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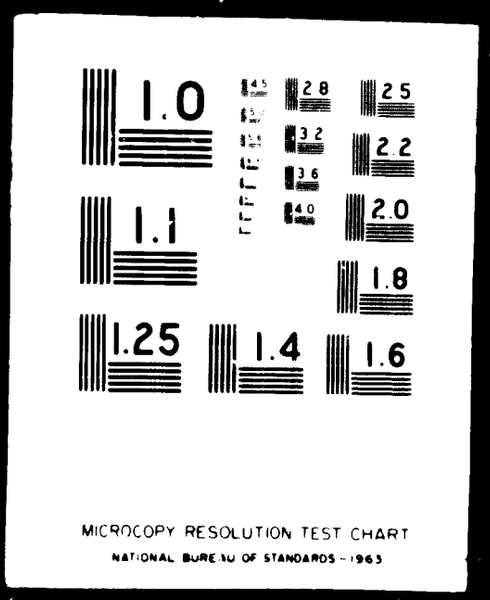
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NATIONAL BUREAU OF STANDARDS - 1963

In 1926 the Russian translation of Weber's book was published in the Soviet Union. In the preface to the translated text the most eminent Soviet economic geographer N. Baranski wrote:

> "One could recognize as quite uncontroversial that any step forward in the field of spatial distribution of industry can be achieved only through the Weber theory, and in no case outside it."1/

In 1928, an English translation of Weber's book was published in Chicago,2/ thus opening the American chapter in the adaptation and transformation of the locational theory of Weber.

The publications of E.M. Hoover3/ and W. Isard4/ are most outstanding in this field.

These publications also show how the approach of Weber was supplemented by later authors who inter alia took into account the changing distribution and scale of markets, a problem almost totally neglected by Weber.

2. The principal criterion of industrial location.

In the past thirty years an important change is observable in the definition and evaluation of the principal criterion of industrial location.

Some typical opinions are quoted below:

In 1962, a Soviet economist, A. Probst, wrote:

> "The technical and managerial progress in transportation diminishes transportation costs. This has a marked reflection in the field of industrial location ... where we find a tendency ... the diminishing role of transportation and the relative growth of importance of other factors."5/

A Belgian economist, Ph. Leurquin, analyzing the role of distance and transportation costs in industrial location, presents the following arguments:

> "At the time when Weber wrote, distance played a major part in determining the location of heavy industry. Technology was still relatively simple, which meant that there were not numerous complex variations of the ways in which factors could be combined; certain branches of industry, like steel-making require bulky raw materials which are used up in processes of production. Historically, the location of many industries can be so explained. For example, in 1908, Swedish ore cost 14.16 marks a ton C.I.F. Ruhrort and 14.94 marks C.I.F. Dortmund; that was enough to discourage any considerable extension of the steel industry in the Dortmund area and to encourage it, on the other hand, in the vicinity of the Rhine-Ruhr harbours.

1/ Quoted from a footnote on page 113 in the book by J.G. Feygin, Razmeshcheniye proizvodstva pri kapitalizmie i Sotsializme, Moscow 1954.

2/ Carl J. Friedrich, Alfred Weber's Theory of the Location of Industries, Chicago, 1928

3/ E.M. Hoover, The Location of Economic Activity, New York 1948.

4/ W. Isard, Location and Space Economy, New York 1956

5/ A. Probst, Razmeshcheniye soltsialisticheskoi promyshlennosti, Moscow 1962 - quoted from Polish translation, Warsaw 1965, p.226.

Today, the problem for many industries is much more complex; the transport factor and the distance factor play a less important part and are more and more in competition with other cost factors, the cost of water, of labour, etc."1/

Interesting empirical evidence is supplied by two American economists, T.P. Bergin and W.F. Eagan who conducted an inquiry - "into the factors that play a part in the choice of the location for new or expanding industries comprising 5,000 American undertakings which were new or had expanded during the last five years. In response to this enquiry 1,180 replies were received."2/

The following table presents the results of this inquiry.

TABLE 1

The reasons of plant location for 1180 undertakings in the United States

Rank	Reasons for Plant Location	No. of Times Ranked as No.						
		Total	1	2	3	4	5	Other
1	Availability of Labour	559	93	147	96	75	63	85
2	Convenience to markets	457	143	97	65	54	43	55
3	Availability of buildings or other property	394	96	84	57	65	41	51
4	Lower labour costs	343	38	53	79	69	55	49
5	Availability of raw materials	327	89	59	53	32	39	55
6	Less unionization	299	31	53	50	57	65	43
7	Local co-operativeness	294	20	28	55	71	89	31
8	Home of management	246	81	41	25	27	32	40
9	Climate	239	48	37	33	29	42	50
10	Transportation costs	230	22	48	42	52	37	29
11	Adequate power	229	18	30	49	41	45	46
12	Centre of particular industry	221	69	30	29	27	33	33
13	Transportation facilities	174	11	24	37	38	35	29
14	Decentralization of operation	151	25	27	31	27	25	16
15	Favourable tax structure	127	16	8	17	34	30	22
16	Financial aid	101	18	21	16	14	22	10

Source: International Information Centre for Local Credit - Government Measures for the Promotion of Regional Economic Development, The Hague, 1964, p.22.

1/ Ph. Leurquin - Marché Commun et Localisations, Louvain 1962, p.266.

2/ International Information Centre for Local Credit. Government Measures for the Promotion of Regional Economic Development. The Hague, 1964, p.22.

The leading role of labour problems in the field of industrial locations is found too by a British economist, W.F. Luttrell[1] who presents the following results of an inquiry into 93 British firms.

TABLE 2

Main impetus to finding a new location after 1945 for 93 firms in Great Britain

Industry group	Labour	Premises[a]	Other	Total
Shoe	15	-	-	15
Hosiery	24	-	-	24
Clothing	5	-	-	5
Textiles	7	1	1	9
Engineering	5	2	-	7
Electrical goods	8	1	-	9
Metal goods	6	3	3	12
Miscellaneous	4	3	5	12
Total	74	10	9	93

Source: W.F. Luttrell. Factory Location and Industrial Movement, London, 1962, p.48

a/ Premises - meaning physical premises (the need for new factory space).

The French Rapporteur, M. Parodi[2] sums up as follows the question of criteria affecting the choice of location for industry:

"(1) Certain professional organizations have been led to carry out enquiries among their members as to the reasons for the location of industry. These enquiries make it plain that when industries plan to carry out a programme of capital investment they give special importance to the factor labour in deciding the question of location.

This concern can be explained and justified by the tightness of the labour market in France since the Second World War. It might therefore be thought that the existence of labour made available by the abandonment of certain activities of the primary sector would be a consideration favouring the industrialization of rural areas. In actual fact the need to have highly qualified personnel limits to large towns the possibility of setting up industries and constitutes one of the reasons why the Paris area is found to be attractive.

In view of the foregoing a distinction should be made between light industries not employing highly technical processes but needing considerable manpower not very highly qualified, the location of which does not give rise to any special problem and heavy industry or industry with involved technical processes, the location of which is governed by various essential considerations.

(2) The existence of adequate basic physical equipment also determines, to a great extent, the location of industry. The availability to industrialists of land with all necessary services and above all the existence of rapid

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1/ W.F. Luttrell. Factory Location and Industrial Movement, London, 1962.

2/ M. Parodi - A letter to the Secretariat dated 25 January, 1966.

communications are factors which will lead to a decision to make an investment. Means of communication must provide satisfactory connexions between production and consumption centres but also meet the internal needs of the enterprise by linking the management with the places in which industrial or other work is carried on.

Means of communication comprise not only roads and railway lines and various types of transport equipment but also telecommunications, the development of which is indispensable for industrialization at the present time.

The removal of industries from supply areas to consuming areas is a phenomenon which is to be found fairly generally. Not all industries, however, follow this trend; the aluminium industry, for example, still remains dependent on supplies of energy. It is therefore clear that, besides the question of the actual existence of means of transport, their cost is a determining factor in the calculations of heads of enterprises.

(3) The economic and social environment is far from being a matter of no consequence for questions of investment. The degree of activity of the local economy should be such as to enable an undertaking which is set up there both to obtain its necessary supplies and to find markets. Such considerations will, however, be affected by the size of the undertaking; they are of lesser importance for undertakings operating on a national scale but paramount for the medium-sized undertaking. On the other hand, the existence of a relatively healthy social climate is an essential basis for industrial development irrespective of the size of the enterprise. It should be noted that this preoccupation is shared by foreign investors, who choose Europe as a location in the light of this criterion."

From what has been said the following conclusion can be put forward: in the past 30 years one of the most important changes in the field of industrial location can be described as the growing role of labour problems and the diminishing role of transport costs.[1/]

This is naturally a simplification but this formulation is perhaps useful as a starting point for international discussion.

There is no doubt that in reality the principal factor influencing location is always inter-related with other factors, which jointly create a complex reflecting the technological, economic and social conditions of a particular country.

1/ In these generalizations the changing pattern of transportation systems must be taken into account. The impact of the development of modern highway systems on the location of economic activity is especially important in this field.

3. The changing role of natural environment in industrial location

Each plant location has to solve some problems of land utilization. Therefore, the natural environment is a permanent factor in industrial location. But the role of this factor is changing both in time and in space.

It can be argued that technical progress, via the discovery of new mineral deposits or the introduction of new products, is diminishing the role of natural environment by increasing the number of locational choices. But the trend of the increasing role of big plants is in most cases acting in the opposite direction.[1/] It is much more difficult to find a proper place for the location of the big plant, than of the small one. It was relatively easy - 50 years ago - to find limestone deposits for a cement mill with a yearly capacity of 100,000 tons. In contemporary conditions if we look for limestone deposits to locate a cement mill with a yearly capacity of 1 million tons, the amount of choices among suitable limestone deposits is reduced drastically.

The same problem exists in the case of the water supply necessary for the location of a power station or a metallurgical plant, if we compare the situations now and 50 years ago.

So we have to agree with the following generalizations of A. Probst[2/]

(a) technical progress is changing the role of natural environment in industrial location

(b) there are several trends in this change which are not acting in the same direction.

These generalizations can be further exemplified by the change in the relative significance of different elements of natural environment for industrial location.

It is interesting to note that A. Weber, publishing his book in 1909, took into account only one element of natural environment, the mineral deposits. The

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1/ Compare: A. Kuklinski, Polish Geographical Review, Vol. XXXII. Supplement 1960 - Problems in the Location of Brickmaking Industry in Poland and L. Górecka, J. Grzeszczak - On Problems of the Interrelations between Industrial Plants and Geographical Environment, Geographia Polonica 2, 1964.

2/ A. Probst. Razmeshcheniyu sotsialistitsieskoi promyshlenniosti. Moscow, 1962 - quoted from Polish translation, Warsaw 1965, p.418-419.

problems of water and climate were considered unimportant. According to A. Weber "water is a practically unlimited, and therefore an absolute ubiquity in many German regions".[1/] Forty-three years later in the United States, the Presidents' Material Policy Commission stated: "By 1975, access to good water may become the most important factor in deciding where to locate industries".[2/]

So in the evaluation of water, we have a basic change: water is no longer a free commodity, it is a scarce commodity. In the field of location this change is reflected in the following statement: water is no longer a ubiquitous material available practically everywhere, it is a localized material available in a limited number of places.

In contemporary conditions water is a very important factor in industrial development and location. In the United States about 50 per cent of total water use is represented by the demand of thermal electric power generation and manufacturing industry.

According to J. Borchert[3/] there are three characteristic features of industrial water use in the United States.

(a) Industrial water use is concentrated within a few types of manufacturing industries[4/]

(b) Industrial water use is concentrated in a relatively small number of big plants

(c) Industrial water use is concentrated on a relatively small territory (less than 1 per cent of the land area of the United States accounts for 52 per cent of the nations manufacturing water use).

In such conditions industrial water use is not only a problem of industrial location but also a problem of regional economic development.

1/ A. Weber - Theory of the Location of Industries, Chicago 1929, p.51.

2/ Resources for Freedom, Vol. 1, Washington DC, 1952, p.50.

3/ Industrial Water Use in the United States, Polish Geographical Review, vol. XXXII. No.1-2, 1960. Analyzing the industrial water use in the United States, J. Borchert did not take into account the changes in this field which will be introduced in case of successful solutions of the problem of desalinization of sea water. Compare: J. Davy - A power worth its salt, The Observer, September 11, 1966.

4/ Compare United Nations, Water for Industrial Use - New York, 1958.

The role of climate in industrial location is less pronounced than the role of water resources, especially if the discussion is limited to the productive aspect of the problem. In most cases, climate is not recognized as a special factor in the location of the productive facilities.[1/]

Nevertheless, the type of climate in the chosen location is reflected in the level of investment outlays for the construction of the given plant. The most obvious example is the investment in air-conditioning facilities in industries where specific conditions of temperature and humidity must be created for the production process.

Another example is supplied by the recent developments in industrial design promoting the application of roof-less solutions, especially in the construction of plants producing electric power, sulphuric acid and cement.[2/] In this way, the investment outlays for buildings are reduced. This solution improves the efficiency of industrial investment since not the performance of the building but the performance of the direct productive equipment is reflected in the capital-output ratio. However, this technique of construction cannot be applied in all climatic conditions.

In the evaluation of the role of natural environment in industrial location, not only the "input" but also the "output" aspect of the problem should be taken into account.

In the classical micro-economic approach the input considerations were most important. The different elements of natural environment were evaluated from the point of view of the efficiency of production of the given plant. In recent years new trends have been observable in this field and the validity of the output side is receiving growing recognition. The macro-economic problem[3/] of air and water pollution are solved not only by the urban and regional authorities, but also by the industry itself.

1/ Compare: G. Grundke, Die Bedeutung des Klimas für den industriellen Standort, 1965 Gotha.

2/ Compare: Cz. Bąbiński, Projektowanie zakładów przemysłowych. Tendencje postępu, Warsaw 1962.

3/ Compare: G. Müller und F. Hessing, Kostenträger der Wasserversorgung und Abwasserbeseitigung, Ein Beitrag über die Zusammenhänge zwischen grossstädtischer Ballung und "social costs", Bad Godesberg 1962.

Nevertheless the problem of how to arrest and eliminate the processes of deterioration of natural environment caused by undesirable industrial outputs has not yet been solved in a satisfactory way in any country.

A long-run approach to the utilization of natural environment should receive full recognition. This long-run approach is required not only on account of direct productive demands, as in the case of the growing role of water resources in industrial development, but also because of the fact that the quality of the natural environment is in many cases an important factor in attracting the labour force, especially highly skilled personnel, to a given region or town where the plant is or will be located. In this sense amenities are emerging as a new factor in the determination of industrial location.[1/]

4. Structural changes in industry and the criteria of location

Not only are the criteria of industrial location changing in time and in space but there also exists a marked differentiation in the application of those criteria when different industrial sectors and branches are considered.

The locational pattern of a given sector or branch is closely associated with the particular features of technological and managerial solutions adopted in the industry concerned.

Therefore, the sectoral differences in the rate of industrial growth and the resulting changes in industrial structure[2/] should be a guideline for the locational studies. Conclusions should be drawn from the basic fact that in the dynamic sectors and branches more demand for new locations will be generated than in the relatively static ones.

The more important trends in this field in the past 30 years can be summarized as follows: the most dynamic sectors have been the metal-processing, chemical industries, electricity and gas, and non-metallic minerals and and products (Eastern Europe). Empirical evidence for Europe and North America in the years 1950-1962 is summarized in the accompanying tables (see Tables 3 and 4).

1/ Compare: H. Perloff and L. Wingo, Natural Resource Endowment and Regional Economic Growth in the volume edited by J. Friedman, Regional Development and Planning, Cambridge 1964.

2/ Compare: Walther J. Hoffman. The Growth of Industrial Economics, New York, 1958, p.143.

TABLE 3

Employment in industry and industrial production in western Europe and northern North America, 1950-1962

Period and Area [a]	Mining, manufacturing, electricity and gas	Mining	Manufacturing	Food, drink, tobacco	Textile clothing	Wood	Paper	Chemicals	Non-metallic mineral products	Basic metals	Metal products	Electricity and gas
ISIC	1-3, 51	1	2-3	20-22	23-24	25-26	27	31-32	33	34	35-38	51
EMPLOYMENT												
Number of persons engaged (in thousands)												
1950												
Industrialised western Europe	31 500	2 400	28 300	3 310	6 610	1 970	660	1 560	1 270	1 760	8 560	850
Southern Europe	2 900	370	2 450	400	800	350	30	100	100	100	600	90
Northern North America	18 200	1 000	16 700	2 060	2 990	1 270	550	840	580	1 240	5 070	550
1962												
Industrialised western Europe	39 600	2 200	36 500	4 310	6 670	2 230	890	2 130	1 550	2 220	13 140	950
Southern Europe	5 700	180	5 160	850	1 150	630	70	300	330	180	1 300	130
Northern North America	19 700	790	18 280	2 040	2 670	1 080	690	1 030	620	1 190	6 660	620
Rate of increase												
1950-1962												
Industrialised western Europe	1.9	-0.5	2.2	2.2	0.1	1.1	2.5	2.7	1.7	2.0	3.6	1.2
Southern Europe	5.8	-5.7	6.6	6.5	2.9	4.8	6.2	9.0	9.3	3.9	6.7	3.3
Northern North America	0.7	-2.3	0.8	-0.1	-1.0	-1.4	1.9	1.7	0.6	-0.4	2.3	0.9
INDUSTRIAL PRODUCTION												
Rate of increase												
1950-1962												
Industrialised western Europe	5.7	1.4	5.3	4.4	2.5	4.4	5.6	7.4	5.6	5.9	7.3	7.4
Southern Europe	7.7	6.6	7.8	5.8	4.6	5.5	9.5	11.0	9.2	11.6	10.3	12.1
Northern North America	4.0	2.6	3.8	2.6	2.1	2.0	4.0	6.0	3.5	0.6	5.1	8.6

Sources: UN, The growth of world industry 1938-1961 (National Tables and International Analyses and Tables), and national statistics.

NOTE.- Employment data are based on estimates and only indicate the general order of magnitude and general trends.

[a] Industrialised western Europe comprises EEC and EFTA countries, Finland and Ireland. Southern Europe comprises Greece, Portugal, Spain, Turkey and Yugoslavia.

TABLE 4

Employment in industry and industrial production
in the USSR and eastern Europe, a/ 1950-1961

Period	Mining manufacturing, electricity and gas	Food, drink, tobacco	Textiles clothing and leather products	Wood	Paper	Chemicals incl. coal mining and crude petroleum	Non-metallic minerals and products	Metal mining and basic metals	Metal products
ISIC	1-3, 51	20-22	23-24,29	25-26	27	11,13,30-32	14-19,33	12-34	35-38
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EMPLOYMENT									
Number of persons engaged (in thousands)									
1950	21 750	2 320	3 820	(590)	(135)	2 430	1 210	1 200	5 910
1961	34 890	3 330	6 330	(790)	(160)	3 670	2 430	1 830	10 820
Rate of increase 1950-1961	4.4	3.3	4.7	(2.6)	(1.6)	3.8	6.6	3.9	5.7
INDUSTRIAL PRODUCTION									
Rate of increase 1950-1961	11.8	8.6	9.3	12.8	8.6	10.0	15.3	10.9	15.3

Sources: UN, The growth of world industry 1938-1961 (National Tables and International Analyses and Tables) and national statistics.

NOTE:- Coverage of the series:
Column (1) excludes employment in electricity and gas industries for Bulgaria, Czechoslovakia, eastern Germany and Hungary.
Column (3) excludes employment in clothing and leather industries for Romania.
Columns (4) and (5) exclude employment in the USSR.
Column (6) excludes employment in mining in eastern Germany.
Employment data are based on estimates and only indicate the general order of magnitude and general trends.
For Bulgaria they refer to operatives only; for the USSR they include estimates in respect of non-manual workers.

a/ excluding Albania.

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Background paper

CRITERIA FOR LOCATION OF INDUSTRIAL PLANTS
(CHANGES AND PROBLEMS)

Presented to the Symposium by the Secretariat of
the Economic Commission for Europe

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It is perhaps worth mentioning that the vast majority of locational studies prepared in most countries of the world still reflect the nineteenth century pattern of industrial growth through their preference for studying the location of metal-smelting industries and of textile and food industries. This trend should be reversed and the study of the location of expanding industries should get preferential treatment.

This is not an easy change. The effect of the inertia existing in connexion with studies of the location of industry is made greater by the methodological and technical difficulties involved in the study of the metal-processing and more especially of the chemical industries.

Nevertheless, some pioneering studies,[1] could, or even should be taken as a starting point, with a view to encouraging comprehensive programmes developing the locational studies of the metal-processing and chemical industries. A series of specialised international symposia could possibly be organized in this field.

5. The emergence of macro-economic criteria of industrial location

The late twenties witnessed both the peak of popularity of Weber's theory and also the first important challenge to the theory.

It is not an accident that this challenge was formulated in the Soviet Union during the dramatic discussion on the location of new capacity of the iron and steel industry.[2]

Two solutions were reviewed:

(a) the expansion of the existing iron and steel industry in the European part of the Soviet Union and especially in Donbass;

(b) the creation of a second base for the iron and steel industry in the Urals and Western Siberia - the Ural-Kuznetsk integrated plant.

The theory of Weber was used as an important argument supporting the first solution and stressing the prohibitive transportation costs of the second.

1/ N. Sokin, Ekonomicheskie osnovy razmeshcheniya nekotorykh otraslei khimicheskoy promyshlennosti, Plan No.8, 1958, USSR; J. Airov, The Location of the Synthetic Fiber Industry: a Study in Regional Analysis, New York 1959, John Wiley and Sons and Technology Press; H. Fedorenko, Ob optimalnon razmeshcheniyu otraslei khimicheskoy promyshlennosti: Voprosy ekonomiki, No.4/1965.

2/ Compare: R.S. Livsjc, Ocherki po razmeshcheniyu promyshlennosti SSSR, Moscow 1954, p.163; and F.D. Holzman, The Soviet Ural Kuznetsk Combine. A study in Investment Criteria and Industrialisation Policies, The Quarterly Journal of Economics, No.3, 1957.

The followers of the idea of the Ural-Kuznetsk integrated plant, indicated correctly that the theory of Weber cannot be used in this case. The approach of Weber was a typical micro-economic and short-run approach, taking for granted the existing distribution of population and economic activity. The decision to build the UKK was a typical macro-economic and long-run decision designed to change the existing distribution of population and economic activity.

The second solution was implemented and already in the late thirties the UKK emerged as the most efficient steel producer in the Soviet Union. The economies of large-scale operations used in all stages of mining, processing and transportation activities went far to explain this success.

The UKK experience may be said to merit special mention as being probably the first example of the successful application of a long-run and macro-economic approach to the criteria of industrial location.

In the Western countries the emergence of macro-economic criteria of industrial location was associated with the first examples of state intervention in the field of industrial location and regional economic development.

In the United States the well-known TVA programme was started in the framework of New Deal policies. The implementation of the TVA programme created in this region new conditions for industrial development. According to S.H. Robock:[1]

> 'A major economic development feature of the Tenessee Valley experience has been the rapid industrialization. Since 1933, when the TVA was established, the Valley economy has grown at a faster rate than the nation and has shifted from a predominantly agricultural area to an important and expanding industrial region. By 1960, due both to rapid industrialization and extensive out-migration of surplus labour, income per capita in the Tennessee Valley reached a level of $1,378 or 64 per cent of the national average.'[2]

A very important chapter relating to the Western experience in this field was written by the United Kingdom where a Special Areas Act was passed in 1934. This Act marked the acceptance by the Government of some responsibility for influencing the pattern of industrial location.

1/ Stefan H. Robock. Integrated River-Basin Development and Industrialisation. The Tennessee Valley Experience. A US paper for the Third Meeting of Senior Economic Advisors, Geneva 1964 - p.2.

2/ Stefan H. Robock, op.cit. p.7.

