms of predicted values at the other, it is difficult to correct for obvious mistakes attributable to data imperfections. With a simpler model the planner can keep an eye on the unfolding of the planning process and can make qualitative adjustments of obvious irrelevancies and errors in the light of the planner's own knowledge of the economy. It was generally felt that techniques can considerably improve the planning process, but can never be a complete substitute for judgement and good economic common sense.

60. It was believed by one expert that in regional planning, the judgement and economic common sense of the planners in developing countries could be improved by studying the regional planning experiences of other developing countries. Whereas a considerable amount of information of a general nature exists on planning and regional problems, there is a dearth of information on the actual mechanisms of regional planning and on the concrete problems encountered by regional

planners in developing economies. Little is known about the problems of regional planning undertaken under conditions of uncertainty due to incomplete factual information and to changing economic conditions. Some experts felt, however, that such studies should be interpreted with great caution. The general frame of reference and attitudes of the planner policy-maker will tend to colour and unconsciously distort the reporting of the planning process, thus limiting the usefulness of the case study. Moreover, planning in various developing countries is undertaken under unique institutional and organizational constraints; this factor may considerably reduce the "transferability" of the lessons gained by one country through its own experience to another country.

61. One solution to the problem of technique, suggested by some experts, is to use more than one (simple) technique for the same planning problem and then average the results. In general, there was agreement that any technique employed, especially in the field of regional planning, must be carefully evaluated according to the expected benefits (in terms of predictive accuracy) relative to the costs incurred (in terms of the use of scarce skills, research time and funds).

Guidelines for UNIDO's action in regional industrial planning

62. The consensus was that the basic objective of UNIDO should be the enhancement of the developing countries' own ability to deal with problems of regional industrial development and planning. This basic objective can be achieved through various complementary and mutually supporting research and technical assistance activities.

63. Most experts were also convinced that UNIDO's research activities in regional planning should be kept separate from, although closely co-ordinated with, administrative and operational activities. The group was of the opinion that a general separation of UNIDO's research functions from its other functions would greatly benefit the efficiency of the organization.

64. A first set of technical assistance measures should be designed to improve the professional capacity of administrators and planners in developing countries so that they are better able to cope with regional industrial problems themselves. A second set of measures should be designed to assist developing countries directly in the formation and execution of regional plans and programmes.

Indirect technical assistance

Operations guide on regional industrial planning

65. The experts strongly endorsed UNIDO's plans to compile an operations guide on regional industrial planning. The project was considered to be of urgency and great immediate usefulness, in the light of the current absence of operational documents for consultation by regional planners in developing countries. It was stressed that such a document would help to eliminate popular misconceptions and obsolete attitudes on regional industrial planning prevalent in many countries.

66. The experts offered various suggestions on the contents and format of such a guide to enhance its impact and usefulness. The following topics were deemed desirable for inclusion in addition to or in conjunction with UNIDO's draft outline:

(a) An introductory section surveying the social and political environment surrounding regional planning;

(b) A simplified discussion of pricing and resource allocation as it affects regional growth;

(c) A clear classification of planning levels and functions showing the relationships between national planning on the one hand and regional and sectoral planning on the other, including a discussion of the mechanism of transmission of national decisions to the local level;

(d) A discussion of the application of social cost-benefit analysis to regional planning problems;

(e) A discussion of the implications of modern technology for locational decisions;

(f) A section outlining data requirements for different kinds of planning techniques and criteria, including forms, checklists and similar material;

(g) A compilation of case studies of regional planning in developing countries designed to complement and illustrate the general information included in the guide.

67. Most experts believed that the operations guide project should be undertaken on as large a scale as possible. If the guide was to be made a complete and useful operational instrument, a small-scale project would not be adequate, although it might be possible to start with a small pilot project. It was also felt by most experts that the guide should be revised continuously in order to reflect new insights and techniques developed in regional industrial planning. It was acknowledged that UNIDO might face difficulties in finding the qualified consultants or the financial means necessary to prepare the guide on the large scale envisaged. However, several members of the group expressed the belief

that, for this important project, UNIDO would probably be able to obtain the support and active co-operation of foundations, universities or governmental research institutes. One expert pointed out the great importance of ensuring that the guide be actually used; for that purpose serious and systematic promotional efforts should be made.