The objectives of this policy are described by B.J. Loasby in the following way:

'The whole history of location policy in this country has been conditioned by its origins in the realization that acute problems of localized unemployment lay half-concealed beneath the general depression of the inter-war years. It was, therefore, inevitable that location policy should be seen mainly as a means of alleviating such localized unemployment.1/

The same author gives the following appreciation of the results of the first six years of this policy:

' In 1939 location policy could claim only the most modest success.

In one respect, however, it had been successful: it had become a topic of some interest, and the subject of a Royal Commission (the Barlow Commission) which was established in 1937 and reported in 1940. The Barlow Report is a classic example of an inquiry with its conclusions written into its terms of reference, with their emphasis on the disadvantages of the existing distribution of population. But at least it did attempt to set the problem in a context which included strategic issues and the problem of congestion in the great cities, and envisaged control over the location of industry as a means of remedying what it saw as a maldistribution of industry. The idea that there is some pattern of industry which is best for a particular region, and for the country as a whole, and towards which Government effort should be directed, was a common feature of thinking for several years, but what this pattern might be was never explicitly stated. Implicitly, it seemed to be that which would minimize inter-regional variations in unemployment.'2/

A more detailed account of the application of macro-economic criteria will be given in the following sections of this paper. Here it will be sufficient to emphasize that both in the Eastern and Western countries the emergence of macro-economic criteria of industrial location was associated with the experience of industrial development or industrial depression in the years 1927-1939.

1/ B.J. Loasby. Location of Industry. Thirty Years of Planning. District Bank Review, December 1965, p.28.

2/ B.J. Loasby, op.cit. p.35.

Section II

The choice of location by an individual enterprise and groups of enterprises

1. The choice of location by an individual plant

The traditional solution of this problem was designed for a new plant trying to find an answer to the following question: "In what place would the costs of production of the new plant be minimized". The problem of location was in most cases the last one in the process of investment decision.

Consciously or intuitively, the comparative cost approach was used and the variation of costs between different locations was examined for the selected type of plant. The material presented by W.G. Holmes, who analyzed the comparative costs of a Portland Cement plant at four possible locations in the United States, can be taken as an example.

TABLE 5

Computations of delivered-to-customers cost[a] according to location of cement mill

Costs are per barrel

	Site			
	A	B	C	D
Raw materials at the mill:	$	$	$	$
Limestone	0.14	0.16	0.13	0.10
Shale	.02	.03	.02	.03
Gypsum	.04	.04	.04	.04
	(.20) b/	(.23) b/	(.19) b/	(.17) b/
Fuel and Power:				
Coal	.27	.19	.30	.22
Electrical energy	.18	.22	.26	.20
	(.65)	(.64)	(.75)	(.59)
Works expense:				
Mill labour	.14	.16	.12	.14
Superintendence, laboratory, repair parts etc.	.08	.08	.09	.08
	(.87)	(.88)	(.96)	(.81)
General expense and charges:				
Administration and incidentals	.06	.05	.05	.05
Insurance	.01	.01	.01	.01
Taxes (including income)	.06	.08	.10	.08
Bond interest	.05	.05	.05	.05
Amortization	.06	.06	.06	.06
	(1.11)	(1.13)	(1.23)	(1.06)
Distribution:				
Packing, sack cleaning, and sack loss	.07	.07	.07	.07
Sales	.10	.09	.10	.11
Transportation (to market)	.33	.24	.30	.40
Total	1.61	1.53	1.70	1.64

Source: W.G. Holmes: Plant Location, McGraw Hill, 1930: quoted in Industrial Location and National Resources - National Resources Planning Board, Washington, 1943, p.335.

a/To a large extent these figures are taken from an actual case. Some changes have been made both to increase the effectiveness for purposes of illustration and to conceal the identity of the company.

b/Figures in parentheses are cumulative totals.

The cost items given in Table 5 can be divided into two groups.

(a) cost items which depend upon location (for example, limestone, coal, labour and transportation);

(b) cost items which are independent of location (for example, insurance, amortization, packing).

This is a valid distinction because in some cases the analysis could be confined to those items of cost which vary most with changes in location of a given industry.

The comparative cost technique has a long history of successful applications in different economic and social systems and there is no doubt that it will be useful in the future.1/

However, the new trends of industrial development are creating much more complicated problems than those covered by Table 5 - and in consequence restricting the application of the classical comparative cost technique to a diminishing number of cases.

2. The choice of location by a group of enterprises or by a multi-plant enterprise

An analysis of the locational decisions in the industrial countries would probably enable a trend to be established showing a growing number of decisions, where the problem of location was solved, not from the point of view of the optimum performance of an individual plant but from the point of view of a group of plants forming a higher managerial unit. This unit could be described as a concern in a market-economy country or an industrial association in a planned-economy country.

There are very important differences between the market and planned economies in this field. These differences are analysed in Section IV of this paper. In this context attention may be drawn to an important point of similarity: the trend towards shifting locational decisions from plant level to higher managerial unit level.

Within such units the problems of location are solved in two ways:

(a) in the traditional way, when -

i. the problem of location is restricted to new plants

ii. the problem of location is the last one in the process of investment decisions.

1/ Compare: W. Isard, Methods of Regional Analysis, New York 1960, pp.233-245; W. Kawalec, Problemy rozmieszczenia przemysłu w Polsce Ludowej, Warsaw 1965, pp.219-227.

(b) in the modern way, when -

i. the problem of location is recognized as a comprehensive one covering the location of new productive capacity and including both the expansion of the old plants and the construction of new ones.

ii. the problem of location is incorporated in the whole process of investment decisions and the feed-back possibility is recognized. A good example of feed-back possibilities is a situation when the decision on the size of plant or the decision on the factor proportions is changed in order to take advantage of the results of the locational analysis.

It is perhaps interesting to note that there are very few publications analyzing the second way and describing the feed-back effects of locational studies.

It is worthwhile to note too, that probably 60-80 per cent of investment in manufacturing industry in developed countries is allocated to the expansion of existing plants and only something under 40 per cent to the construction of new ones.

In Table 6 there are data showing this proportion in the case of the industries of the Soviet Union. In this case the main attention of locational studies is concentrated on problems representing only less than 40 per cent of total industrial investment.

It is true that the location of new plants deserves special attention, but at the same time the above-mentioned proportions should be kept in mind.

3. The locational implication of the change in size of industrial plants

There exists an impressive number of publications analyzing the economies of large-scale production and of the growing size of industrial plants,[1/] which is one of the most important trends in the development of modern industrial technology.

1/ Compare: A. Armstrong, A. Silberston. Size of plant, size of enterprise and concentration in British manufacturing industry 1935-1958. Journal of the Royal Statistical Society No. 3, 1965. J.S. Bain. Economies of Scale Concentration and the Condition of Entry in Twenty Manufacturing Industries. The American Economic Review, No. 1, 1954. L. Berri and J. Shilin, Ekonomicheskaya effektivnost kontsentracii proizvodstva v promyshlennosti, Voprosy Ekonomiki, No.9, 1965. P.S. Florence. Investment Location and Size of plant, Cambridge University Press, 1958. M.M. Metwally. A comparison between Representative Size of Plant in Manufacturing Industries in Industrialized and Less-industrialized Countries. Yorkshire Bulletin of Economic and Social Research, No.2, 1965. Plant Size and Economies of Scale - Industrialization and Productivity Bulletin, UN, No.8, New York, 1964.

TABLE 6

Relative share of investment in expansion, reconstruction and modernization in total investment[a/] in the USSR industry

Percentages

	1959	1963
Total industry	51	61
Ferrous metallurgy	62	60
Non-ferrous metallurgy	45	53
Coal	59	69
Oil and gas	28	35
Electricity production and transmission	19	22
Engineering	70	81
Chemicals	51	51
Construction materials	48	62
Lumber and wood processing	56	60
Light industry	49	51
Food industry	59	61

Source: Kapitalnoe stroitelstvo SSSR, Moscow, 1961, p.69.

a/ Investment in production facilities only.

TABLE 7

Size of establishments in Polish State industry

Employment size	Number of establishments		Number of persons employed	
	1956 %	1960 %	1956 %	1960 %
Up to 4	21.1	21.0	0.3	0.3
5 - 10	17.0	16.6	0.8	0.7
11 - 15	6.5	5.9	0.5	0.4
16 - 50	21.9	21.3	4.5	3.8
51 - 100	12.0	12.0	5.6	5.1
101 - 200	8.0	7.9	7.4	6.9
201 - 500	7.1	7.9	14.7	14.9
501 -1000	3.3	3.8	15.2	15.9
1001 -2000	1.7	2.0	15.2	15.8
2001 -5000	1.1	1.2	21.9	21.7
5001 - and more	0.3	0.4	13.9	14.5

Source: Statystyka Przemysłu, Główny Urzad Statystyczny, Warsaw 1963, p.97.

TABLE 8

Manufacturing industry - Distribution by size of plant in Great Britain

No. employed in plant	1935	1951	1958
	Percentage of total employment		
11 - 50	13.9	11.5	9.7
50 - 100	11.7	10.4	8.8
100 - 300	26.2	22.2	20.9
300 - 500	12.8	11.6	11.4
500 - 1,000	13.9	13.6	13.9
1,000 - 1,500	6.3	7.2	7.9
1,500 - 3,000	} 15.2 (266)	9.0) 23.6 (388)	11.5) 27.4 (428)
3,000 +	}	12.6) (161)	15.9) (214)
	Percentage of gross output		
11 - 50	12.8	9.9	8.3
50 - 100	11.2	9.7	7.4
100 - 300	25.1	22.2	19.2
300 - 500	12.5	12.6	11.1
500 - 1,000	14.0	14.1	13.6
1,000 - 1,500	6.0	7.1	8.7
1,500 - 3,000	} 18.4	12.9) 24.6	13.3) 31.7
3,000 +	}	11.7)	18.4)
Number of plants (actual)	47,730	56,200	54,740
Number of plants (index)	100	118	115
Output (index)	100	164	191
Output per plant (index)	100	139	161

Source: A Armstrong and A. Silberston, Size of Plant, Size of Enterprise and Concentration in British Manufacturing Industry 1935-1958, Journal of the Royal Statistical Society, Vol. 128, part 3, 1965.

TABLE 9

Manufacturing industry - distribution by size of establishments in the United States

Establishment with an average of employees	Number of establishments		Number of employees		Value added by manufacture	
	1947	1958	1947	1958	1947	1958
	%	%	%	%	%	%
1 - 4	29.2	35.4	1.1	1.4	1.2	1.3
5 - 9	19.4	17.0	2.2	2.2	1.9	1.8
10 - 19	16.9	15.7	3.9	4.2	3.5	3.4
20 - 49	16.6	15.5	8.7	9.4	8.1	7.8
50 - 99	7.8	7.3	9.1	9.8	8.9	8.5
100 - 249	5.9	5.4	15.6	16.2	15.8	15.0
250 - 499	2.3	2.1	13.5	14.0	14.0	13.7
500 - 999	1.1	0.9	13.1	12.3	13.6	12.8
1,000 - 2,499	0.6	0.5	15.0	13.3	15.6	15.2
2,500 and over	0.2	0.2	17.8	17.2	17.2	20.5
All establishments	100.0	100.0	100.0	100.0	100.0	100.0
All establishments in absolute figures	240,807	298,182	14,293,963	15,393,766	74,290,475	141,270,297
Per one establishment	x	x	59.35	53.69	0.309	0.494
Index	x	x	100	90.46	100	159,87

Source: US Census of Manufactures, 1958, Volume 1, p.2-2

This trend is especially evident in some branches of manufacturing industry. Mention may be made, in particular, of plants producing electricity, steel, cement, fertilizers, petrochemicals and motor cars. Nevertheless there are branches of industry where the small plant is demonstrating an astonishing power of survival and expansion. It is very difficult to get the general inventory and evaluation of change in this field. There exists an additional technical difficulty: in many countries the statistical data describe the size of enterprise and not the size of plant.

Although in many cases it may be assumed that the growing size of enterprises represents the counterpart of the growing size of plant, there are also numerous cases where the growing size of enterprises is the result of institutional changes, which favour the creation of multi-plant enterprises. This is particularly true, for instance, in the Soviet Union and Poland where the recent tendency has been towards amalgamation of enterprises into larger organizational units. Also for Great Britain, the available data indicate a growing role of relatively larger enterprises associated with a decline in the total number of existing industrial establishments (compare Tables 7, 8 and 9). The US experience in the years 1947-1958 (see Table 9) does not support the arguments of those who predict the relatively fast rate of disappearance of small plants. In this period in the US the absolute number of plants was growing and the role of the large plants in the manufacturing industry increased only slightly.

In short, it may be said that although a rise in the size of plants may have been the more prevalent tendency in recent years, the direction and rate of change were certainly differentiated sectorally (among industries), and geographically (among countries). Analyzing the locational implications of the changes in the size of industrial plants, attention may be drawn to the following problems.

(a) the role of external economies and infra-structure investment
(b) the role of distance in the supply of inputs and ditribution of outputs.
(c) the role of physical space.

(a) The role of external economies and infra-structure investment in the location of industrial plants of different sizes. Some specialists in the field of industrial location argue that:

"external economies ..... today constitute, on an increasing scale, the principal factor of attraction in determining the location of industry". 1/

1/ Ph. Leurqin, Marché Commun et Localisations, Louvain 1962, p.266.

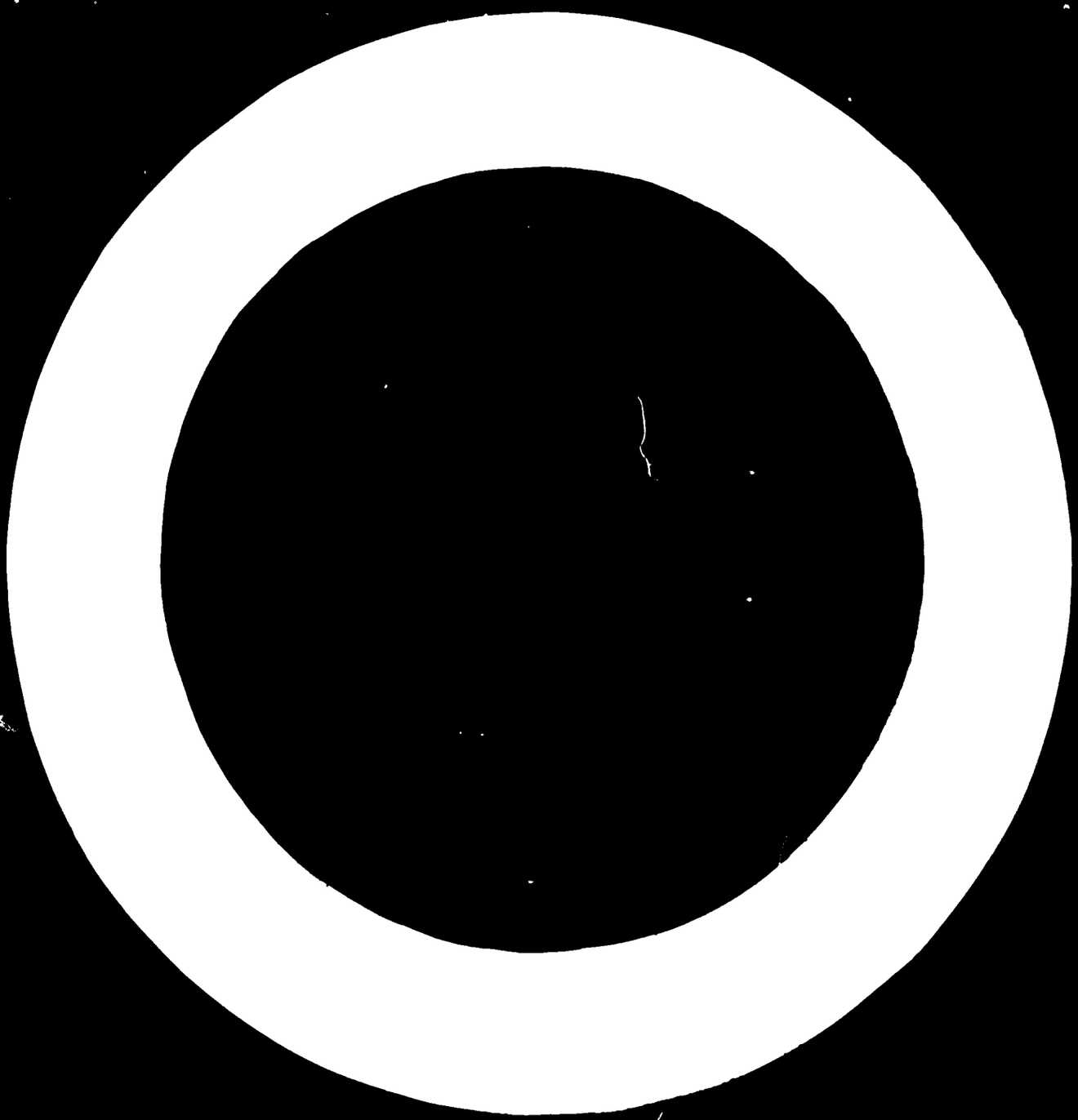
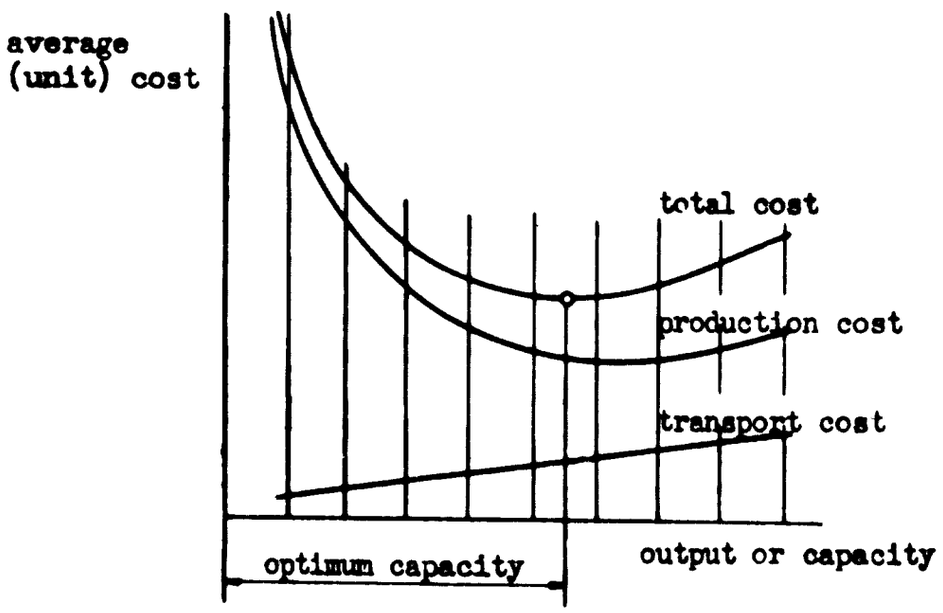
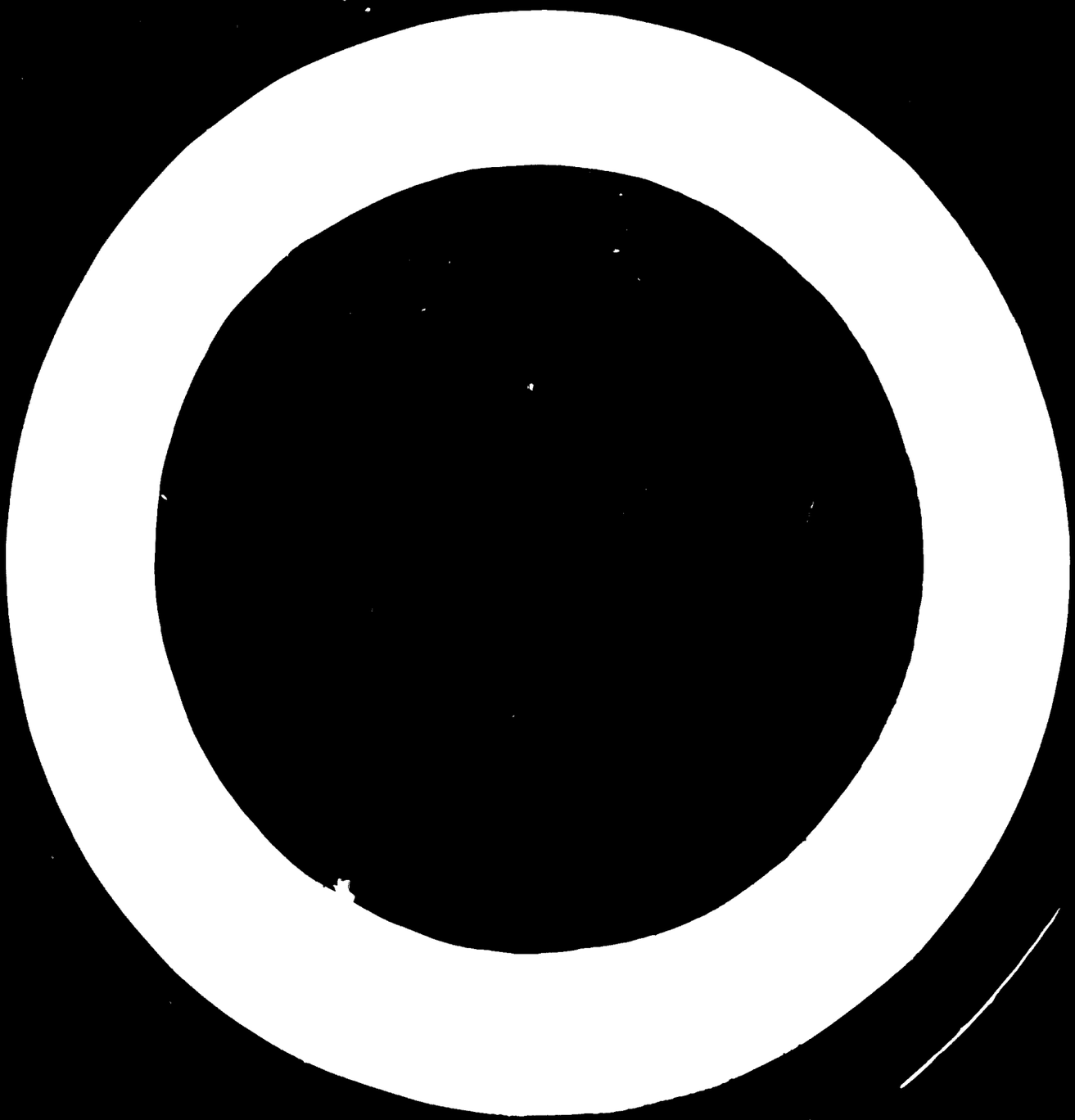


Fig. 1.

Average cost as a function of scale



Source: C. Kadas, op.cit., p.198



There is no doubt that such economies are an important factor, but it can be argued that the large plant is less dependent on external economies than the small or medium-size plant.

There are two arguments supporting this point of view:

i. there are many elements which are recognized as external economies in relation to the small plant - and as internal economies inside the big plant. Specialist maintenance services are a good example: they are supplied from outside to the small plant but from inside in the case of the large plant.

ii. the small plant is too weak to provide, when necessary, the missing elements of infra-structure investment, the large plant has resources which are sufficient to take care of the missing elements of infra-structure investment.

In fact, experience with the construction of large plants in under-developed regions affords a number of examples of such solutions.

(b) The role of distance in the supply of inputs and distribution of outputs.

It is generally accepted that the growing size of plant and the growing benefits of the economies of scale are in most cases associated with the possibility of extending the area of supply of inputs and the area of distribution of outputs. This problem is well demonstrated by Figure 1 (see end of Study) reproduced from a paper by C. Kadas.[1/]

Ceteris paribus, the large plant is in a better position to serve the distant national and international markets than the small one. This means that as the size of plant grows the role of distance diminishes especially as large plants have a better access to the facilities of large-scale mass transport. It is not an accident that so many new large plants are located on the sea coast.

(c) The role of physical space.

One of the new trends of modern industrial design and technology can be described as the growing use of space.[2/] Industrial construction, especially of large plants, is beginning to constitute an acute land-use problem in densely settled areas. This consideration is an important factor favouring the location of new large plants outside over-congested metropolitan areas.