Dissemination of technical information

68. The experts agree that UNIDO should undertake the dissemination of technical information in the field of regional industrial development and planning. The preparation of the proposed operations guide on regional industrial planning would be an important step in this direction. Another concrete measure would be to distribute to developing countries lists of current publications in this field. Such lists could be compiled by UNIDO on the basis of periodic contributions of bibliographical material by public and private institutions engaged in research or applied work in the field. Finally, UNIDO should disseminate as widely as possible the results of its own applied research, including a periodic review of the main points contained in field reports of technical assistance missions in regional industrial planning.

Training

69. UNIDO should conduct training seminars and workshops for planners and administrators of developing countries. In this context, several experts stressed the remarkable success of UNIDO's training workshops in industrial project formulation and evaluation, which provide special training for technicians and policy-makers of developing countries. UNIDO should also examine the possibilitiy of setting up multi-national research and training centres on regional industrial planning. Most experts were convinced that, for the time being, these training and applied research functions could best be carried out by superimposing them on existing industrial development centres, rather than by creating separate institutes. However, some experts also believed that the importance of regional planning would justify, at a later stage, the creation of independent training and applied research centres in this field. One expert felt that research would be more effectively carried out in a centralized fashion, while decentralized centres would be more suitable for the dissemination of information and for operational activities.

Direct technical assistance

70. UNIDO should pursue further its contacts with private or public institutions throughout the world with expertise in various aspects of regional industrial development and planning, compile a comprehensive list, and form a roster of institutions willing and able to undertake UNIDO assignments of an advisory nature as part of their regular functions.

71. UNIDO should establish two separate categories in its roster of technical assistance experts: Regional Industrial Planners and Industrial Location Experts. Experts in these categories should be economists or industrial economists familiar with problems of industrial development and with experience and training in industrial location, regional planning or related fields. There was general agreement that, since regional development must be viewed as a whole, UNIDO technical assistance experts in regional planning and in industrial location should, whenever possible, work in co-operation with experts in related fields such as transportation, housing, and resources.

72. The general consensus of the group of experts was that a clear distinction should be made between technical assistance missions on regional planning problems for the economy as a whole, and advice on location of individual plants. The nature of the mission, as well as the necessary qualifications of the expert differ according to the dimension of the problem.

73. Advice on the macro-economic aspects of regional industrial planning should as a rule, be entrusted to individuals with a solid training in economics, familiarity with planning processes and techniques, and specialization in the spatial aspects of industrial development. This type of assistance should encompass at least the following fields, depending on the needs of the requesting country:

(a) Assist in the formulation of regional planning at the national level, that is, in the determination of the over-all pattern of geographic distribution of industry and of infrastructure throughout the country. This type of assistance should also take into account the influence of multi-national undertakings on national industrial location planning;

(b) Assist in the formulation of regional plans at the regional level, that is, in the design of a programme of industrial development for a specific region within the country;