1/ C. Kadas. The Impact of the Development of Transportation on the optimal size of plants and on optimal regional location. Regional Science Association Papers. Volume XII, 1964.

2/ Compare: C.Z. Babinski: Modern Trends in Industrial Design, Warsaw, 1962.

In conclusion, it can be said that the growing size of plant is associated with growing difficulties in finding a proper place where the lay-out of the plant can be designed according to the rules of modern industrial technology and architecture, allowing also sufficient space for the future expansion of the plant.

4. The locational implications of technological integration and specialization in manufacturing industry.

There are many approaches to the problem of technological integration and specialization in manufacturing industry. In this paper technological integration will be considered as involving the growth of plants or groups of plants situated in the same location and performing activities "subject to important technological, marketing and other interrelations."1/

Technological specialization is, according to the approach adopted in this study, a process of splitting up operations previously performed in one plant and establishing new plants which through the limitations in the scope of their output benefit from certain economies of scale even in medium-sized and small producing units. The locational implications of these two processes can now be considered.

(a) The locational implications of technological integration.

There are different types of technological integration associated with different stages of industrial development. The first industrial revolution concentrated attention on integration in the textile and steel industries.

In the present stage of industrial development integration in the chemical industries is most important. In this case the concentration in one location of a set of technologically interrelated activities generates economic advantages which encourage this solution in a growing number of cases.

The locational implication of this process can be described as the diminishing role of external economies and the growing preference for locating integrated plants outside the over-congested metropolitan areas.

1/ Compare: W. Isard, op.cit, p.409.

It would seem that the location of an integrated plant or a multi-plant enterprise is in most cases one of the best ways of promoting the industrialization of an under-developed region.

Technological integration also stimulates the development of new techniques of locational analysis. The classical comparative cost approach is applied most successfully in single commodity industries. In these cases all costs could be recomputed on the basis of a given unit of physical output like one kWh of electricity, 1 ton of steel, cement or sugar. In the case of modern chemical industries the situation is much more complicated. The integrated plant produces a given set of interrelated outputs and the advantages and disadvantages of location and the economies of scale must be related in a comprehensive way to this set. To solve this problem a new technique of analysis has been developed - the industrial complex analysis. W. Isard gives the following evaluation of this technique.1/

' In conclusion, it may be stated that for many problems of resource use, industrial location, and regional development, industrial complex analysis is a useful technique. It can identify and evaluate profitable situations and activity combinations which cannot be accurately assessed, either by industry-by-industry comparative cost studies or by strictly linear inter-industry techniques. In one sense, the industrial complex approach is a hybrid approach; it can effectively isolate and evaluate the interplay of key variables among groups (subsystems) of highly interrelated activities. '

(b) <u>The locational implications of technological specialisation</u>.

Technological specialization is a typical phenomenon in the metal-processing industries. In the case of specialised plants "external economies, and especially co-operation with other plants," are a very important factor affecting location. This is the world of interrelations between plants acting in the capacity of contractors

1/ W. Isard, <u>op. cit</u>, p.411.

and subcontractors and in some cases in that of assembly-line industries which generate demand for thousands of specialized plants. The locational implications of this process can be described as the preference for locating specialized plants in the metropolitan areas which afford the best advantages with regard to external economies and which have varied labour resources. A very good example of this trend can be quoted from the study of Ph. Leurquin, where the accompanying map, reproduced as Figure 2, is to be found.1/ This locational preference for metropolitan areas can be reversed only in large-scale solutions, creating simultaneously in an under-developed region a sufficiently large group of enterprises of metal-processing industries.

Such an approach is found in the EEC study for promotion of an industrial development pole in southern Italy which was prepared by a team of Italconsult guided by Professor E. Tosco.

The object and method of this study is described in the following way:2/

' The object of this study is to create in the provinces of Bari and Taranto an industrial centre that will be sufficiently closely knit to continue developing simply by the interplay of market forces once the initial nucleus has been established.

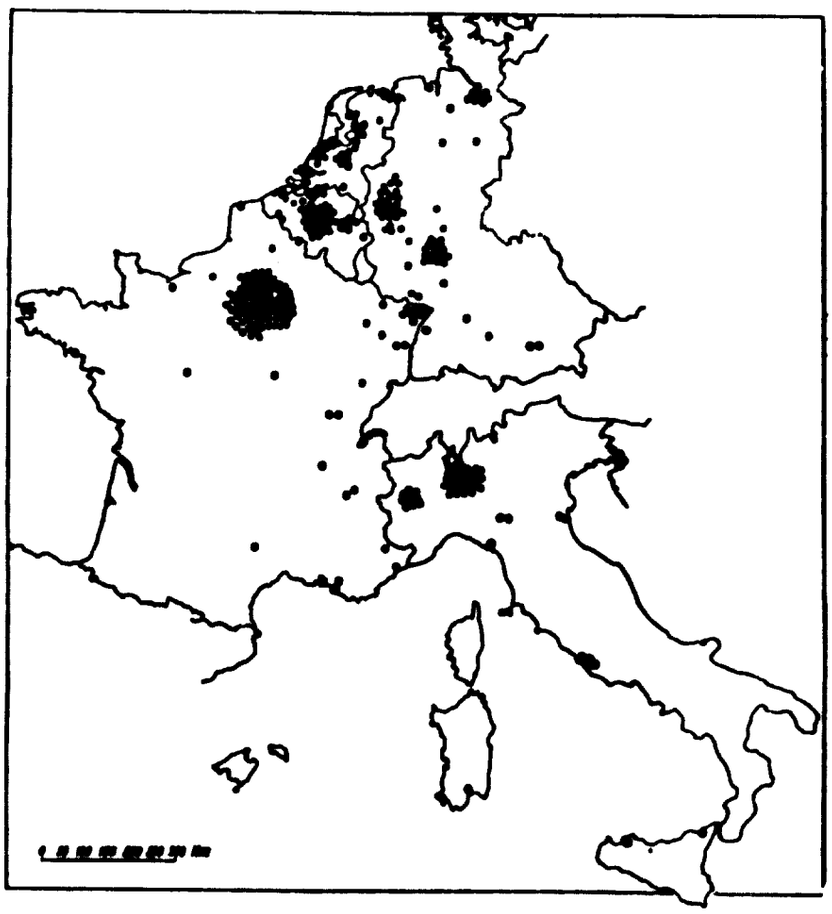
The method employed, which it is the purpose of this study to put into effect as an experiment, depends on the role of trade in intermediate goods and services in the economy of complex-cycle industries. It consists in the simultaneous establishment of all the intermediary industries needed in the sector that is to be promoted - in this case heavy and medium mechanical engineering - and of a sufficient number of user industries to justify economically the existence of these intermediary industries. '

1/ Ph. Leurquin, op.cit., p.274.

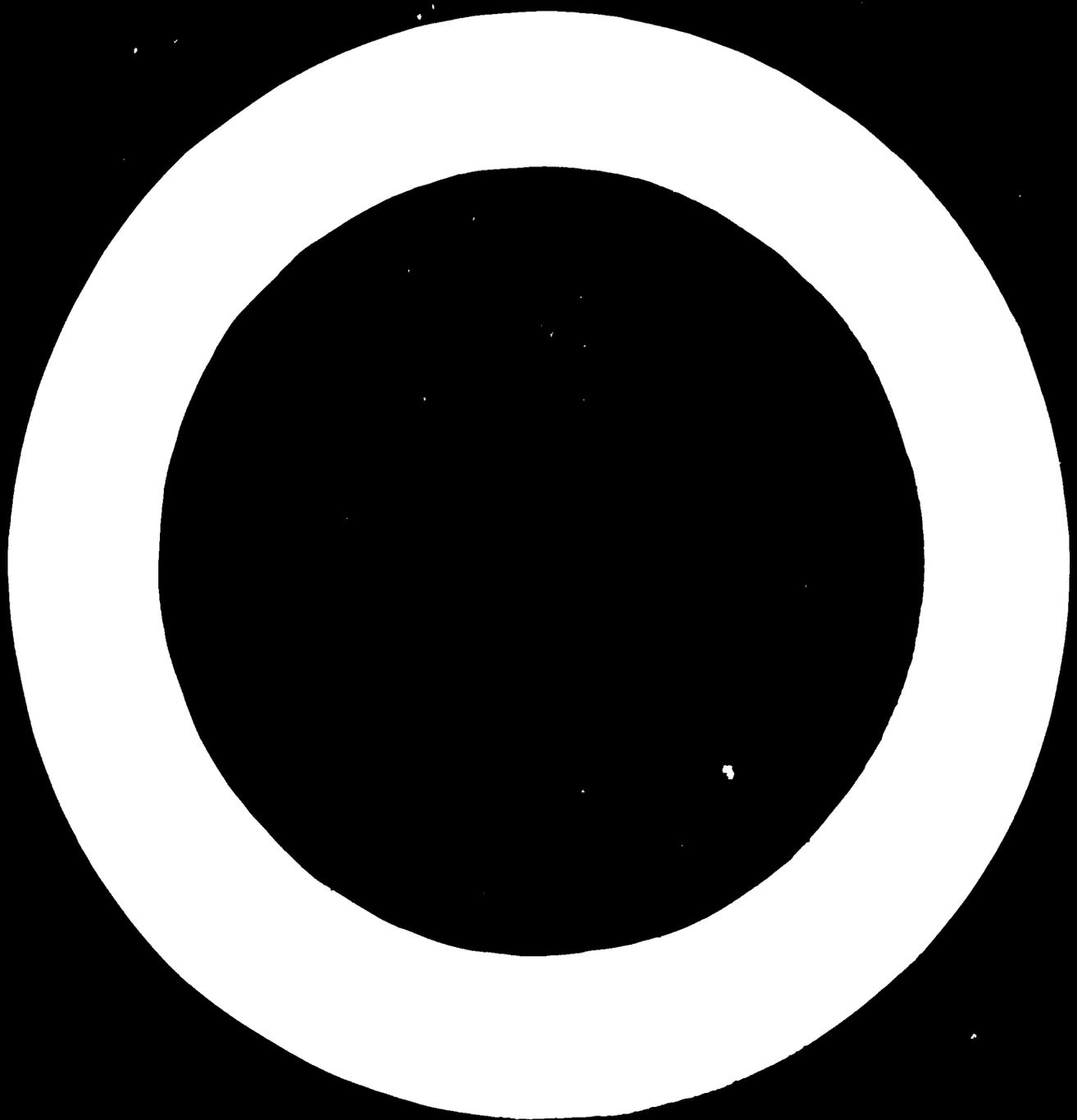
2/ European Economic Community - Commission - Study for promotion of an industrial development pole in southern Italy. Brussels, January 1966, 312/II/66E. Compare too, the information published in the Press Review, Bank for International Settlements, No.227, 23 November 1965.

Fig. 2.

New engineering and electrical enterprises in Common Market countries



Source: Ph. Leurquin, op.cit. p.274



5. The locational implications of technical progress.

It is very difficult to restrict the discussion of the locational implications of technical progress to a given set of problems, since in most cases any change in industrial location is directly or indirectly associated with technical innovations.

Here it is proposed to discuss only a few topics which are important, and which are not analyzed sufficiently in other parts of the study.1/

In the evaluation of technical progress in industry, the basic distinction between process and new product innovations is accepted. A comprehensive analysis of the locational implications of technical progress following this distinction is not developed. But a few examples can be indicated.

In the field of the locational consequences of process innovations, the most interesting example is supplied by the history of the iron and steel industry in the last two hundred years. The direction of this basic change in location can be described as follows: from a small-scale spatially dispersed, to a large-scale spatially concentrated industry.2/ In the locational analysis of this phenomenon, special attention was given to the relative change in input requirements of coke and iron ore per one ton of pig iron produced.3/

Other examples of the locational implications of process-innovations can be found in the history of the electric power industry and of the cement industry.

In the evaluation of the locational consequences of new product innovations, two different situations should be taken into account. The first situation occurs when the output of a new product is started in an existing plant. This fact in many cases generates very limited locational consequences, or none at all.

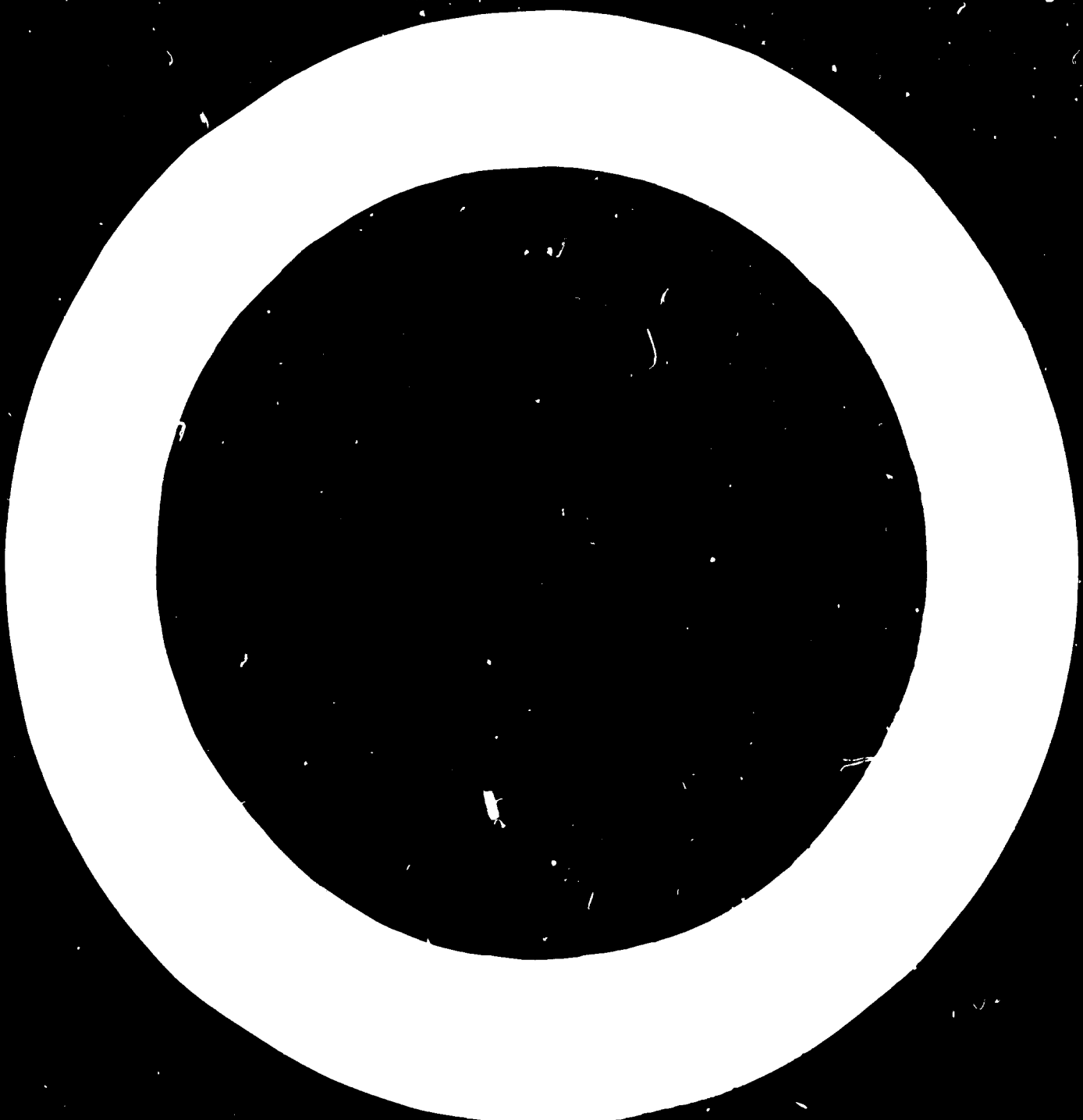
The second situation arises when a new plant in a new location is built for the output of a new product. In most cases such an experience creates a demand for new methods and approaches in locational analysis. The output of new petrochemical products in technologically integrated plants is an example of this situation.4/

1/ Compare for example the remarks in paragraphs 3 and 4 of Section II.

2/ Compare the remarks of A. Probst on the historical trend in the location of the iron and steel industry in Russia and the Soviet Union: A. Probst - Razmeshchenive sotsialisticheskoi promyshlennosti, Moscow, 1962, quoted from Polish translation, Warsaw 1965, p. 457-460.

3/ Compare E.W. Zimmerman, World Resources and Industries, New York 1951, and W. Isard, Some Locational Factors in the Iron and Steel Industry since the Early XIX Century, Quarterly Journal of Economics, November 1949.

4/ Compare paragraph 4 of this Section.



In trying to explain the limitations of the application of A. Weber's theory to contemporary industrial location, the problem of new products which did not exist at the beginning of XX century is very important. The theory of A. Weber was not apparently evaluated from this point of view.

The second part of the discussion of the locational implications of technical progress will be restricted to the following topics.

(a) The locational implications of mechanization and automation in the manufacturing industry.

(b) The locational implications of the decreasing importance of material inputs in manufacturing industry.

(c) The locational implications of technical progress in transportation and communication.

(d) The forecasting of technological change and industrial location.

(a) The locational implications of mechanization and automation in manufacturing industry.

The processes of mechanization and automation are very important factors in the development of manufacturing industry. In recent years, the problem of automation in particular has been treated with special attention, but the scale and rate of introduction of automation in manufacturing industry should not be overestimated because there are two obstacles:

(i) technological - the application of automation is possible only in relatively few manufacturing industries.

(ii) economic - the application of automation is in most cases a capital-intensive operation.

Contrary, therefore, to the fears and hopes of the early fifties, automation did not introduce a revolutionary change into the industrial labour market. But, at the same time, there is no doubt that the growing mechanisation and automation of industrial production was one of the important factors explaining the growing efficiency of labour in manufacturing industry and the growing demand for highly qualified personnel.

The locational implications of this process in the Soviet Union are described by M. Vilensky in the following way:1/

' Comprehensive mechanization and automation is not the prerogative of any particular region. The reduction in labour input resulting from technical progress is not a local process. With the general introduction of mechanisation and automation, the location of manufacturing industry in regions with limited labour resources will not have any advantages.

1/ M. Vilensky, K. voprosu o vlijanyu technicheskogo progressa na razmeshchenie proizvoditelnyk sil, Voprosy Ekonomiki, No.9, 1964, p.26.

> Furthermore, even in conditions of diminishing labour input, the absolute labour requirements of these branches of industry will remain substantial; it will be easier and cheaper to meet these requirements in the western regions of the country than in the Siberian and far eastern regions.'

This statement of M. Vilensky raises a very interesting problem: is the application of mechanization and automation really an ubiquitous process? From the technical point of view the answer is "yes". From the economic point of view, however, it can be argued that inside a given country the rate of application of mechanization and automation should be much faster in regions where labour is scarce than in regions with abundant labour resources.

The experience of the Soviet Union may be said to support this point of view. The giant industrial plants located east of the Urals represent the highest levels of mechanization and automzation (see Table 10).

TABLE 10

Fixed assets per worker in the industry of Eastern Siberia

the average for Soviet Union = 100

Total industry	123.6
Metallurgy	85.1
Fuels	63.5
Energy	125.8
Engineering	141.9
Chemical	186.0
Lumber and paper	114.7
Construction materials	117.4
Light industry	93.7
Food industry	75.4

Source: E.P. Golbunov. Tempy, urovien i struktura promyshlennogo proizvodstva, SSSR, p.153

The problem of location of automated industries can be formulated in another way: what advantages and disadvantages in a given region will affect the growth of automated industries. This approach is presented by J. Paelinck (see pages 48 and 49 of this study).

(b) The locational implications of the decreasing importance of material inputs in manufacturing industry.

Process and new product innovations generate two types of inter-connected changes in the material inputs of manufacturing industry which are valid from the point of view of locational analysis.

The first change can be described as the growing efficiency in the transformation of new materials used as inputs.[1] The decreasing amounts of coke inputs per one ton of steel produced, or coal inputs per one Kwh of electric energy, can be quoted as typical examples.

The second change is the growing role of substitution between different material inputs.[2] Examples of this substitution are: aluminium replacing copper, plastics replacing metals, and synthetic fibres replacing natural fibres.

The growing efficiency in the transformation of inputs and the increasing possibilities of substitution, between them generate the following consequences for the location of manufacturing industry: primo, ceteris paribus, there are more and more choices in the process of the selection of industrial location; secondo, ceteris paribus, the significance of materials for industrial location is being reduced and the role of markets increased. However, we have to stress that the markets for intermediary products as well as the markets for final products are important.

This phenomenon was analysed by Ch.D. Harris in the following way:[3]

> 'Attention needs to be directed toward manufacturing as the main source of its own materials. An industrialist searching for components for a product may not look directly to the forests, mines, or farms of the country, but rather to other factories. Four-fifths of the industries in the United States utilise materials that have already been processed by other industries.'

The problem of good access to markets and to basic inputs is considered as very important in the typology of regions, which exhibit different potentials of economic growth.

This typology, presented in Table 11, is a good framework for the evaluation of industrial locations. There exists a big difference - in the locational advantages - between region No.4 and in region No.13.

1/ Compare: E.M. Hoover, The Location of Economic Activity, New York 1948, p. 176-184.

2/ Compare: H.G. Roepke, The Impact of Technologic Change on Industrial Geography. The American Industrial Development Council Journal, No.3, July 1966, p.18.

3/ Compare: Ch.D. Harris, The Market as a factor in the Localisation of Industry in the United States, Annals of the Association of American Geographers, Vol. XLIV, December 1954, No.4, p.341.

TABLE 11

A Schematic Presentation of Types of Regions that Can Exhibit Different Potentials with Respect to Growth

		Good access to basic inputs* from external regional and national sources		Poor access to basic inputs* from external regional and national sources	
		Good access to basic inputs in home region	Poor access to basic inputs in home region	Good access to basic inputs in home region	Poor access to basic inputs in home region
Poor access to external regional and national markets	Poor access to markets in home region	≠1 II	≠2 I	≠3 I	≠4 0
	Good access to markets in home region	≠5 III	≠6 II	≠7 II	≠8 I
Good access to external regional and national markets	Poor access to markets in home region	≠9 III	≠10 II	≠11 II	≠12 I
	Good access to markets in home region	≠13 IV	≠14 III	≠15 III	≠16 II

* Not only basic resources but important intermediate sources need to be considered.

NOTE: Roman numerals indicate number of "good" access dimensions, and suggest relative over-all locational advantages or disadvantages.

Source: Regions, Resources, and Economic Growth, by Harvey S. Perloff and others; published for Resources for the Future, Inc. by The John Hopkins Press, Baltimore, 1960, p.98.

(c) The locational implications of technical progress in transportation and communication.

Technical progress in transportation and communication is one of the most important elements changing the conditions of industrial location and of inter-regional and international specialization.

The trend of diminishing transportation costs reduces the importance of transportation as a factor of industrial location, which was stressed in the first section of this study.[1/] The growing efficiency of transportation systems is also one of the necessary conditions for the increase of the size of plant which has definite locational implications.[2/]

No attempt is made here to extend the classical analysis of the locational implications of technical progress in transportation.[3/] Instead, attention is focused on the relatively new phenomenon generated by the rapid improvement of communication and information systems. This is the development of separate locational patterns for management and for production in industry. One can indicate a growing number of cases where the traditional solution of having both production and management in the same place is no longer valid.

There are even specialists who consider that the decentralisation policies influence the location of production much more easily than the location of management.

(d) The forecasting of technological change and industrial location.

The problem of technical progress is so important that the design of any programmes of industrial development and location should take the forecast of technological change as a starting point. This analysis should identify, primo, the emergence of new industries creating new problems of location, and secondo, in which of the existing industries the impact of technical progress will change the basic factors of location.

The correct forecast of these two phenomena is a necessary condition for the design of optimal prospective programmes in the field of industrial development and location.

1/ Compare p. 2-6 of this Study.

2/ Compare p. 14 of this Study.

3/ Compare A. Probst - op.cit, p.203-277, and E.M. Hoover - op.cit. p.168-174.

6. The interrelations of the location of a plant and enterprise.

In locational studies the plant is recognized as the basic unit since the choice of location is of necessity expressed in terms of technical and physical facts. But there is no doubt that the enterprise rather than the plant is the unit of lowest order in the process of investment decisions. From this point of view there is a justification for raising the problem of how to reconsider the approach to industrial location if the enterprise, and not the plant, is accepted as the basic unit.1/

This is especially important when account is taken of the trend towards the location of the management and the productive plants of an enterprise in different places, and towards the growing significance of multi-plant enterprises.

Section III

The problem of industrial location in regional planning and programming.

1. Two approaches to regional planning.

There are two approaches to regional planning.2/ The first approach is the continuation of the physical planning traditions and is very closely interwoven into the development of town planning. This approach considers the land-use problem as the most important in regional planning.

The second approach - a relatively recent phenomenon - is the result of the growing recognition of the necessity of considering the regional dimension of national economic growth. This is the economic approach to regional planning.

In discussing the problem of industrial location in relation to regional planning the relevance of these two approaches will be analysed separately.

1/ Compare: Chapitre 16, Entreprises et géographie in the volume by J. Desrousseaux, L'évolution économique et le compartiment industrial, Paris 1966; and R. Vals - The Case of the Multi-plant Manufacturer, Harvard Business Review, March/April 1964, p.12.

2/ A. Kuklinski - Regional Economic Planning for the Development of New Towns. Background Paper No.6 - UNO Round Table Conference on the Planning and Development of New Towns, Moscow 1964.

Industrial location as a land-use problem[1/]

In traditional physical planning the negative consequences of industrial location were considered in the first place. The physical planners called the attention of public authorities to the negative influence of industrial locations on the development of towns and regions, to the pollution of air and water by industry, and to the destruction of aesthetic values of landscapes of different types. The results of these activities were incorporated in all kinds of zoning laws or other regulations in an attempt to eliminate or to diminish, for a given district, city or region, the negative consequences of industrial locations. It should be stressed that the physical planners have often made an important contribution to the education of reckless anti-socially minded industrialists, in the mobilization of public opinion against them, and in the creation of the recognition of the fact that industrial location is not only the problem of a given enterprise but also the problem of the local, and sometimes regional, community. At the present time, this function of physical planning is - mutatis mutandis - recognized in most countries. There are three factors responsible for the different treatment of this question in different countries. The first factor is of an institutional character. It could be said that in countries where the socialization of the economic system is more fully developed, the influence of physical planning on industrial location is stronger. The second factor could be called the welfare factor. It could be said that in countries representing higher levels of economic development and higher levels of per capita consumption, there are more possibilities of inducing industry to recognize the non-economic problems of industrial location than in the less-developed countries.

1/ The land-use approach is sometimes called the "community approach". Compare: H.A. Hossé, Aspects of Industrial Location in the ECAFE Region, UN, Economic Commission for Asia and the Far East, Bangkok, 1965. This publication presents a very good example of analysis of industrial land-use problems in the developing countries.

The third factor is the relative scarcity of land suitable for industrial locations. This factor is especially important in small countries like the Netherlands or Switzerland, where a proper land-use pattern is the most important problem of physical planning.

Industrial location in regional economic planning and programming. The approach of an economic regional planner to industrial location is in most cases different according to whether the planner represents a "weak" or a "strong" region. The regional planner of a "weak" region is first of all interested in the attraction of new industrial location and in the creation of new jobs in the manufacturing industry for the growing labour force. His success is dependent not only on the objective conditions of the given region but also on his ability to adjust his arguments to the locational demands of modern industry. This is the problem faced by the regional planners in under-developed regions.

The regional planner in the "strong" region is in a different situation. In such regions industrial expansion makes labour even scarcer and raises the cost of infra-structure investment still more. In most cases, therefore, regional and urban planners of "strong" regions are in the first place concerned with the growing social costs of industrial expansion. They point out that the external economies of an individual plant are counterbalanced by the growing social costs of the expansion of big metropolitan areas. This is an extremely difficult and important problem of regional and urban economic analysis which can be illustrated by Figure 3

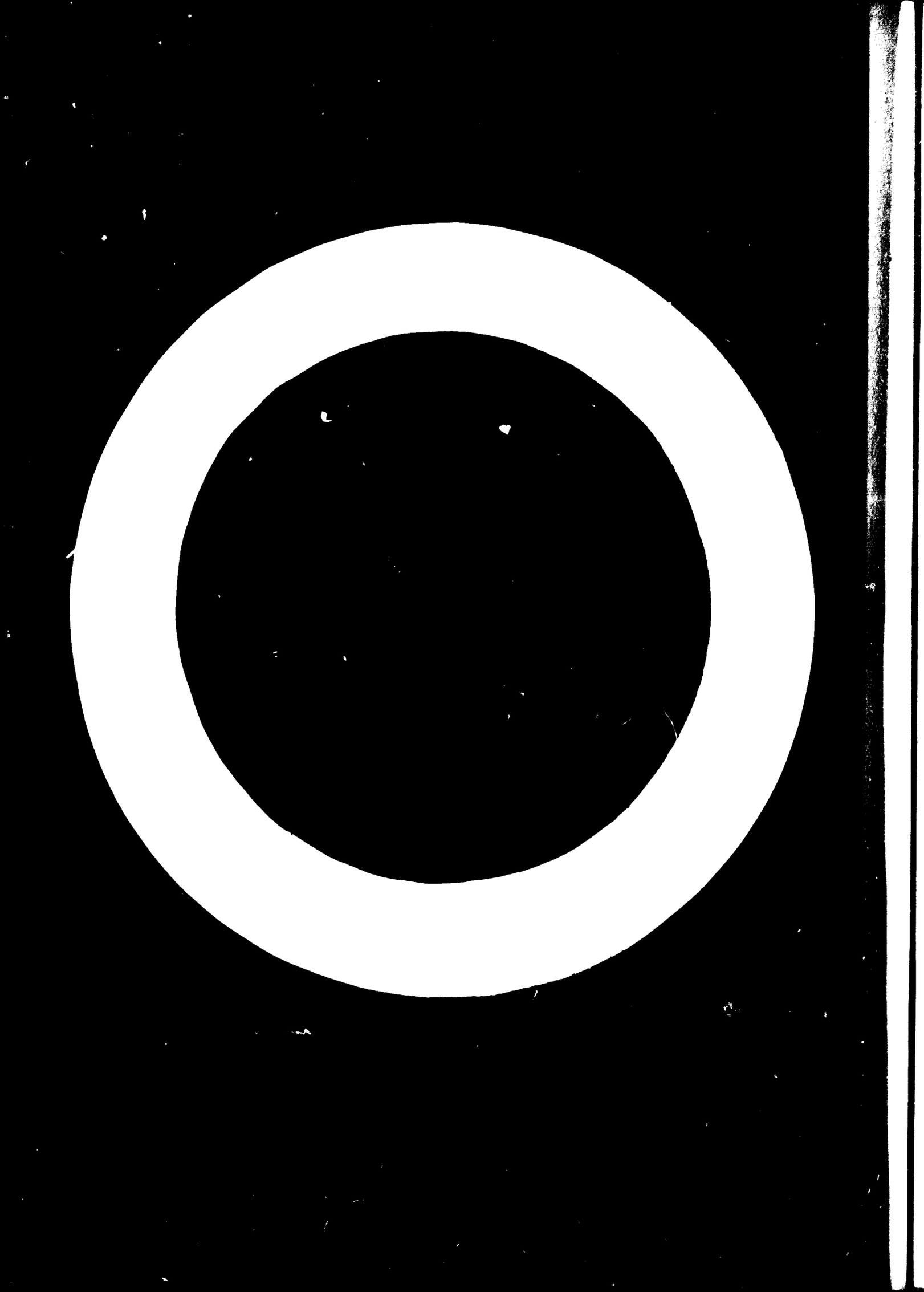
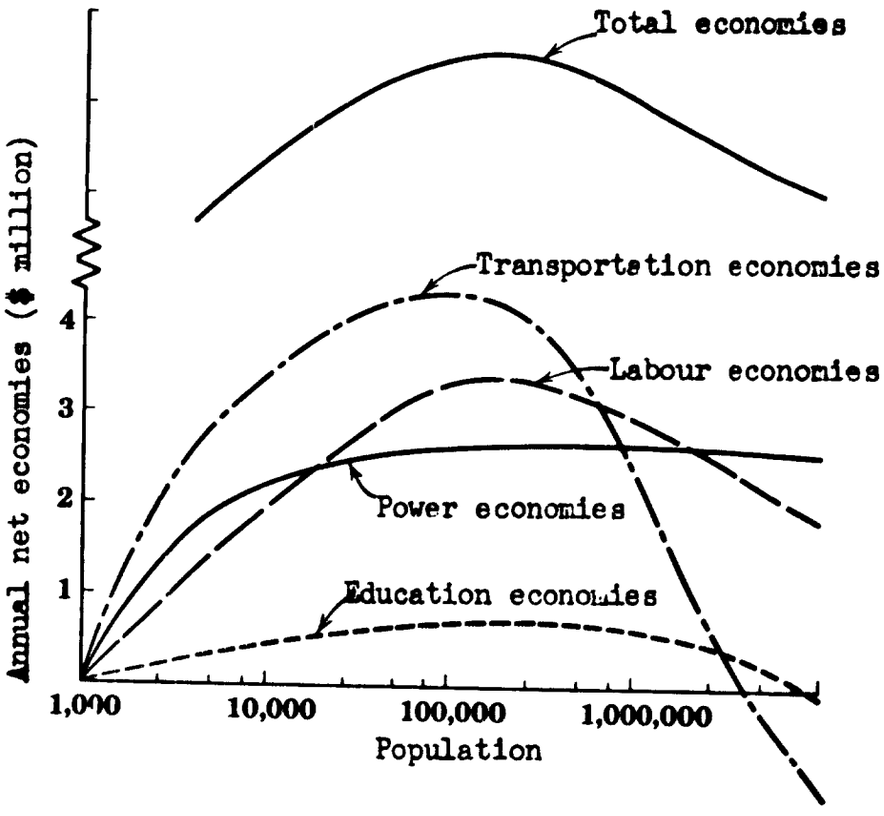


Fig. 3.

Hypothetical economies of scale with urban size



Source: W.Isard, Location and Space Economy, New York, 1956, p.187.

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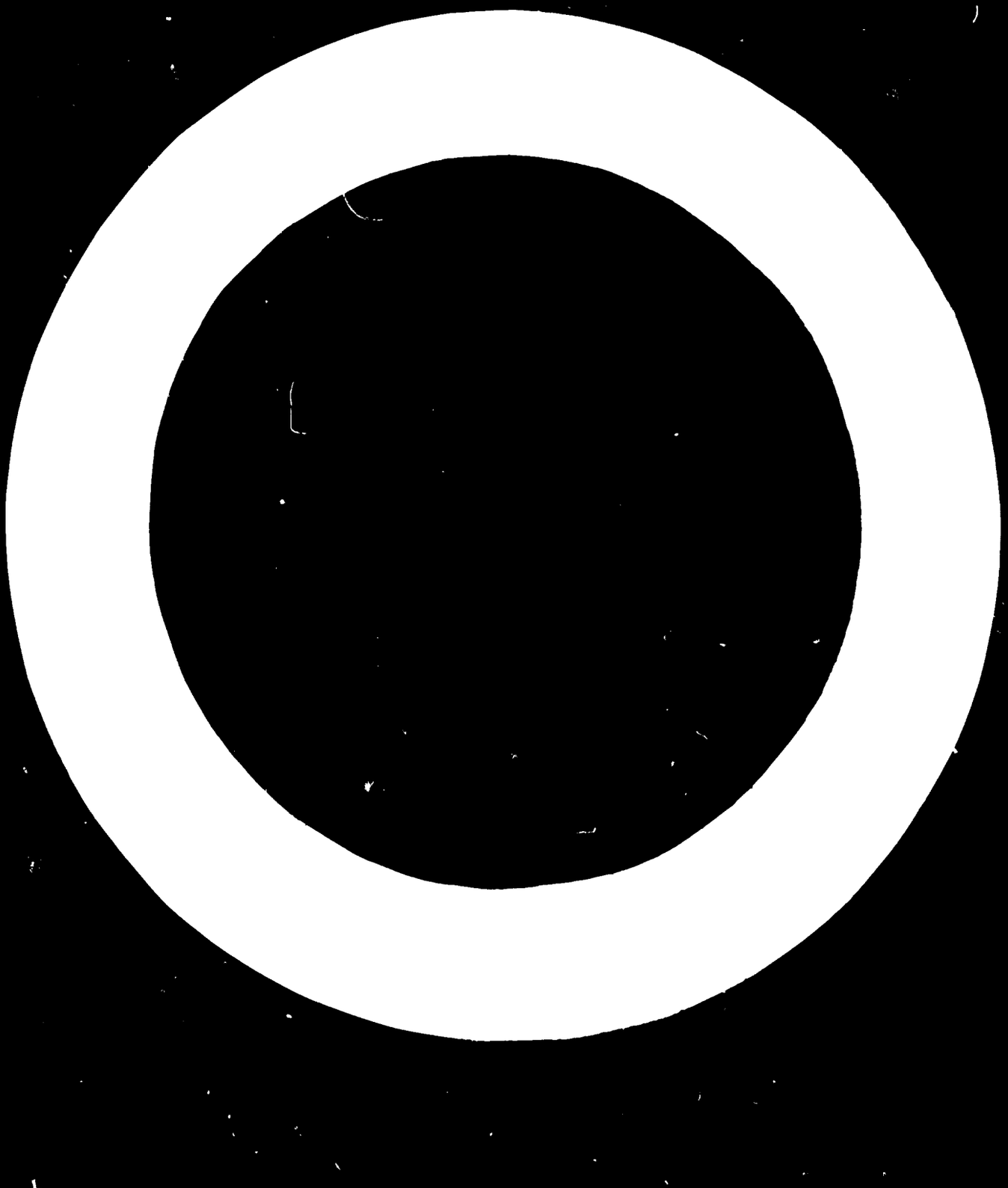

In commenting on this graph W. Isard stresses the hypothetical character of this approach: it is only an illustration and not a solution of the problem.[1/] There are very numerous theoretical, methodological and computational difficulties in this field. Nevertheless, some authors[2/] have prepared empirical studies on the relative costs of expansion of cities of different size. The full and satisfactory solution of this problem would be an important inducement to reconsider the approach to external economies of industrial location.

If European experience in the field of regional economic planning and programming is considered, there would appear to be three types of regional policies which are most important: the policies for accelerating the growth of underdeveloped regions, the policies for accelerating the growth of depressed regions and the policies for controlling the growth of over-congested areas. In the subsequent paragraphs of this Section the relevance of these policies regarding the location of industry will be examined.

2. Industrial location and the problem of underdeveloped regions

European experience in different attempts to solve the problem of underdeveloped regions has been particularly interesting during the past 15 years.[3/]

If attention be concentrated on the experience of three countries - Italy,[4/] Poland and Yugoslavia,[5/] there arise a number of problems for discussion and some conclusions can be put forward. The first problem is that of timing. The following question has to be answered: when, and at what stage of economic development can a particular country start a successful policy for promoting rapid economic growth in under-developed regions.

There are two points of view in this field. The first one stressing that from the start the problem of under-developed regions should be considered as one of the most important problems of national economic policy. The second approach considers that the successful solution of the problem of under-developed regions can be achieved only at a higher stage of economic development, when a country has already solved the basic problems of economic and social transformation.

1/ Compare: W. Isard, Location and Space Economy, New York, 1956, p.182-188.

2/ V.G. Davidovic, Rasselenie v promyshlennyk uzlach. Inzhenernoekonomicheskie osnovy Moscow 1960; B. Malisz, Urban Planning Theory. Methods and Results, Chapter 2 of the volume City and Regional Planning in Poland, Cornell University Press, 1966.

3/ Compare: Third Meeting of Senior Economic Advisers, Secretariat Paper No.1, Selected Problems of Regional Policy.

4/ For a synthetic evaluation of the Mezzogiorno experience, see N. Novacco, Efficacité des Mesures de Politique Economique Régionale, Un cas global Le Mezzogiorno. Collique annuel del'Association de Science Régionale de Longue Francaise, Namur - September 1966.

5/ Compare: M. Mladenovic - Post-war Development in Economically Under-developed Republics and Areas. Yugoslav Survey, April/June 1965.

Comparing the experience of Yugoslavia, Poland and Italy it may be said that in all three countries, policies for accelerating the economic growth of under-developed regions were announced already in the late forties, but the problem did not begin to be solved on a large scale until the late fifties and it is still recognized as a problem of the future.

J. Pajestka summed up the Polish experience of the years 1950-1960 as follows:[1]

"Policies and planning of the economic development of the country were concerned with the basic question of raising the level of the economy as a whole, whilst the development of separate geographical regions was subordinated to general strategies of economic development."

It is perhaps worthwhile to quote the salient items of the discussion on the under-developed regions in Poland in the years 1950-1964.[2]

"The starting point for this discussion is undoubtedly the following quotation from the Six-year Plan Bill voted by the Polish Parliament in 1950[3]: '... during the planned period a long-term process will be commenced leading to a more balanced distribution of the productive forces and also of social and cultural facilities over the whole country.'

The aforesaid principles of the Bill have been readily introduced into scientific and popular literature dealing with the principles of distribution of industry. One of these publications says: 'The most important and predominant principle is the tendency to a more equal distribution of industrial plants over the whole area of the country.' "[4]

In the middle fifties the assumptions of the localization policy of the Six-year Plan have been subject to a thorough analysis. This has led to an evolution, which still continues, of the overall views on the transformation of the regional structure of industry in Poland.

1/ J. Pajestka, Overall Economic Planning and Regional Planning in Poland. A paper prepared for the Third Meeting of Senior Economic Advisers, Geneva 1964, p.2.

2/ Compare, A. Kuklinski, Changes in Regional Structure of Industry in People's Poland, Geographia Polonica, Warsaw 1966.

3/ B. Malisz, J. Kostrowicki, Aktywizacja województw niedostatecznie zagospodarowanych 1950-1955 (Activisation of insufficiently economically developed voivodships in 1950-1955). Polgos, Warszawa 1952, p.7.

4/ B. Malisz, Lokalizacja przemysłu. Zasady ogólne. (Localization of industry. General principles). Państwowe Wydawnictwa Techniczne, Warszawa 1952, pp.77.

There follow three quotations explaining the trend of this evolution.

In 1956, K.Secomski stated his attitude towards the problem as follows:[1]

" Undoubtedly, one should first of all refer to the most commonly presented leading principle of the distribution of productive forces, formulated in most cases as the principle of equal distribution of productive forces in the country. Instead, it would perhaps be more proper to say "the principle of rational distribution" for, of course, the thesis of equal distribution must, as a rule, be supplemented by a commentary. This, however, is not a problem of a mechanically equal localization in the whole country, but of a good choice of alternatives of localization enabling the full utilization of natural conditions of development of individual regions, bearing in mind the problem of equalizing the level of development. It is, therefore, wiser to use the definition of rational distribution of productive forces in the whole country."

In 1958, K.Dziewónski[2] stated that:

" In view of the experience in building the basis of the socialist economy it seems that the above principle should be differently formulated or replaced by the principle of equal possibilities and equal chances of social and economic development of the population in all parts of the country, of giving to their inhabitants similar living conditions and standards. This principle will continue to be the aim which in the circumstances of continuous development of human society and its economy will never be achieved in an absolute manner."

The experience and discussions held during the years that followed finally led to the following formulation by K.Secomski:[3]

" As a rule, in each country the existing situation in the field of the distribution of the productive forces will always cause some reservations. Only perspective planning of the economic development allows the introduction of the required changes in regional proportions, thus achieving some additional economic advantages. At the same time, it is true that inter-regional differences as regards the level of industrialisation, intensification of agriculture, uneven distribution of communications, deficiencies of settlement network, differences in the living standards of individual regions, etc. - may only be reduced step by step after implementation of several stages of economic policy.

1/ K.Secomski, Z zagadnień teorii rozmieszczenia sił wytwórczych w gospodarce socjalistycznej. (The problem of the theory of distribution of productive forces in a socialist economy). Ekonomista 1956, No.2, p.14.

2/ K. Dziewónski, Zmiany w rozmieszczeniu sił wytwórczych i zagospodarowanie przestrzenne Polski. (Changes in the distribution of productive forces and the spatial economy in Poland) Inwestycje i Budownictwo 1958, No.7

3/ K. Secomski, Problem międzynarodowego i międzyregionalnego podziału pracy na tle teorii rozmieszczenia sił wytwórczych. (International and inter-regional division of labour from the point of view of the distribution of productive forces). Ekonomista 1964, No.4, p.735.

"... 'The aforesaid problem is really extremely complex. Differences in the trends of development of the particular regions, the necessity for bringing about a proper distribution of tasks, considering the problems of individual rate of growth of each region in view of the premises of the overall social interest, lead to the formulation of highly complex decisions in the long-run economic plans seeking an optimum for the whole country'."

The second problem is the role of industrial growth in the transformation of under-developed regions. European experience in this field is well summarized in the following quotation from a Yugoslav paper.[1/]

"Industrialization constitutes the basic method of speeding up the development of economically under-developed regions, because it makes possible the maximum rate of increase in social productivity and thus the most rapid rise in income, the full utilization of the available factors of production, the fastest possible change in their backward economic structure and, on this basis, the most effective integration of these regions in the national economy."

It is interesting to note that until the middle fifties in the promotion of economic development of southern Italy the problems of agriculture and infra-structure were considered as a first priority: around 1957, however, the Cassa per il Mezzogiorno changed its attitude. In a summary of the Italian experience in this field the following statement occurs:[2/]

"The necessity therefore arose, in about 1957, for an efficacious policy of industrialization, the primary condition for the expansion of the plan for assistance drawn up by the Cassa per il Mezzogiorno. It was not enough, for this purpose, to create conditions comparable with those prevailing in industrial areas. It was rightly recognized that the actual presence of industry would alone bring about all these conditions. It was therefore necessary for the State to provide stimulants or encouragement which would result in attracting private industrial initiative."

The third problem is the pattern of distribution of industrial investment within an under-developed region.

The experience of all three countries supports the conclusion that industrial investment should be concentrated at certain well chosen points - which could be called the poles of industrial growth.

1/ Le développement des Régions Sous-Développées de Yougoslavie. (The development of the under-developed areas of Yugoslavia). A paper prepared for the Third Meeting of Senior Economic Advisers, p.6.

2/ Expériences et perspectives d'interventions variant selon les régions et d'après la planification territoriale en Italie (Experience and prospects of intervention varying with regions and in accordance with territorial planning in Italy), Rome 1964, p.5-6.

The Italian approach to this problem has been described in the following way:[1]

" In 1959, drawing in particular on certain interesting experiences in other countries, the policy of special intervention was directed towards the determination of certain areas of the south where the establishment of an integrated system of private equipment would allow the most productive result to be obtained, and, at the same time, the maximum economy of effort for the public authorities providing assistance. The areas would, moreover, be those where industrial concentration would provide, besides the advantages of a faster rate of progress resulting from its multiplying effects, also the possibility of the integration of the productive system which was indispensable for setting in motion the machinery of expansion which provided its own momentum. Obviously, the effectiveness of this new trend depends on the choice of areas, which must not only offer real possibilities for progress and show the first signs of a process of industrial growth, but also, by being relatively limited in number, enable assistance to be provided in keeping with the financial resources of the Cassa per il Mezzogiorno."

The fourth problem is the evaluation of the role of big industrial plants in the transformation of under-developed regions. Here again the experience of Italy, Poland and Yugoslavia combines to support the point of view that the construction of one or several big industrial plants or multi-plant enterprises is a "conditio sine qua non" of the transformation of an under-developed region.

At present, the economic and social consequences of the construction of big industrial plants in under-developed regions in Poland are the subject of numerous research projects promoted by the Polish Academy of Sciences.[2]

The problem of "The leading firm in an area" is presented in a very interesting way by F. Perroux.[3]

In an attempt to summarize the conclusions in the discussion of the topic of industrial location and the problem of under-developed regions the following generalizations can be made:

(a) The problem of under-developed regions can be solved only within the framework of long-term economic policies, which are fully effective only when a country has already solved the problem of basic transformations of its national economy and has reached the stage of sustained economic growth.