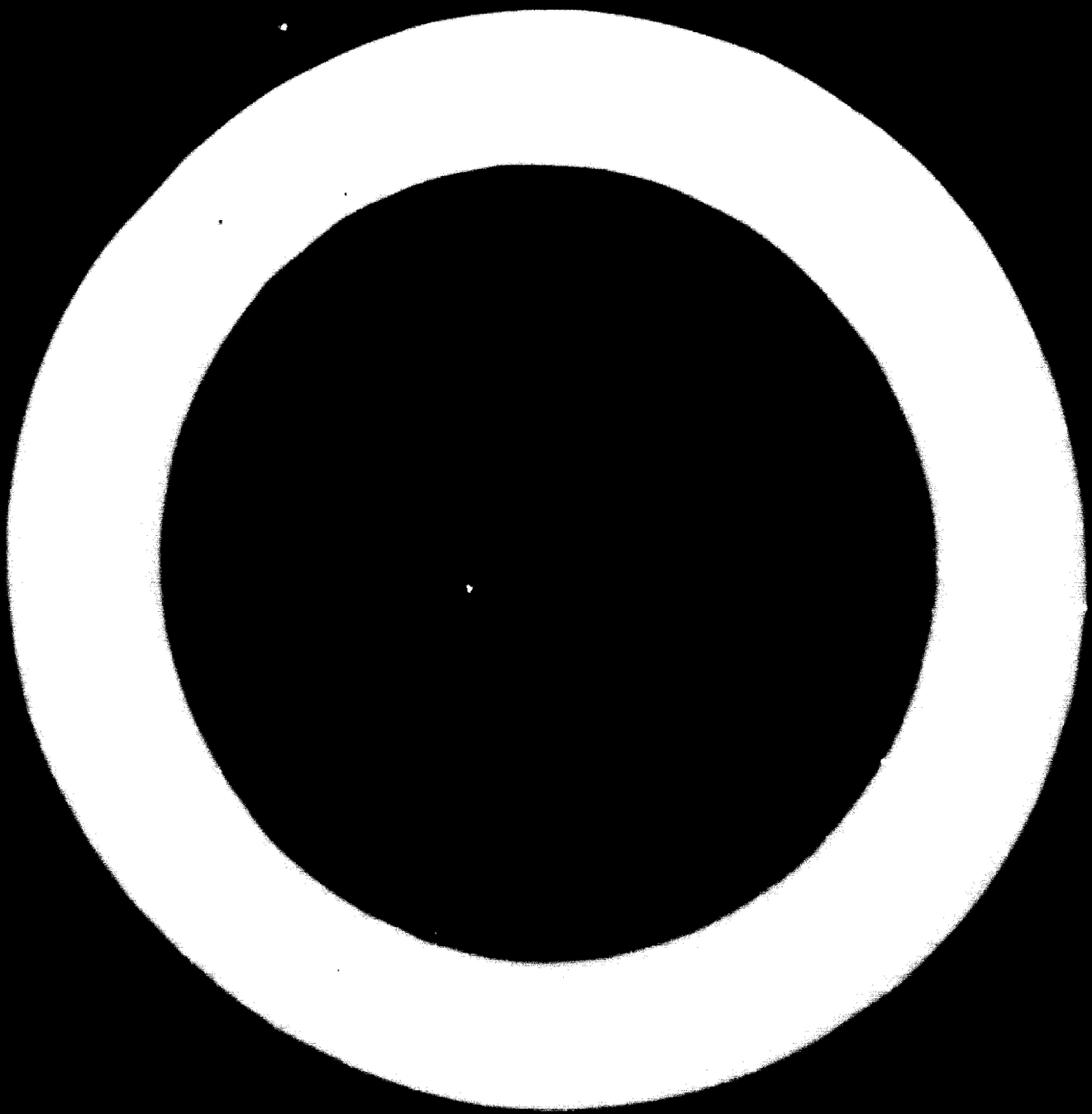
(c) Assist in the organization, administration and implementation of regional planning at the national level or at the regional level;

(d) Advise on the implications for national industrial location of multi-national co-operation or integration undertakings.

74. Advice on the micro-economic aspects of regional industrial planning should as a rule be entrusted to individuals with a considerable amount of practical knowledge of specific industries and with experience in dealing with concrete locational problems. This type of advice should centre mainly on the choice of location of a plant, project, or industrial complex.

75. The group emphasized that no effort should be spared to select top quality experts in regional planning and industrial location as well as in technical assistance in general. One expert suggested that a possible means of developing a top quality group of experts would be to create a trainee programme for technical assistance experts; such a programme is different from the "associate expert" programme and would enable young economists, already theoretically competent, to accompany established experts on industrial development missions in order to gain practical experience in the field. Such a programme would stand a good chance of being independently financed by governments or private foundations.

76. Finally, there was general agreement that, whenever practicable, the services of competent experts from developing countries should be actively sought, since these individuals can provide direct insight into the realities of regional planning in a development setting. The group considered this recommendation valid also in relation to technical assistance programmes in general.