1/ Expériences et perspectives, op.cit. p.6-7.

2/ Compare the publications of two Committees of the Polish Academy of Sciences. The Committee for the Research of Industrialized Regions, and the Committee of Spatial Economy and Regional Planning.

3/ F. Perroux. La firme motrice dans une région et la région motrice. (The leading firm in an area and the leading area), Cahiers de ISEA, Supp. No.111, mars 1961, Série AD, no 1.

(b) Industrialization in the great majority of cases is the most important item in the programme of economic and social transformation of an under-developed region.

(c) Industrial investment should not be dispersed but concentrated in well chosen poles of growth[1/] in the under-developed region.

(d) In the industrialization programme of an under-developed region a special function is performed by the big industrial plant or multi-plant enterprises.

3. Industrial location and the problem of depressed regions.

In most cases the problem of depressed regions is recognized as a problem of a small group of countries, which had already achieved a high level of development during the first industrial revolution. In these countries the structural changes in industrial development create especially difficult problems in those areas which were specialized in industries with a high rate of growth in the nineteenth century and low rate of growth or even regression in the twentieth century.

Analyzing the Pittsburgh case, E.M. Hoover[2/] makes the following remarks on the problem of arrested growth.

> " The development of a region, like that of a nation encounters from time to time crucial situations in which the future course hangs in the balance and can be influenced by some really major planning decisions. A forking of alternative paths appears. One of the alternatives may be a further growth, along a new line, and the other may be stagnation, sinking into a "trap" of arrested developments or even regression.
>
> These crucial situations present of course the biggest challenge to our insight into the growth-determining factors involved. The stakes are highest and the rewards for correct decisions, in terms of economic progress, are at a maximum in such conjunctures.
>
> This paper focuses on the case of a mature industrialised urban region threatened by stagnation. Typically in such a case, the rate of growth has been more and more sub-normal for many decades. Unemployment is high and chronic. Emigration is heavy. The dynamic growth character that brought the area's economy to its present importance seems to have faded away. There is a feeling that unless something really decisive happens, stagnation will go on indefinitely.

1/ Compare, F. Perroux, Note sur la notion de Pole de développement (Note on the concept of the development pole), Economic Appliquée, No. 1, 1955.

2/ E.M. Hoover, Confronting Urban Obsolescence: The Pittsburgh case. A paper prepared for the Third Meeting of Senior Economic Advisers, Geneva 1964.

Such a situation can of course arise in a region whose economy is based heavily on a few industries which have themselves ceased to grow or begun to decline. But arrested growth in a region may also mean simply that the factors of inter-regional competition have, in specific industries, taken a trend adverse to that particular region. The region's difficulties are compounded if both of the above conditions apply, so that it finds itself with shrinking shares of shrinking industries."

Great Britain was the first country where the problem of depressed regions was recognized as a problem of national economic policy.1/

Describing the present situation in this field, D.J. Robertson and G.C. Cameron2/ discuss the issue "Development or Redevelopment" in the following way:

" This is a point of considerable importance for the British economy since most parts of the British economy have already been the subject of substantial development of one kind or another at one time or another. The essential nature of the regional problem in most areas is that of redevelopment and reconversion. This is particularly the case in the older industrial regions. The Scottish Highlands and some prosperous agricultural areas which are suffering loss of employment through increasing mechanization are, of course, exceptions to this statement. In one sense redevelopment and reconversion are easier problems to handle than the task of developing a region which is completely lacking in social capital or industrial expertise. In another sense the problem is more complicated as it involves changing, often radically, a long established physical environment and traditional attitudes and institutions."

The last opinion is expressed too by the Belgian rapporteur, A. Detroz:3/

" Practice has, in fact, shown that it is still more difficult to find a remedy for the ageing, and lack of adaptability, of an old industrialized region, than to bring about the development of regions which have remained relatively retarded, but which possess important but insufficiently utilized, resources. It must also be said that, in the meantime, the closing of coal mines and other old industries has gone on faster and that the first results can no longer be seen, since the situation has subsequently worsened."

1/ Compare: B.J. Loasby, op.cit. and Political and Economic Planning Report on the Location of Industry, London, 1939.

2/ D.J. Robertson, G.C. Cameron. The Backward Areas in Industrialized Countries; United Kingdom, Glasgow 1965, p.8. A report prepared for European Co-ordination Centre for Research and Documentation in Social Sciences, Vienna.

3/ A. Detroz - letter to the Research and Planning Division of ECE, dated 24 January 1966.

It is very difficult to draw a clear-cut conclusion from the evaluation of J. Paelinck.[1] There would appear to emerge a negative one that both the rural and the depressed areas are not the best possible places for the location of modern automated industries.

If the comparison be confined to manpower problems, then, according to J. Paelinck, the level of skills is higher in depressed areas, but the mental attitude is better in rural areas. In some cases the negative mental attitude in relation to modern industries may be considered the most important obstacle to the industrial reconversion of a depressed region.

1/ J. Paelinck, Advantages and disadvantages of depressed industrial and rural areas for location of automated industries. OECD - European Conference and Manpower aspects of Automation and Technical Change, Zurich 1966.

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PREFATORY NOTE

1. In its resolution 7(XVIII) the Economic Commission for Europe requested the Executive Secretary to prepare, as part of his normal economic research activities and if necessary with the assistance of governmental rapporteurs, a study of a methodological nature on the criteria determining the rational location of industrial plants. In pursuance of this resolution the Executive Secretary approached interested ECE governments in order to obtain information of a methodological nature on the subject and also invited these governments to appoint a rapporteur with whom the Secretariat could consult in the course of the preparation of the study.

2. The present study was prepared by the Secretariat with the help of Dr. A. Kuklinski, Executive Secretary of the Committee for Spatial Economic and Regional Planning of the Polish Academy of Sciences, acting as a consultant to the Secretariat. During the preparations the Secretariat kept in touch, as necessary, with rapporteurs appointed by the governments of Belgium, Bulgaria, Denmark, the Federal Republic of Germany, France, Greece, Poland, Sweden, the Ukrainian SSR, the United Kingdom and the United States of America.

3. The study attempts to provide an overall picture of the experience of ECE countries in the application of various criteria for industrial location. Taking into account the institutional context of the economies of these countries, the study focuses more particularly on the growing importance assumed by macro-economic criteria and on the basic change affecting the mechanism of the decision-making process of industrial location. The effects on locational factors and criteria of the more significant developments in industrial technology, economic management, regional policies and economic integration on an international scale are examined in some detail. A special section of the study is devoted to evaluating the relevance of the experience derived by industrialized countries to problems of industrial location faced by developing countries.

Section I

THE TRADITIONAL AND MODERN APPROACHES TO THE CRITERIA OF INDUSTRIAL LOCATION

1. General remarks on the location of industry in the first industrial revolution

The classical formulation of factors governing the location of industry in the first industrial revolution was presented in the well-known publication of Alfred Weber[1] in 1909.

The main items of Weber's theory can be summarized in the following way:

(a) The author uses the micro-economic approach establishing a methodical framework for the selection of the optimal location of an individual enterprise.

(b) The minimization of costs of the individual enterprise is chosen as the decisive locational criterion. Weber introduced the notion of a factor of location defined as:

"a kind of clearly distinct advantage, which arises in economic activity when this activity occurs in a given place or generally in a given kind of place"[2]

(c) According to Weber the most important influence in the choice of location is the inter-action of three factors:[3]

i. the factor of transport costs, which establishes the basic framework determining general location.

ii. the factor of labour costs which introduces a distortion into the basic framework - attracting those activities for which the labour factor is more important than the transport factor.

iii. the factor of agglomeration which introduces a second distortion into the basic framework - attracting those activities for which the agglomeration advantages are more important than the minimization of transportation costs.

The theory of Weber was subject to very lively and extensive discussion in the years following its publication but for quite a long time its most fundamental premises remained unchallenged.

1/ A. Weber - Über den Standort der Industrien, Tübingen 1909

2/ A. Weber, op.cit., p.16.

3/ Compare: H. Meyer-Lindemann: Typologie der Theorien des Industriestandortes, Bremen, 1951, p.50.

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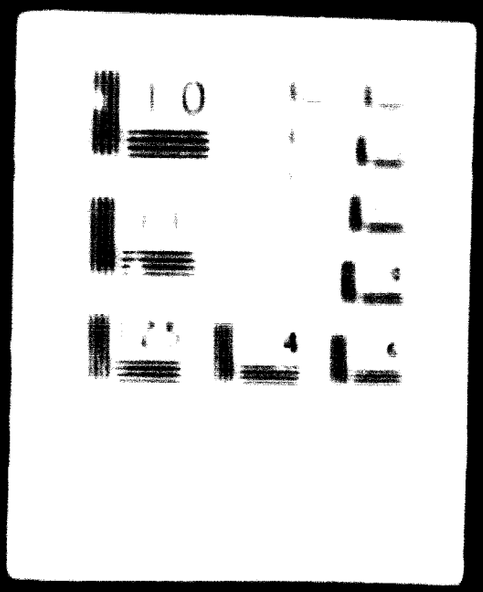
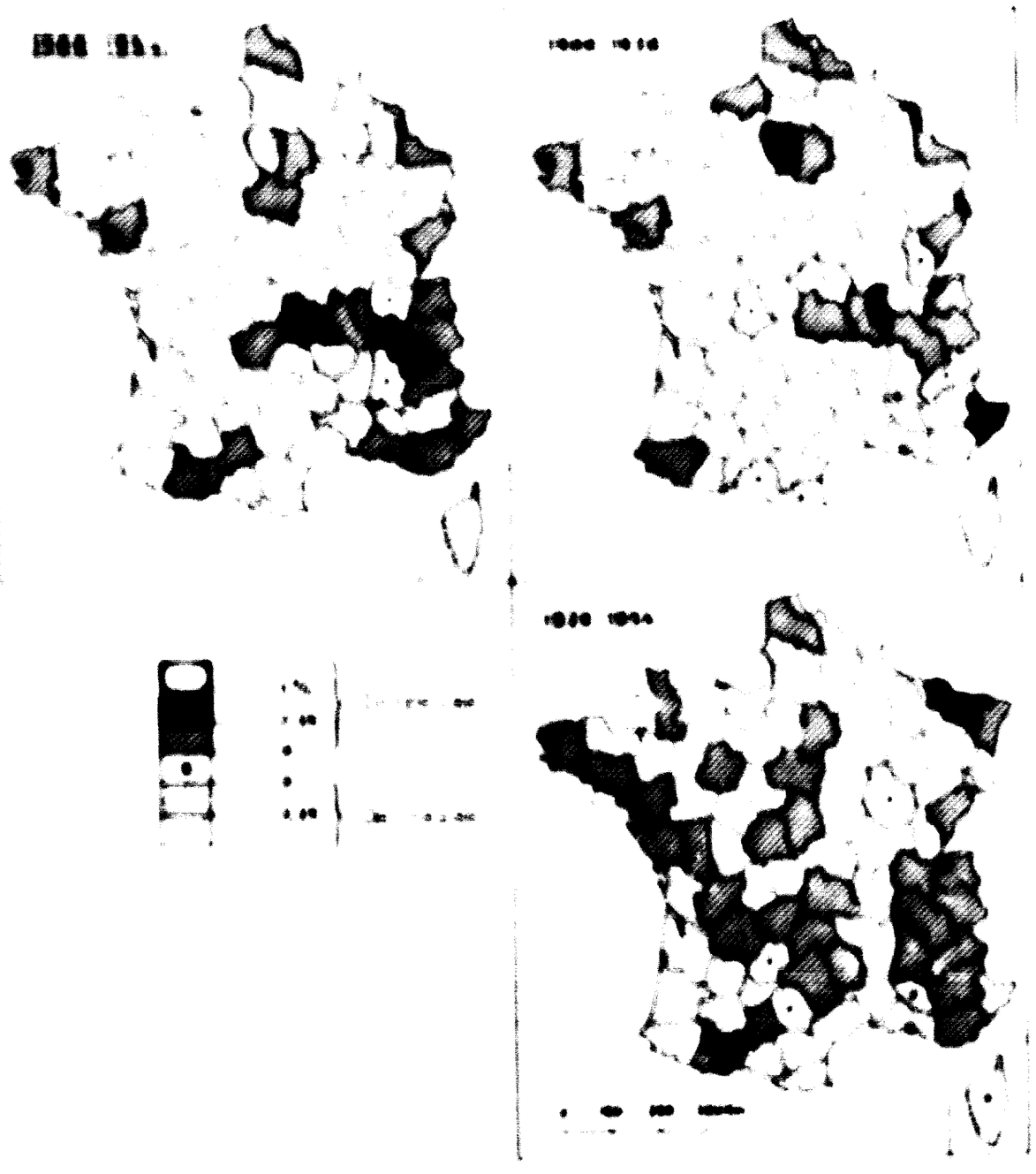
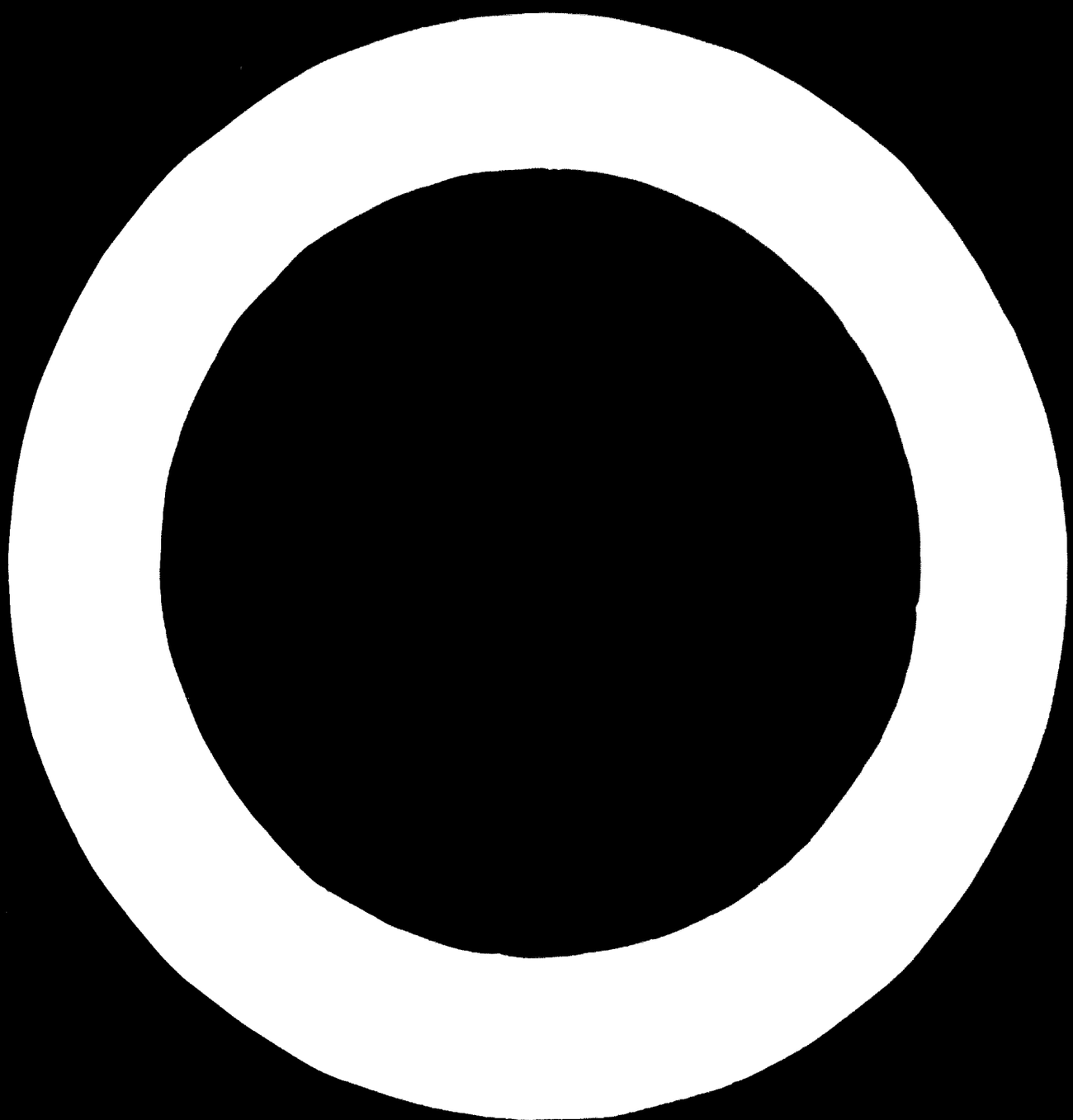




Source: F. Perroux-Dhaluwaeus, La Formation de l'espace économique national, Paris 1964, p. 234



[illegible] upper [illegible] Silesia [illegible] large volume and high rate [illegible] Bialystok.

The [illegible] of industrialization [illegible] with [illegible] large volume and high rate [illegible] area [illegible] Cracow.[1]

The empirical material is presented in Table 1[illegible] and Figure [illegible].

TABLE [illegible]

[illegible] problem of industrial growth in [illegible] 1946 [illegible]

Index	Industrial district of Upper Silesia [a]	Unindustrialized area of Bialystok [b]	Industrial area of Cracow [c]
Population			
Increase in thousand persons	[illegible]	148	324
Increment per 1 sq.km	[illegible]	6.[illegible]	35.[illegible]
Index of increase [illegible]	[illegible]	116	140
Urban population			
Increase in thousand persons	[illegible]	16[illegible]	320
Increment per 1 sq.km	[illegible]	6.[illegible]	84.2
Index of increase 1946 [illegible]	[illegible]	200	183
Employment in industry			
Increase in thousand persons	[illegible]	35	116
Increment per 1 sq.km	[illegible]	1.5	30.5
Index of increase [illegible]	[illegible]	[illegible]48	271

Source: A. Kukinski, op.cit.

a/ Unit No. 1 in Fig.6.

b/ Unit No. 2[illegible] in Fig.6.

c/ Unit No. 2 in Fig.6.

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1. Compare: J. Kr[illegible]sala, *Regional Planning as an Instrument of Regional Development Policy*. A paper prepared for the Third Meeting of Senior Economic Advisers.

The industrial growth of the majority of overcongested areas can be recognized as representing type 1. where even a very low rate of growth generates a large volume expressed as an increase in absolute numbers or per 1 sq. km.

The high rate of industrial growth of the under-developed region of Białystok created 1.5 new jobs per 1 sq km, whereas the low rate of growth of the over-congested region of Upper Silesia created 48.5 new jobs per 1 sq. km in the same time (see Table 14).

The limited success of different policies[1/] aimed at controlling the process of industrial growth of overcongested areas can be explained in the following way:

Primo: the industrial expansion of overcongested areas is implemented mainly through the extension of existing plants. In this case supervision is much more difficult than in the case of the construction of new plants.

Secondo: the industrial managers who overestimate the role of external economies in the development of a plant have in quite a number of cases greater bargaining power than the urban and regional planners who correctly indicate the cumulative consequences of the expansion of industrial plants, in growing social costs.

There is also a technical aspect of this conflict: both in the planned and market economies the methods of computation of the costs of industrial plants are much more developed than the methods of computation of the social costs of the expansion of an overcongested area.

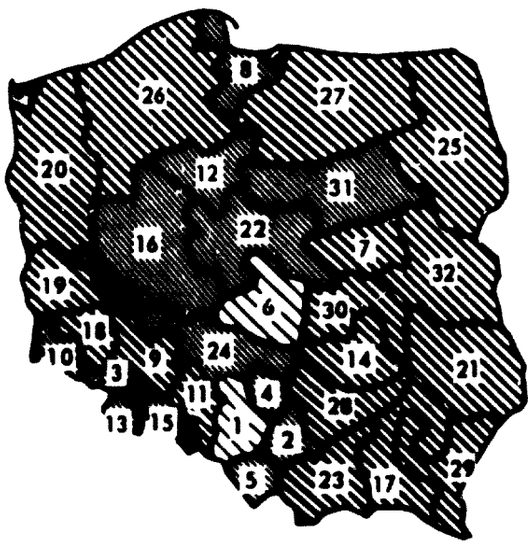
Analysing the future trends of industrial expansion of overcongested areas two phenomena have to be considered. The first phenomenon is the diminishing role of manufacturing industry in those areas. Table 15 clearly shows the trends in this field in the Parisian region.

1/ Compare: Third Meeting of Senior Economic Advisers. Secretarial Paper No.1. Selected Problems of Regional Policy, p.36-38.

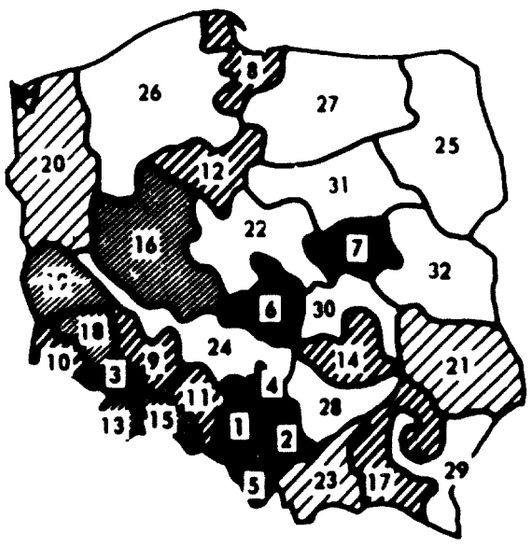
Fig.6 -

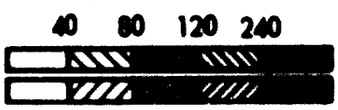
The rate and volume of industrial growth in Poland 1946-1960

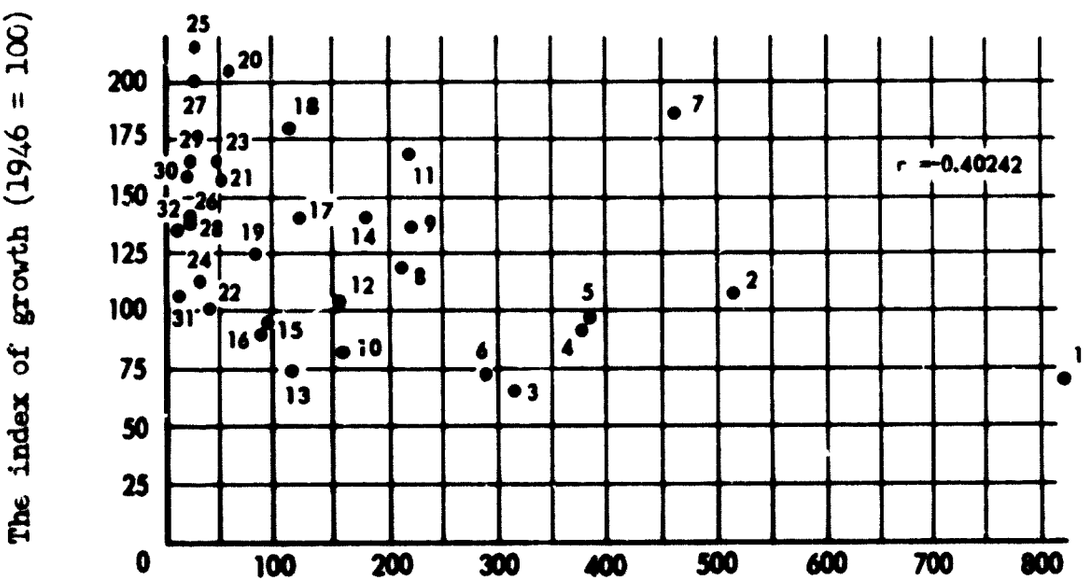
DIFFERENTIATION OF THE RATE OF GROWTH



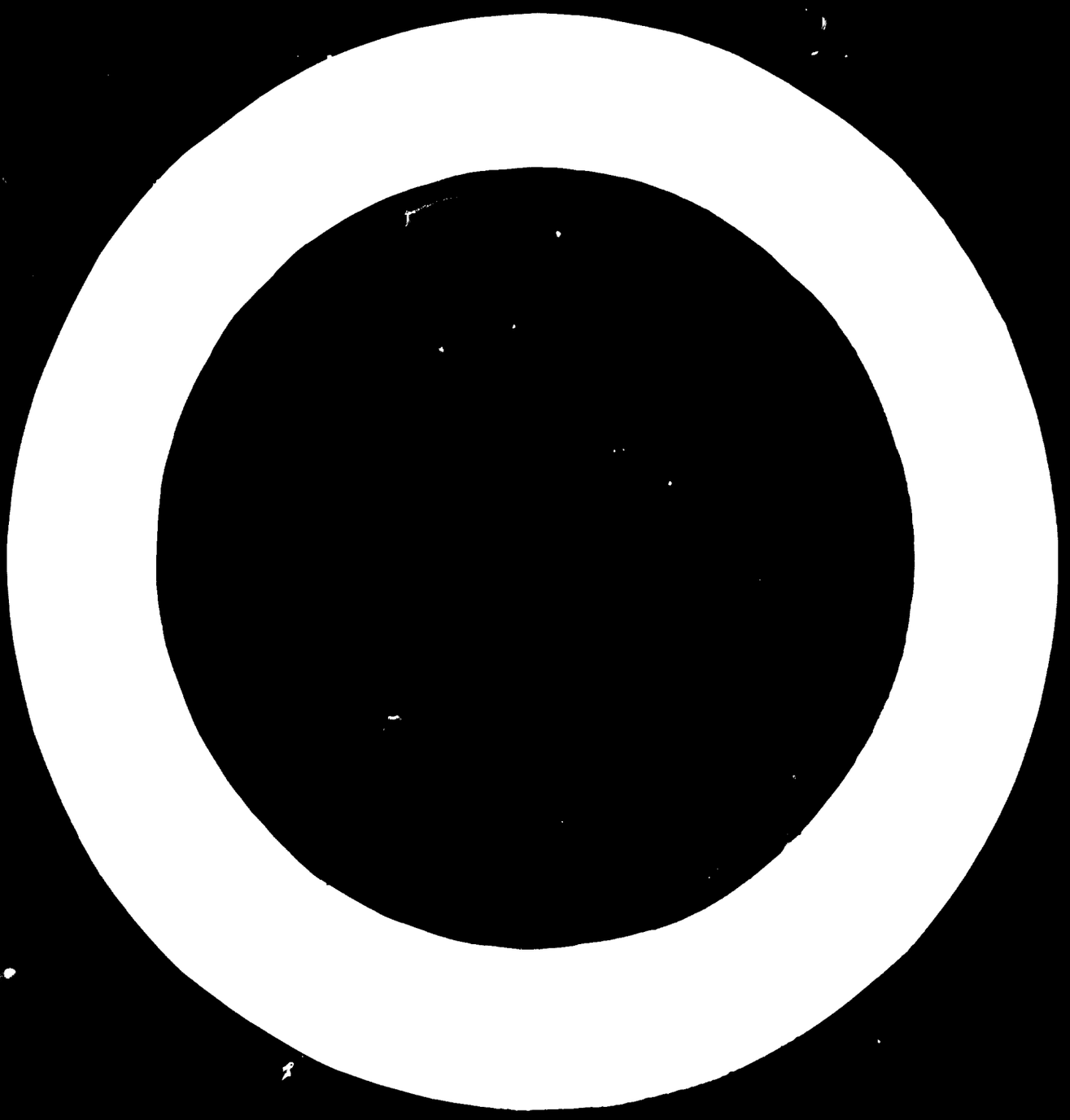
DIFFERENTIATION OF THE VOLUME OF GROWTH







Source: A. Kukliński op.cit.



Departments	Growth of economically active population (percentage change in 1962)	[illegible]
Seine	[illegible]	[illegible]
Seine-et-Oise	+ 70.2	[illegible]
Seine-et-Marne	[illegible]	[illegible]

Source: F. [illegible], op.cit., p.[illegible]

a/ The changes are computed as differences in the shares of sectors in total active population in 1926 and 1962.

b/ Sectors I, II and III refer respectively to primary, secondary and tertiary economic activities.

Therefore in many overcongested metropolitan areas a critical factor in the future will not be industrial employment but the growth of [illegible] and research employment.

The second phenomenon is the fact that the spatial concentration cannot be explained only by economic factors. This [illegible] psychological and social problem. When the high level of social costs in overcongested metropolitan areas is analyzed the simple question has to be answered, would the French really exchange Paris for five smaller metropolitan areas which would have much more advantageous economic parameters?

Discussing the problems of the so-called overcongested areas we should consider the following statement of H. Wise,[1]

"Although some students of cities have argued that, on balance, there are more advantages than disadvantages in great city growth, most writers have been at pains to condemn the big city. The growth of city regions undoubtedly brings many problems, but in itself cannot be categorised as bad or harmful. The city region is a characteristic urban form of our time and our economy. As such its existence must be accepted and planned for, to increase its advantages and to decrease its disadvantages. The city region itself reflects changes in the distribution of population taking place over wider areas: distribution adjusting themselves to changing geographical values. The population distribution map is a restless one; the movements in it are often out of phase with the economic, technical and social changes that are the operating causes. A main task for

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1/ H. Wise, The City Region, Advancement of Science, February 1966, p. 385.

[illegible] investment between economic [illegible] preventing the rapid congestion [illegible] applying checks and balances to influence [illegible] sub-areas. But accepting the facts of regional patterns of urban life, and planning for its betterment."

Spatial elasticity in the allocation of industrial investment.

Different sectoral types of industrial growth generate different locational dynamic and, in consequence, different possibilities of introducing changes in regional economic development of a given country.

It may be said that each type of industrial growth with a given sectoral allocation of investment represents a different level of spatial elasticity,[1] or a different number of locational choices. An attempt is being made to make the distinction between industrial investment programmes which are spatially elastic and those which are spatially inelastic. In the first case there is a large number of locational choices. In the second, locational choice is extremely restricted as a consequence of the sectoral and technological pattern, which has been adopted.

There would seem to be four factors which, in different ways, contribute to the differentiation of the spatial elasticity of industrial growth.

The rate of industrial growth is without doubt the first factor. Ceteris paribus a high rate of growth generates more locational choices than a low rate. The ceteris paribus assumption is very important because it is possible to have investment programmes associated with very high rates of industrial growth, which are spatially inelastic, because the investment is allocated first of all to extractive and heavy industries, where the locational choices are extremely restricted.

The second factor could be described as the share of new plants in total industrial investment. This is an important factor restricting the spatial elasticity of investment programmes in industrially developed countries, where more than 60 per cent of industrial investment is allocated to the expansion of existing plants. In this situation the problem of locational choice should perhaps be interpreted in a different way from the problem of selection of plants for expansion, considering the consequences of this expansion for different towns and regions.

1/ Compare: A. Kuklinski, Glowne problemy przestrzennego zagospodarowania kraju. Problemy Ekonomiczne, Cracow, November 1965.

The third factor could be described as the share of footloose industries[1] in total industrial investment and especially in the construction of new plants. One of the consequences of modern trends of industrial development is the growing share of footloose industries and, ceteris paribus, growing spatial elasticity of investment programmes. To illustrate this point, if in a country the size of Poland it is decided to build a new cement plant, then there are perhaps fewer than 20 locations from which a choice can be made: if there is a decision to build a new metal-processing plant, then there are perhaps more than 200 possible locations. The first case is an example of a so-called localized industry, the second case of the so-called footloose industry.

The growing role of footloose industries is described by the Belgian Rapporteur, A. Detroz[2] in the following way:

> "It seems to us that the most striking factor, affecting the changing relative values of the criteria determining the location of industry, is the growing importance of processing industries, which are heavy users of labour and, unlike basic industries, more closely linked to their markets than to their sources of raw materials. Basic industries, which are very dependent on their sources of raw materials, always very bulky, have always been associated with well-defined locations. The growing improvement in means of transport of goods has also played an important part."

The fourth factor can be described as the growing share of large plants in total industrial investment and in the construction of new units. This phenomenon means that industrial investment is allocated to a diminishing number of locations. According to W. Lissowski, in modern industry there exists a trend towards a "diminishing number of new locations for the achievement of a postulated growth of productive capacities."[3] W. Lissowski uses as an example the diminishing number of new plants constructed in Poland: In the years 1950-1960 about 400 new medium-sized and large plants were built in that country; in the years 1960-70 this number will be not more than 300 or so.[4]

1/ The term of "footloose industry" is used for example in the volume Industrial Location and National Resources, Washington 1943, p.322.

2/ A Detroz - letter to the ECE Research and Planning Division of January 24, 1966.

3/ W. Lissowski, Wpływ układu dzialowo-galeziowego na układ regionalny planu perspektywicznego. Biuletyn Komitetu Przestrzennego Zagospodarowania Kraju, No.34, Warsaw 1965.

4/ W. Lissowski, op.cit.

The Polish case illustrates well the two trends which exist in modern industrial growth in some countries. The diminishing role of investment in new plants and the growing role of large plants in the allocation of industrial investment. These two factors reduce the spatial elasticity of investment programmes. However, there is no clear-cut conclusion in this field. Some trends of modern industry increase the spatial elasticity of investment programmes and some trends act in the opposite direction. Nevertheless, the problem exists and should be always investigated in order to avoid misunderstanding in the attempts at reconciling sectoral and regional approaches to industrial location.

It could happen that the regional planners expect solutions which are technologically impossible within an investment programme which is inelastic and which limits locational choices and the possibilities of adjusting the programme to the demands of regional economic development.

6. Partial and comprehensive solutions of the conflict of sectoral and regional approaches.

The interaction of different factors of industrial location can be interpreted as a conflict of two opposing forces: forces strengthening the trend of spatial concentration and forces strengthening the trend of spatial dispersion.

In most cases the sectoral approach stresses the economic advantages of spatial concentration and the regional approach the advantages of spatial dispersion.

It would be a mistake to limit the problem only to subjective and professional differences of the persons involved in the conflict.

In the fifth paragraph of section III the problem is stated of the spatial elasticity in the allocation of industrial investment, stressing that in modern technology there are trends which in consequence reduce the number of possible locational choices.

The conflict can be described as a situation where the full use of the advantages of modern industrial technology favoured by the sectoral approach gives rise to locational decisions which are recognized as non-optimal from the point of view of the proper long-run regional economic development of the country concerned.

There is no doubt that in the reconciliation of this conflict the institutional factor is a very important one. In the market economies the mechanism of comprehensive economic planning and programming is not used in most cases, and the sectoral and regional approaches represent different criteria for the optimum decision.

TABLE 12

Qualitative assessment of the geographical location of automated industries

Factors	Weighting for automated industry	Rural areas	Depressed industrial areas
A. Production factors			
Natural site	++	+++	—
Land			
- availability	++	+++	+
- equipment	+++	-	+
Raw materials			
- proximity	+	+	+
- quality	+++	o	o
Fuel and power			
- quality	+++	-	++
- continuity of supply	+++	—	++
Means of communication	++	—	-
Industrial premises available	o	-	++
Manpower			
- quantity	+	++	+(+)
- skill level	+++	+	++
- mental attitude	++	++	-
B. Economic and technical factors			
Commercial markets	+++	o	o
Integration into an industrial complex	+++	—	+
Financial markets	+++	o	o
Services ancillary to industry	++	-	+
Public services (especially telecommunications)	++	—	-
C. Social factors: amenities			
Tertiary services	+++	-	+
Housing	++	+	—
Organization			
- of recreation	+++	+	-
- of cultural activities	++	-	+

Source: J. Paelinck, op.cit., p.15 and p.21.

NOTE: + is the unit denoting the degree of availability of the factor in question in the area.
- denotes lack of availability (absence of the factor)
o signifies that the factor or one of its characteristics is not specific to the area as such.

Generally the sectoral approach is represented by private industry and the regional approach by various public authorities. The reconciliation of these two approaches is usually through the application of various policy measures which may or may not interfere with the price mechanism.[1/]

The solutions obtained can be considered as partial in all cases where interest is concentrated on particular problem areas, such as the underdeveloped, depressed or overcongested regions discussed earlier in this section. However, the trend seems to be towards a more comprehensive approach characterized by determined efforts to develop and implement national programmes of regional economic development of the whole territory of the country.[2/]

All the countries with centrally planned economies, on the other hand, possess comprehensive institutional machinery for the reconciliation of the conflict between sectoral and regional approaches.[3/] In Poland there are two points of view in this field. The first stresses that in the framework of a comprehensive system of economic planning where all sectors and regions represent the same criterion of optimal choice - the over-all advantage of the national economy - the conflict of sectoral and regional approaches is simply non-existent.

1/ An analysis of the process of reconciliation of sectoral and regional approaches to industrial location for Western Germany is presented in the article of Th. Strunden: Wettbewerb der Standorte und Regionalpolitik, Information Nr. 16/64, Institut für Raumforschung, Bad Godesberg.

2/ Thus in recent years the Government of France has developed economic programming machinery, including very interesting instruments for the reconciliation of sectoral and regional approaches. Compare Chapter V, pages 11-14 in Economic Planning in Europe, UN, Geneva 1965, and P. Viot - Aspects Régionaux de la Planification Française. A Paper submitted by France to the Third Meeting of Senior Economic Advisers, Geneva 1964.

3/ Compare the following papers prepared for the Third Meeting of Senior Economic Advisers, Geneva 1964.

a/ W. F. Pavlenko, Regionalnoe planirovanie v obshchei sisteme planirovanya ekonomiki SSSR.

b/ Urainskaya SSR - Regionalnye planirovanije kak sredstvo pretvoreniya v zyzn Ekonomicheskiun planov v ravonolnym mastrabe.

c/ Regional Economic Planning and Czechoslovak Experiences in Regional Development.

d/ The Hungarian Peoples' Republic. Regional Economic Planning and its role in National Economic Planning.

e/ J. Pajestka. Overall Economic Planning and Regional Planning in Poland.

The second point of view was expressed by W. Lissowski who puts the following question:[1] "In what way - in the present conditions of regional planning in Poland can we find a joint sectoral and spatial optimum of the distribution of productive forces in the Polish perspective plan?".

According to W. Lissowski:[2]

"the joint sectoral and spatial optimum does not develop spontaneously, because there exists a divergence between the techno-economic trends and tendencies of the modern production sectors, and the tendencies of the regions."

W. Lissowski stresses:

"that this approach is quite different from the approach of the majority of Polish regional planners. Generally speaking, the opinion is accepted that the sectoral and regional pattern should "mutually supplement themselves."

This unclear directive means more or less that the regional planners are supplementing the sectoral pattern by the introduction of spatial elements on the assumption that in good co-ordinated planning, both patterns represent the same tendencies (the over-all advantage of the national economy) and that the whole problem can be reduced to the proper organization of planning. In other words the divergences in the trends of development of sectors and regions which are evident to me, are interpreted as mistakes in the organization of planning."

The validity of this problem was recently recognized by K. Secomski[3] in the following statement:

"In recent years there has been an important development of activity in the field of sectoral industrial programming. At the same time differences in opinion increased as to the future trends of development of regional economy and the influence of those trends on programming of industrial growth of a given region. Using the results of research activities, we have to find the proper way to reconcile those conflicts.

It seems to me that in the first stage of studies we should accept the guiding principle of maximization and optimization of the economic performance of each industrial sector.

Applying this principle, we will get the following results:

(a) strong concentration of industry - ergo the construction and development in each industrial sector of optimum size plants ...

(b) the establishment and growth of large inter-sectoral industrial agglomerations ...

In the second stage of studies we are confronted with the results of sectoral and inter-sectoral industrial programming and the criteria of optimal regional economic development.

1/ W. Lissowski presented his point of view during several meetings in the Polish Academy of Sciences in 1964. In this paper reference is to his article published in 1965 in the Bulletin of the Committee of Space Economy and Regional Planning, No.34, Warsaw 1965.

2/ W. Lissowski - op.cit.

3/ K. Secomski - Some Problems of the Theory of the Distribution of Productive Forces in the volume Theoretical problems of the Distribution of Productive Forces, Warsaw 1965, p.60.

These criteria are a tool to correct - sometimes drastically - the sectoral point of view. In many cases the sums of optimal proposals of all industrial sectors create excessive concentration and agglomeration of industry with its negative consequences.

Therefore, starting from intra-sectoral and inter-sectoral optimations we have to use an integrated sectoral and regional accounting method as a tool of short, medium and long-term evaluations of the advantages and disadvantages of industrial concentration and agglomeration."

It appears, therefore, that the problem of the proper reconciliation of sectoral and regional approaches is an important problem of the future.

Three factors can be mentioned, which would favour the relatively quick solution of this problem. The first factor could be described as the development of industrial sectoral programming activities which extend systematic knowledge of the modern technological and economic trends which will determine the future pattern of industry.

Figure 7 illustrates a scheme of such activities proposed by Z. Knyziak and W. Lissowski.[1/]

The second factor could be described as the development of regional economic programming activities which will extend systematic knowledge in this field and which will take into account the results of industrial sectoral programming. In this context, too, the model of arbitration between regions proposed by J. R. Boudeville should be examined as an extremely valuable tool of inter-regional programming.[2/]

The third factor could be described as the integration of the general theory of economic growth and the theoretical approach to the development of different sectors and regions.[3/]

1/ Quoted from Economic Planning in Europe, p.16, Chapter IV.

2/ J. R. Boudeville - Arbitration between regions, Bulletin of the Committee for Space Economy and Regional Planning, Warsaw 1966.

3/ Compare: K. Secomski - op.cit. p.58-70; Z. Zajda, Makroekonomiczna i regionalna teoria wzrostu W: Teoretyczne problemy rozmieszczenia sil wytworczych, Warsaw 1965, pp.71-89; B. Winiarski, Podstawy programowania ekonomicznego regionow, Studia Komitetu Przestrzennego Zagospodarowania Kraju, Vol.XII, Warsaw 1966; B. Chinits - The Regional Dimension of National Economic Growth. A paper prepared for the Third Meeting of Senior Economic Advisers, Geneva 1964; J. Meyer - Regional Economics. A Survey. The American Economic Review, March 1963.

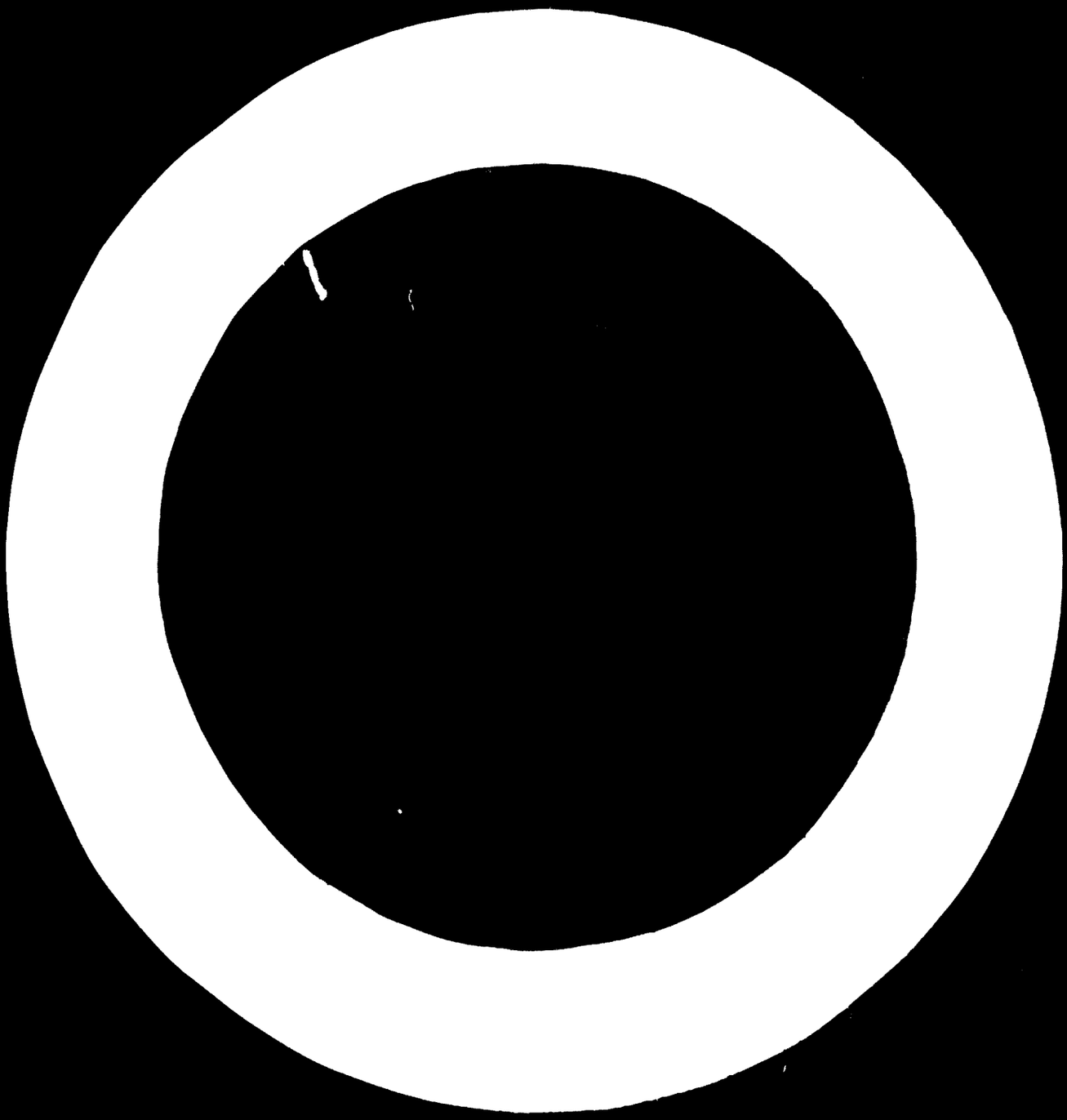
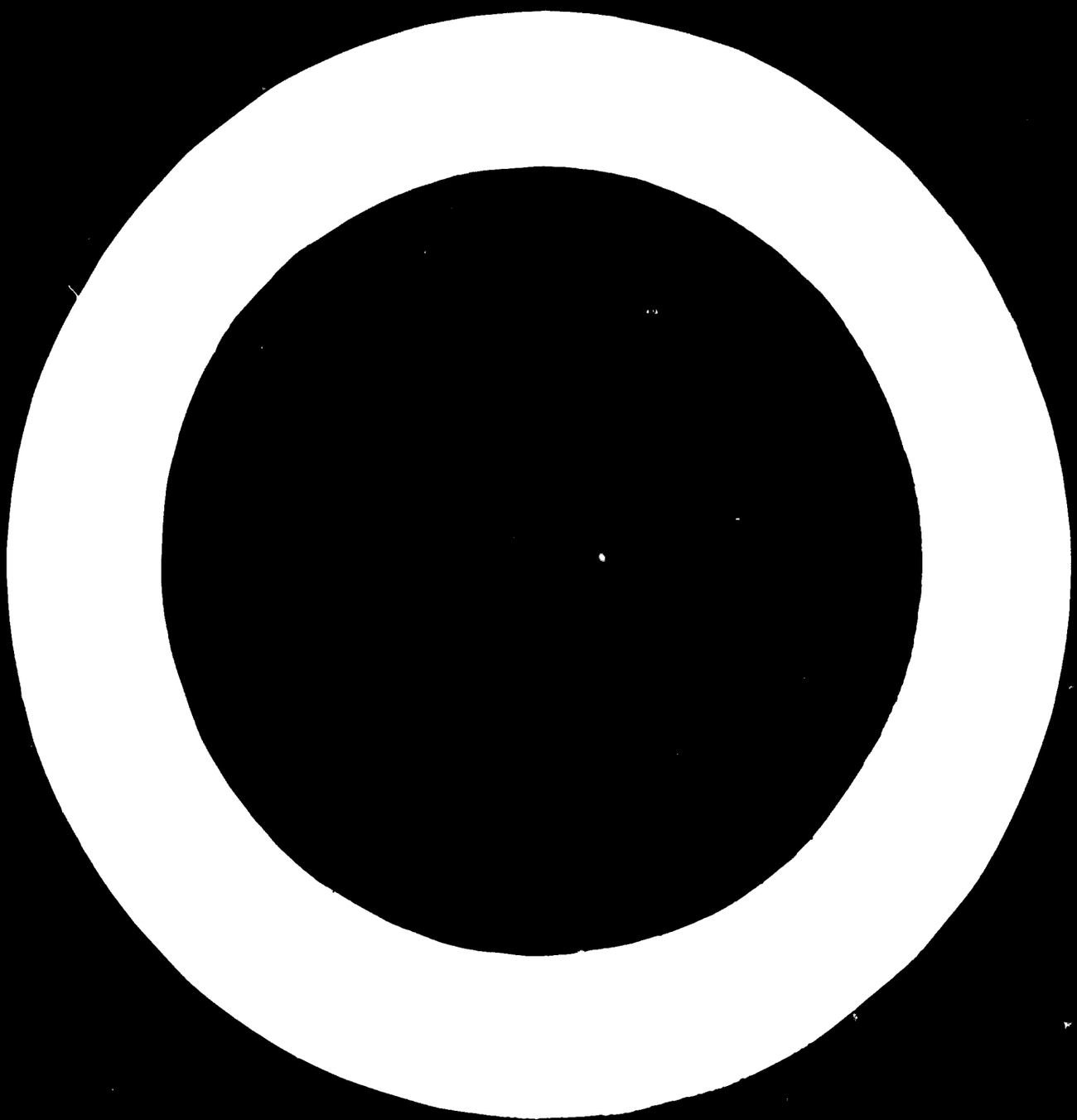


Fig. 7. A scheme of programming of the development of an industry branch

Planning agencies / Phases	Central level	Sectoral level / industry branch	Executive enterprise level
I. Preliminary development directives	1. Analysis and forecasts of demographic development, employment, natural resources and foreign trade 2. Preliminary hypothesis of national product and national income creation 3. Preliminary hypothesis of the distribution of national product and national income 4. Preliminary directives for individual sectors, branches 5. Preliminary material - investment - ... employment - and foreign trade balances		
II. Preliminary development programmes for individual sectors, branches for industry		1 Detailed analyses of development directives of an industry branch 2 Evaluation of technical feasibility of branch directives 3 Optimization analyses and choice of alternative solutions 4 Consistency check: intersectoral balances, import requirements, employment needs, internal relationships 5 Location analyses 6 Formulation of postulates for the central planner and preliminary directives for the executive level	
III. Programmes for individual enterprises			1 Detailed analyses of development directives for the individual enterprises 2 Choice of optimal alternatives 3 Formulation of postulates concerning investment, raw materials, employment and import requirements 4 Final investment location choices
IV. Correction of programmes and formulation of central directives for overall development	1. Final acceptance of demographic, employment, natural resources and foreign trade assumptions 2. Programme of creation of national product and national income 3. Programme of distribution of national product and national income 4. Development directives for sectors 5. Investment - material - employment - and foreign trade balances		
V. Corrections of programmes and formulation of directives for individual branches		1 Detailed targets for individual enterprises and location of their investments 2 Feasibility check 3 Decisions concerning choices of alternative solutions (choice of techniques, commodity structure for exports) 4 Balance requirements for investments, raw materials, employment and imports 5 Decisions concerning the productive capacity increases and their repartition among enterprises 6 Postulates for the central planner	

(1) Z. Knytnik and W. Lissowski, "*Ekonomika i Programowanie Inwestycji Przemysłowych*", PWN Warsaw 1964.