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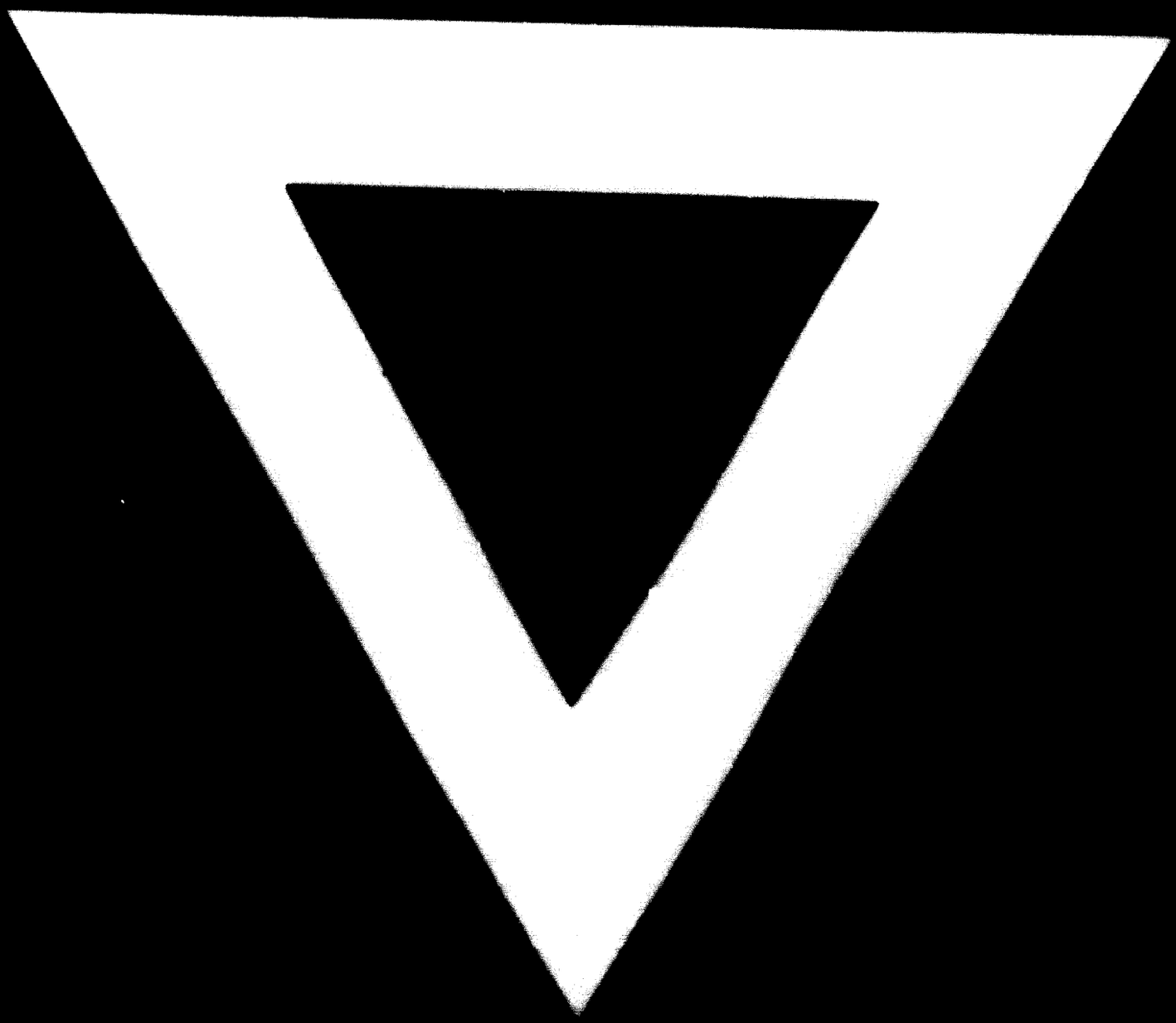

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