Source: Economic planning in Europe, op.cit. p. 16, Chapter IV.



Section IV.

International aspects of industrial location.

1. Industrial location and the international division of labour.

The advantages of specialization and the economies of scale are the main forces in the development of inter-regional and international division of labour, and of the movement of commodities from one place to another.

It is precisely these phenomena that create the problem of location.[1/] According to W. Isard[2/] - "location cannot be explained without at the same time accounting for trade and trade cannot be explained without the simultaneous determination of locations."

Analyzing in this context the international aspects of industrial location, the first point to be considered is the size of the country concerned.[3/] It is well known that international trade is, ceteris paribus, more important for small countries than for large ones. The same generalization is valid in respect of the role of international considerations in industrial location.

These considerations arise when the following factors are analyzed:

(a) the influence of international trade on the size of industrial plants of a particular country.

(b) the influence of the state frontier on the distribution of industrial plants in a particular country.

Firstly, the indirect influence of international trade on industrial location can be pointed out. In Section II of this paper attention was called to the fact that the growing size of plant is changing the relative importance of different locational factors.

In other words, when the growth of larger plants is promoted through the development of international trade then the conditions of some industrial locations in a given country are indirectly changed.

1/ Compare: B. Ohlin - Interregional and International Trade, Cambridge, Mass. 1935

2/ W. Isard - Location and Space Economy, New York 1956, p.207.

3/ Compare: E.A.G. Robinson (Editor)-Economic Consequences of the Size of Nations London, 1960.

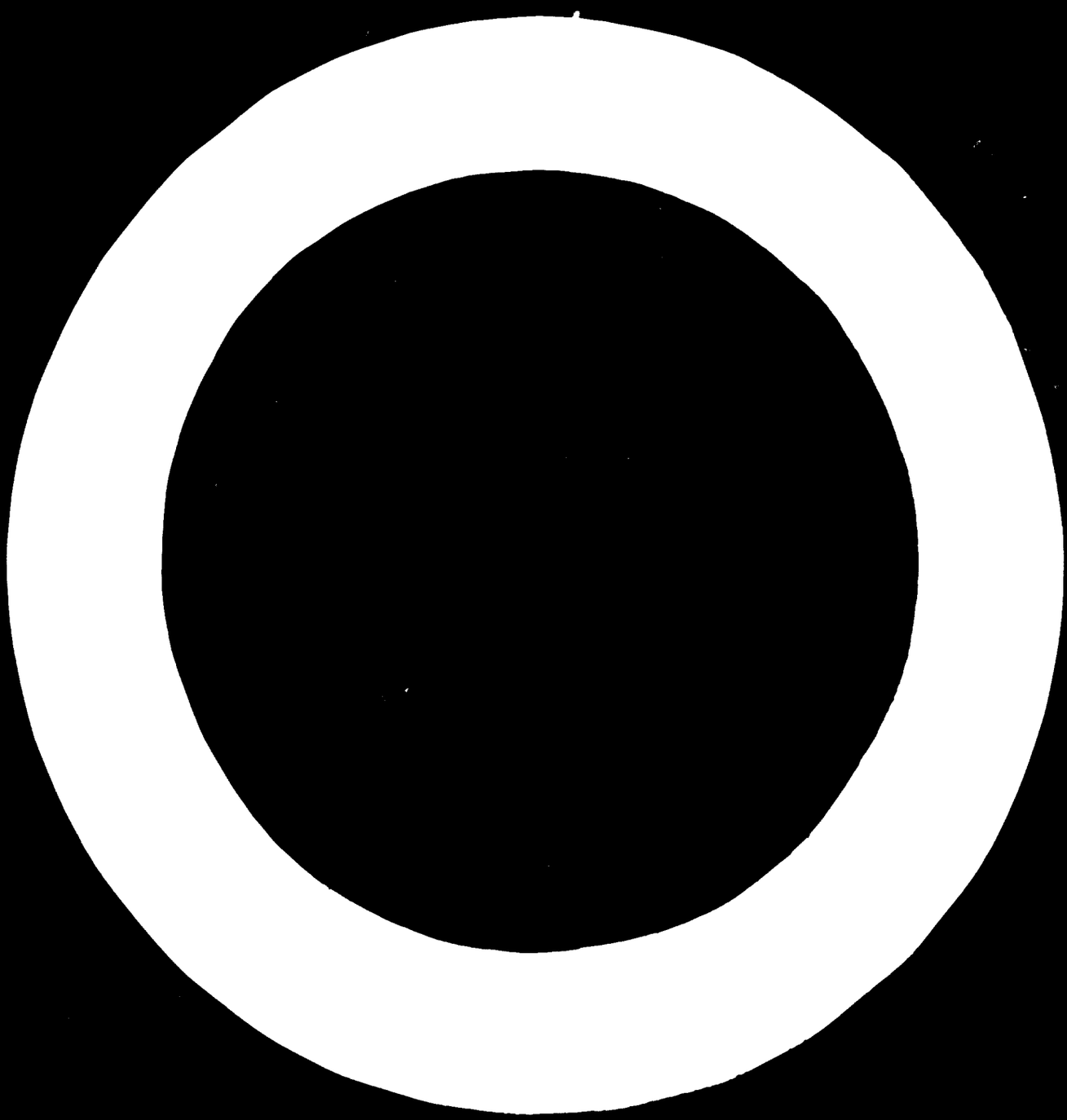
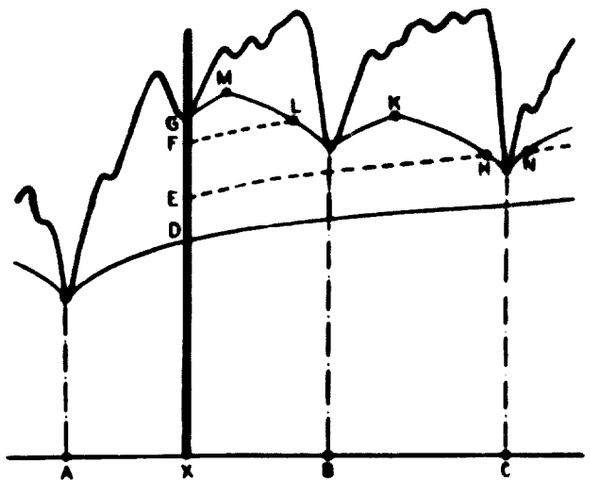
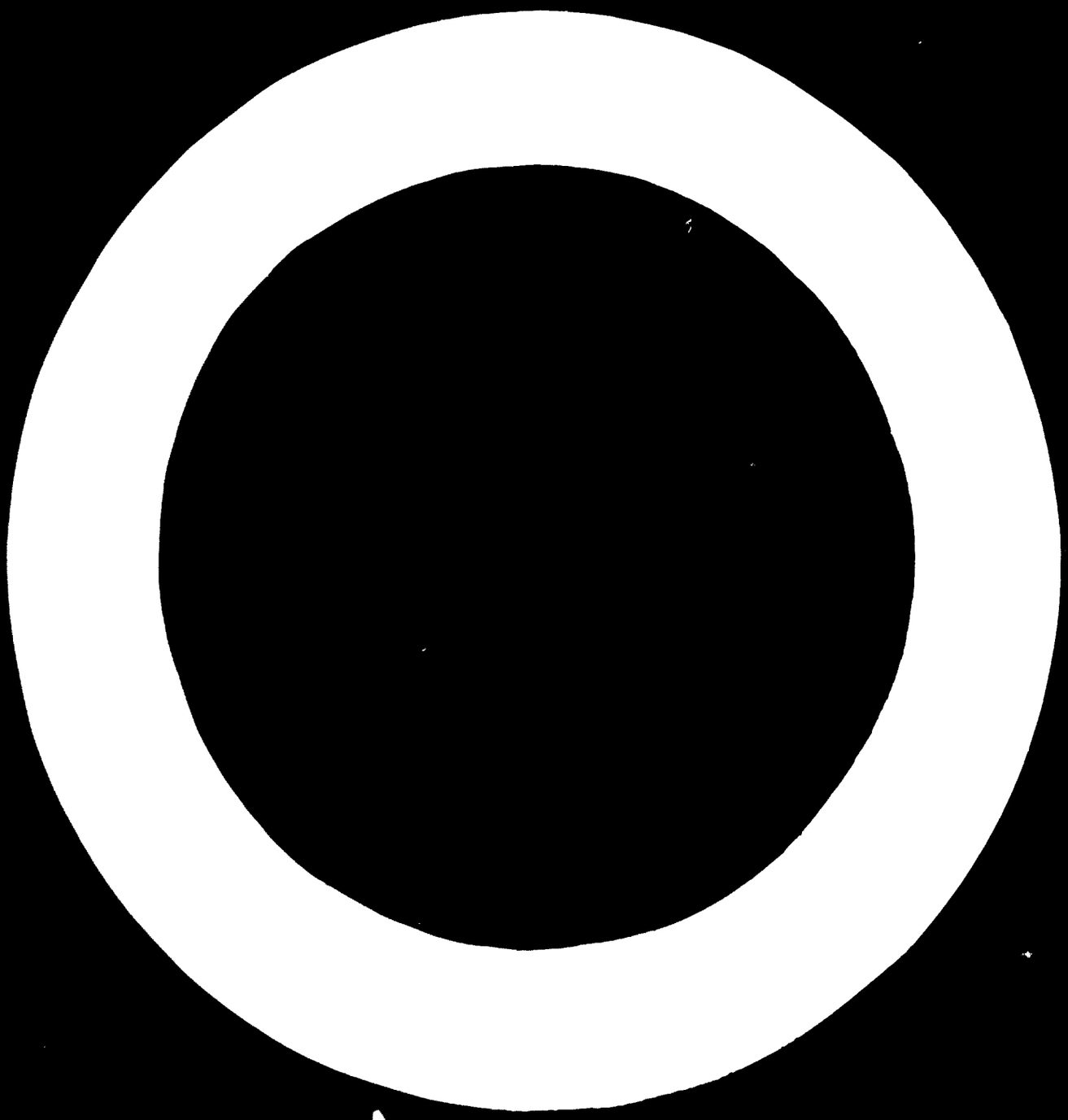


Fig. 8.

Diagram illustrating the protective effect of a trade barrier (at X) upon high-cost processing locations (at X, B, and C) in competition with lower-cost producers at A.



Source: E.M. Hoover, op.cit., p.223.



The statement that the problem of depressed regions is limited in time and in space may now be reconsidered. The first limitation is contained in the opinion that this problem will simply vanish when the reconstruction of the old industrial regions is accomplished. The second limitation is expressed in the opinion that the problem of depressed regions is important only for countries or territories such as Great Britain, Belgium, Northern France, Eastern Germany or Eastern United States.

It can, however, be argued that the problem of depressed regions is a problem of the future for a growing number of countries. The structural change and different rates of growth of different industrial sectors are a permanent feature of industrial development.[1]

Therefore, the problem of reconversion of some industrial regions where the slow-growing industries are concentrated, will also exist in the future. It is possible that this reconversion will not be so difficult because the industrial regions of today are more sectorally diversified and are at a much higher technological, economic and aesthetic level. But probably too the standards of evaluation of the year 2050 in relation to industrial regions developed in 1950 will be much more severe than present-day standards in relation to regions developed in the middle of the nineteenth century.

The problem of relatively depressed regions must therefore be regarded as a permanent problem of economic development.

In this connexion, the notion of "potential distressed areas" suggested by L.H. Klaasen in the following classification is of great interest:

TABLE 13

Income level compared with the national level → / Rate of increase compared with the national rate of increase	High (≥ 1)	Low (≤ 1)
High ($\geq$)	Prosperity area	Developing distressed area (in process of development)
Low (≤ 1)	Potential distressed area (declining prosperity area)	Distressed area

Source: L.H. Klaassen. Area Economic and Social Redevelopment, OECD - Paris, 1965, p.30.

1/ Compare: F. Vinck - Industrial Conversion and the European Coal and Steel Community. International Labour Review, No. 6, 1965.

This problem can be approached from a different point of view. The case can be examined of how the introduction of a trade barrier reduces the market area of a big plant and creates new small high-cost locations.

Such a situation is analyzed by E.M. Hoover[1/] in the following way:

"Reduction of the size of market areas entails, of course, an increase in their number, i.e. a greater dispersion of processing points over the whole market territory. The purpose of 'protective' import duties (in direct or disguised forms) is to acquire or retain for the protected home producers a separate market area that would otherwise not exist. Export duties on raw materials or power are likewise designed to keep such materials at home for further processing, i.e. to carve out a protected supply area for home processors.

Figure 8 presents a relatively simple case of protection in which only processing costs and distribution costs are assumed to vary locationally. This might apply to mining or other extractive industries which make relatively little use of transported materials. The jagged line at the top of the figure represents the pattern of processing costs for points along a route passing through A, X, B, and C. The smoother sloping radients show the variation in total delivered cost of the product at different markets when it is produced at A, X, B, or C.

In the absence of trade barriers, it is evident (following the lowest sloping line) that A can serve all markets more cheaply than any alternative processing point can. All processing will be concentrated at A.

But if there is a trade barrier at X, with added costs amounting to DE on shipments from the A-country into the BC-country, C will be shielded from foreign competition sufficiently to command a market extending as far as H and N. If the trade barrier is raised to a height of DF, the delivered-cost gradient on goods imported from A rises to the position FL and both B and C can compete. C will ship as far as K; B will dominate the markets between K and L; and goods imported from A will continue to be sold in the markets between L and the border. Finally, the barrier is raised to a height exceeding DG; goods from A will not cross the border at all. A fourth production centre located immediately to the right of the boundary will serve the territory between it and M, while B's market area will extend now from M to K.

In this case it is evident that the imposition of a barrier to importation may permit development of one or more domestic production centres, depending on the height of the barrier. This is, of course, at the immediate expense of the consumers of the product in the 'protected' country, all of whom now pay more for the product."

1/ E.M. Hoover. The Location of Economic Activity, New York 1948, p.222-223.

The behaviour of the large plant, which lost the markets across the boundary, can now be analyzed. This plant will be induced to pay more attention to the domestic market and, if possible, find a new location closer to the centre of this market.

This phenomenon is called "national agglomeration" by H. Giersch[1/] who analyzed the following case (see Figure 9)

> "Let A be the location of the firm in Westland, AH the radius of its market area and GB the new national frontier. The introduction of an import-duty in Eastland, which is equal to the transportation cost from J to H, shortens the radius of the market area in Eastland by the same amount. The eastern limitation of the market area is now BCJFG. (Where AC=AJ.)
>
> If K is the only customs-station through which the product can pass from A to Eastland, the market area in Eastland is limited by a circle around K with the radius KJ(AJ - AK). A is no longer the optimum location for the firm. It will tend to widen its market in Westland, as compensation for the loss in Eastland. However, a larger amount can only be sold in Westland if the firm moves from the location near the new frontier to a location which lies closer to the centre of the new area of Westland."

The case presented by E.M. Hoover and H. Giersch analyze two aspects of the same problem of the mechanism of the influence of a state boundary on the location and size of plant.

During the past 15 years the restrictive influence of state frontiers in the process of economic development got a wide recognition, in the first stage mainly through the reduction of trade barriers. Various international institutions were established in order to promote the integration of the national economies of different groups of countries.

A new framework for the consideration of the problem of industrial location was created. Two most outstanding institutions of this type - the European Economic Community and the Council of Mutual Economic Assistance - will be discussed in this paper.

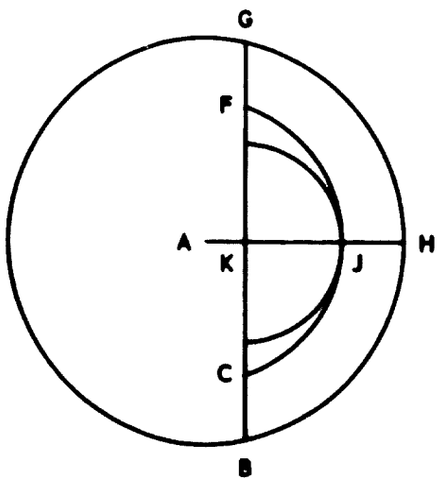
The member countries of the European Free Trade Association are neither adopting a common external tariff nor attempting to unify their basic economic policies.[2/] So the influence of EFTA on industrial location in the member countries represents a rather classical situation of the interdependence of the development of international trade and the size and location of industrial plants.

1/ H. Giersch - Economic Union Between the Nations and the Location of Industries. The Review of Economic Studies 1949-50, Volume XVII (2) No. 43, p.90.

2/ Secretariat of the Economic Commission for Europe - Aspects of Europe's Trade Relations with Developing Countries. Geneva 1964, p.261.

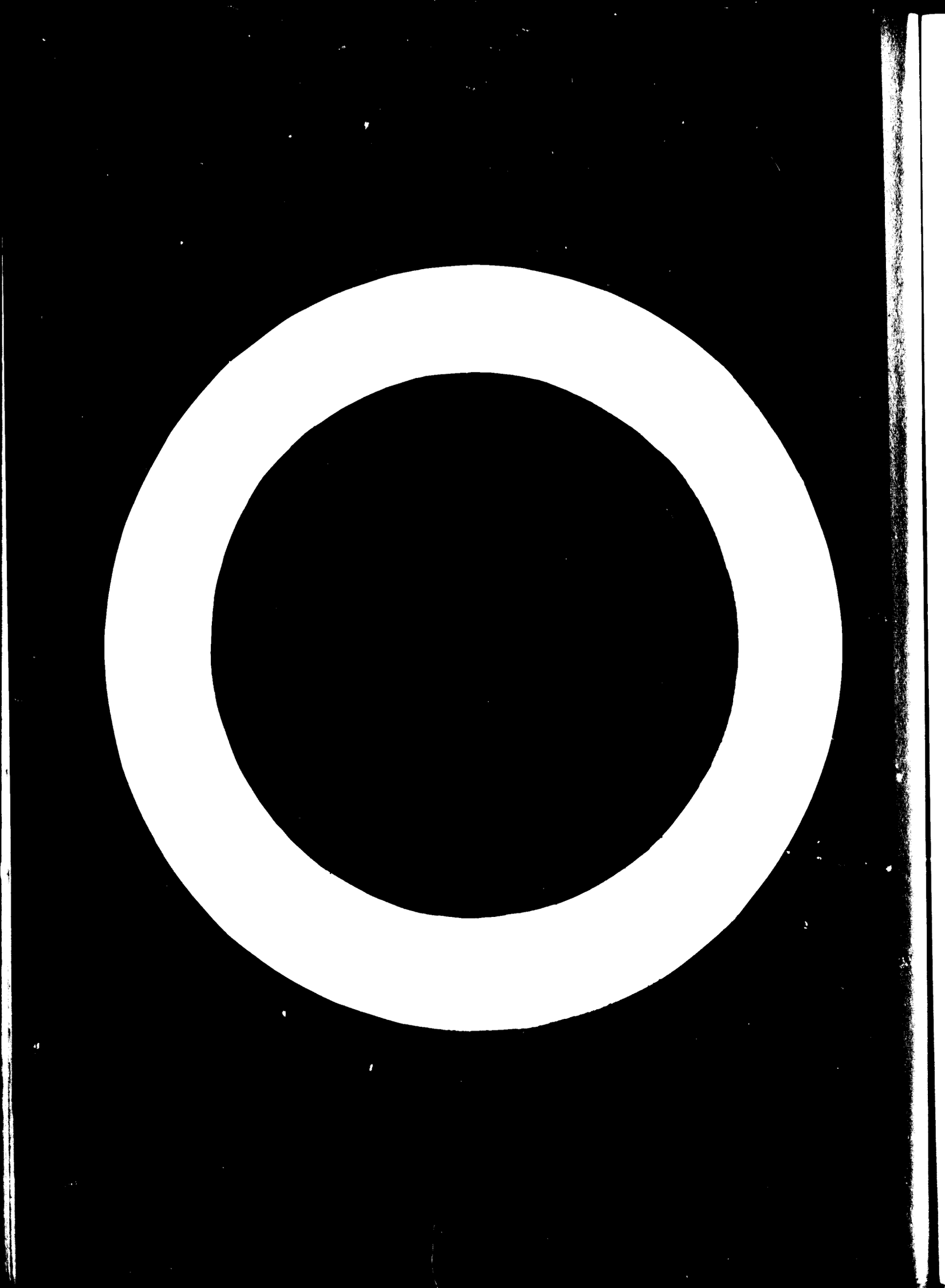
Fig. 9.

The boundary and the optimum location



WESTLAND EASTLAND

Source: H.Giersch, op.cit., p.90.



2. The problem of industrial location within the framework of the European Economic Community.

The Treaty of Rome accepted the following important principles of economic integration: the free movement of goods and the free movement of persons, services and capital; the common external tariff and a set of programmes aiming at unification of basic economic policies.[1/]

It is very difficult to analyze the locational experience of the EEC which was created in 1957. The empirical material covers a very short period and is to a large extent of a transitional character, meaning that the principles of "free movement" were not operating fully.

It has also to be stressed that it is impossible to make an exact distinction between trends of industrial locations resulting from the national development of the respective countries and trends resulting from the Common Market.

With these reservations in mind two questions can be examined:

(a) to what extent is the number of new industrial locations in the six countries affected by the existence of the Common market.

(b) to what extent do the new industrial locations influence the trends of spatial concentration and spatial dispersion.

Answering the first question the existence of two countervailing forces can be noted: the phenomenon of growing size of plant which reduces the number of new locations and the phenomenon of construction of new plants by enterprises entering the Common Market area from outside.

According to M. Falise[2/] out of 303 new enterprises created in the six countries in the period from 1 June 1959 to 30 June 1960 - 147 enterprises represented an external country of origin. (See Table 16).

1/ Compare: Titles I and III in the Treaty of Rome, quoted from the publication: Treaty establishing the European Economic Community and related documents; compare too Secretariat of the Economic Commission for Europe, op.cit. p.251.

2/ M. Falise. Entreprises et fabrications nouvelles dans l'industrie manufacturière du Marché Commun Récherches Economiques de Louvain, septembre, 1961, p.578

TABLE 16

New industrial enterprises created in EEC in the period from 1.6.59 to 30.6.60

	Country of location					
	Germany	Belgium	Netherlands	Italy	France	Total
Industries:						
chemicals	12	7	19	21	52	111
engineering	21	14	8	14	32	89
electrical	4	4	6	9	14	37
food	2	2	1	4	2	11
textiles	2	1	3	6	3	15
base metals	1	-	1	-	3	5
other industries	5	8	4	7	11	35
Total	47	36	42	61	117	303

	Country of origin									
	Germany	Belgium	Nether-lands	Italy	France	Great Britain	USA	Others	More than one country	Total
Industries:										
chemicals	5	3	6	9	23	6	30	2	27	111
engineering	13	4	-	2	7	18	25	9	11	89
electrical	-	-	1	3	6	7	17	1	2	37
food	-	4	-	1	-	1	1	3	1	11
textiles	2	1	1	2	-	4	2	2	1	15
base metals	-	-	1	-	3	1	-	-	-	5
other industries	6	3	2	3	1	5	9	4	2	35
Total	26	15	11	20	40	42	84	21	44	303

Source: M. Falisc, op.cit. p.578.

In answering the second question the results can be used of the study by Ph. Leurquin,[1/] who prepared a map showing the distribution of 795 new enterprises created in the EEC between 1 January 1959 and 31 December 1961. (see Table 17 and figure 10).

1/ Ph. Leurquin - Marché Commun et Localisations, Paris-Louvain 1962, p.225-277.

TABLE 17

New industrial enterprises in the EEC on 31 December, 1961

Locations according to sector

Industries	Number of new enterprises			New enterprises as a percentage of all new enterprises on 31 December 1961		
	Established between 1 June 1959 and 30 June 1960	Established after 30 June 1960	Total	Established before 30 June 1960	Established after 30 June 1960	Total
Chemicals	111	112	223	37	23	28
Metal working	126	225	351	42	46	44
Food	11	29	40	3	6	5
Textiles	15	28	43	5	6	5
Metallurgical	5	26	31	2	5	4
Other	35	72	107	11	14	14
Total	303	492	795	100	100	100

TABLE 17
(continued)

New industrial enterprises in the EEC on 31 December, 1961,
Locations according to countries

Country	Number of new enterprises or firms			New enterprises as a percentage of the whole		
	Before 30 June 1960	After 30 June 1960	Total	Before 30 June 1960	After 30 June 1960	Total
Germany	47	88	135	15.6	17.9	17.0
Belgium	36	112	148	12.0	22.7	18.6
Netherlands	42	54	96	14.0	11.0	12.1
Italy	61	94	155	20.3	19.1	19.5
France	117	144	261	38.1	29.3	32.8
Total	303	492	795	100	100	100

Source: Ph. Leurquin - op.cit. p.275-276.1/

1/ Materials presented in tables 16 and 17 are probably incomplete and therefore should be treated as a preliminary information. Nevertheless we have to leave this information because we could not find better materials.

For the evaluations of data presented in tables 16 and 17 the following remarks of the Belgian Rapporteur, M. A. Detroz, are valid:

"Table 16 gives a relatively favourable figure for Belgium if account is taken of the populations of the five countries. However, it is probable that the enterprises are generally smaller in size in Belgium. Moreover, the source is a study by Professor Falise, who drew his information, which is not necessarily complete, from the Press.

In Table 17 the figure of 112 represents the number of enterprises created in Belgium between 30 June 1960 and 31 December 1961, giving an annual average of 74 plants. On a comparative basis, 290 new plants received state financial aid in the period 1960-1965, giving an average annual figure of 50 new plants (of which 40 per cent were foreign enterprises). It seems then that one plant in three was built without aid from public funds. The relatively high figure of locations should be attributable in part to the fact that Belgium is situated in the favoured EEC triangle (Amsterdam-Paris-Frankfurt). This impression, apparently very favourable to the country, would undoubtedly be less so if the size of the new enterprises were known, and also the number of enterprises which have closed."

The implications of this map are very clear. Spatial concentration was the leading trend in connexion with the choice of industrial locations in the first period of the existence of EEC. Having regard to the considerations discussed in Section IV, it would seem that the conflict of sectoral and regional approaches was solved in favour of the sectoral approach. This implies that the sectoral forces of the Common Market are shaping a huge industrial megalopolis[1/] of western Europe covering more or less a triangle - Paris, Amsterdam, Frankfurt am Main.

It is interesting to note that this type of development inside a customs union area was correctly envisaged by H. Giersch who in 1950 made the following statement.[2/]

> "The locational consequences of the formation of, for example, a Western European Union can now be described by the following general statement: The abolition of barriers to inter-European trade and to inter-European movement of factors will weaken the deglomeration effect of national agglomeration and will thus enforce international, or more precisely, inter-European, agglomeration. It will strengthen the attractiveness of the highly industrialized centre both for labour and capital. Towns and regions with artificial advantages due to national agglomeration will become disadvantageous. On the other hand, particular regions near the industrial centre, which have suffered under the depressing influence of national borders, will gain instead."

H. Giersch, too formulated correctly the basic dilemma of regional economic development of a Common Market area, presenting the following point of view:[3/]

> "If our general answer as regards the locational consequences of the formation of an economic union is right, the question arises whether or not these tendencies are desirable.
>
> On the one hand, complete freedom of trade and a new spatial combination of factors is a necessary condition for raising productivity in the union by a higher degree of specialization both between the industries and the regions. The advantages of an extended free trade area depend to a large extent on the ability of entrepreneurs to produce in the most advantageous

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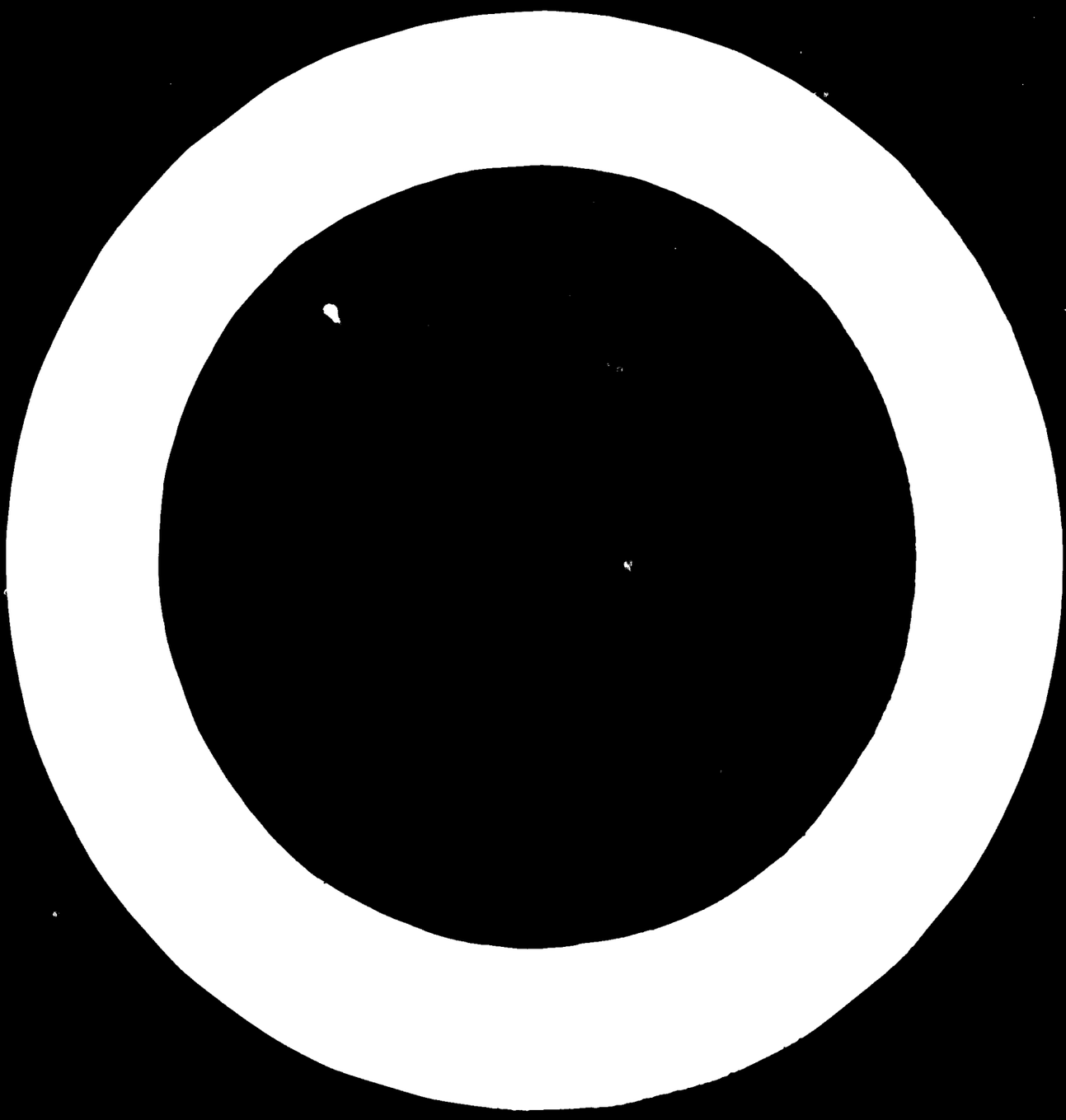
1/ The term megalopolis was introduced by J. Gottmann in his study: Megalopolis: The Urbanized North-eastern seaboard of the United States, New York, 1961.

2/ H. Giersch - op.cit, p.91.

3/ H. Giersch - op.cit. p.93.



[illegible] Klaassen 1/

"... declining or [illegible] areas [illegible] should ... those many areas that closely [illegible] may result in the generation of future distress ... the point of the author the study of [illegible] areas [illegible] economic and social [illegible] of most areas is, perhaps, even more important than the study of distressed areas. For in these areas, still "prosperous" but threatened with decline, an effective policy may more readily be adopted and have [illegible] than in actually "distressed" areas. The reason for this is the tendency that exists, in a distressed area, for the unfavourable situation to subsist to a certain degree of "stability", for the labour force to release its best elements to the outside, and for a general feeling of uneasiness and helplessness to develop in the population.

"Distressed economic areas tend to become less and less capable of self-assertion and initiative as their condition worsens. It is for this reason that early assistance in redevelopment is essential. The general capacity for economic growth is due not only to the spirit of realisation which ultimately suffuses a community that eventually fails, but also to the out-migration of the young and ambitious, leaving behind the older and less mobile persons. As the distress continues, the graduates of the school system move out, making for a more unbalanced population. Community income drops and the quality and quantity of public services deteriorate so that the services and inducements necessary for attracting modern industry become fewer in number."

The opinion of L. H. Klaassen 2/ that in the solution of this problem, the role of research activities is especially important, appears to be sound.

"Research into a region's process of social and economic development, then, may reveal that, whether in the near or the distant future, certain economic problems may arise. Furthermore, this may be so even when the current economic situation of the region seems perfectly satisfactory."

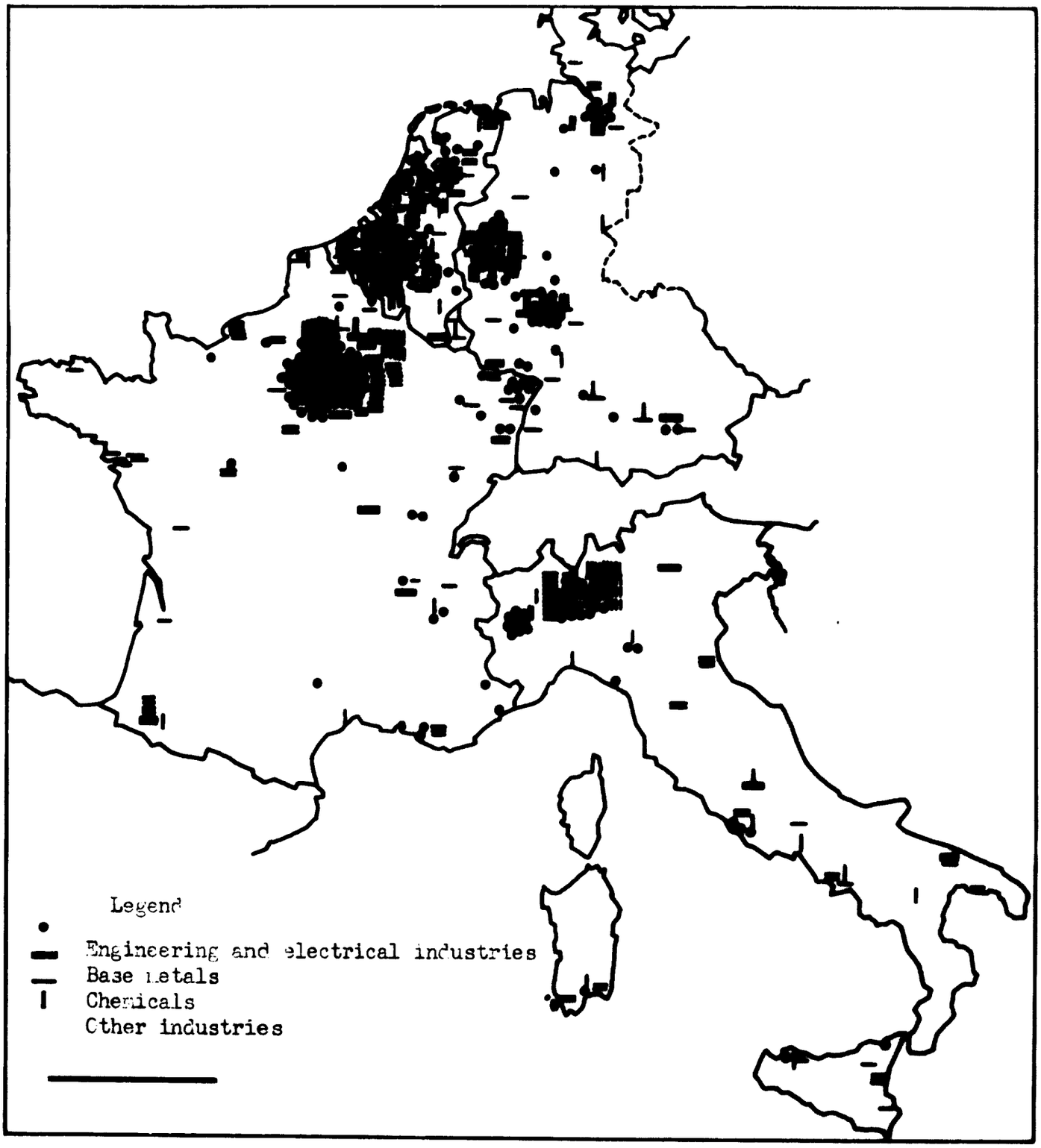
1/ L.H. Klaassen, Area economic and social redevelopment, OECD - Paris 1965, p. 20.

2/ S. Bertin, Principles for Area Redevelopment legislation, Labour Law Journal, August 1959 - quoted by L.H. Klaassen, op. cit., p. 11.

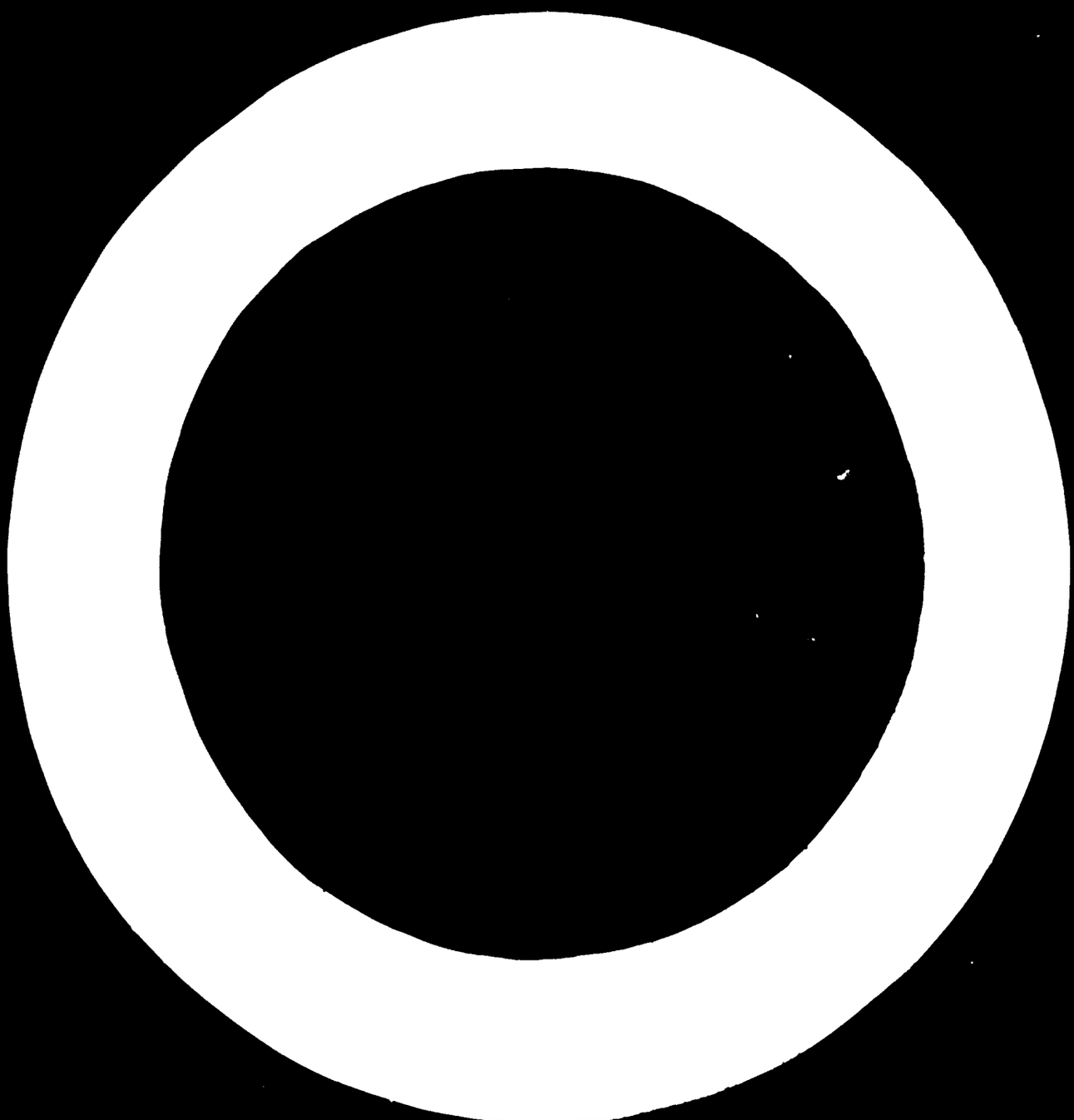
3/ L. H. Klaassen, op.cit., p.16

Fig. 10.

- The location of new industrial enterprises in EEC



Source: Ph. Leurquin, op.cit.p.277



location. On the other side we must consider the difference between money costs which go into the accounts of the firm and into the calculation of the entrepreneur - and the social costs. Choices of location by entrepreneurs are based on private costs. In the case of agglomeration, external economies for the individual firm are taken into account, while the social costs which arise in connexion with the concentration of population in a rather small area are not considered.

Furthermore, it should be realized that external economies which are both causes and consequences of agglomeration in the gaining regions have a counterpart in the form of decreasing external economies in the adversely affected regions. The shifting of factors from the latter to the former causes a vacuum and a deterioration of business efficiency in the latter. The development and use of natural resources in them may become more difficult, because their exploitation may only be profitable in connexion with a certain rate of capital growth. In a growing economy a stop in the industrialization process or a smaller rate of growth in one region compared with the rates of growth of other regions already means an absolute disadvantage. If one firm or one industry shifts gradually from one region to another it causes external economies in the new location, both for the firms already existing there and for itself. It can be assumed that this effect is intuitively anticipated in the calculation of the moving entrepreneurs. But the adverse effect in the location they are leaving, on the other firms there, and on the natural resources, the development of which may become more difficult, does not go into the entrepreneurial calculation as a negative item. It necessarily follows from this that agglomeration tends to go beyond the social and economic optimum.

If this is true it will be necessary to find a substitute for the deglomeration effect of national borders and customs walls. The substitute must be an instrument which is precise enough to distinguish between the advantageous process of regional specialization and the abuses of agglomeration beyond the social and economic optimum.

The necessity to promote a more balanced regional economic development was recognized by the Treaty of Rome especially through the creation of European Investment Bank. According to Article 130 of the Treaty, 1/ the first task of the Bank is to facilitate the financing of "projects for developing less-developed regions." As already mentioned in Section II of this paper the first practical large-scale application of this provision was announced in 1965.

It is interesting to note that the regional approach within the framework of EEC was not applied in the initial stage of development of this institution. The action of the EEC will probably be restricted to a limited number of specially difficult cases like that of southern Italy. The existence of EEC does not eliminate the necessity for national policies of regional economic development; it merely introduces new elements which such policies should take into account and it creates new possibilities of which advantage can be taken in order to find the optimal solution.2/

1/ Treaty, op.cit. page 113.
2/ Compare: R. Bird. The Need for Regional Policy in a Common Market. Scottish Journal of Political Economy, November 1965.

3. The problem of industrial location within the framework of the Council of Mutual Economic Assistance.

In the evaluation of the activity of the CMEA three stages of development, [1] can be distinguished.

In the first stage, in the years 1949-1954, the most important item in the activity of CMEA was the co-ordination of international trade of the member countries. This was the period of the implementation of the policies of rapid industrialization which were designed from the point of view of semi-autarkic approaches. Each country in eastern Europe was developing a similar set of basic industries.[2] In these conditions the role of international trade was recognized as secondary and clearly subordinated to the demands of the semi-autarkic industrialization policies. The advantages of the international division of labour were underestimated.

The second stage in the development of CMEA - in the years 1954-1962 - has a transitional character. During this period there grew up a recognition of the advantages of the international division of labour. Both in the field of economic policies which were carried out, and in the field of development of economic studies[3] the conditions for the next stage were prepared.

This stage was started in 1962 at the Meeting of the Representatives of the Communist and Workers Parties of the Member Countries which approved the Basic Principles of the International Socialist Division of Labour.[4] This document opens a new chapter in the history of CMEA as an institution promoting the international division of labour according to the following principles:

> "Correct assessment of the objectively necessary proportions of economic development in each country and in the world socialist system as a whole, conducive to a balanced economy in each country;
>
> "Economic effectiveness of international socialist division of labour which has its expression in rapid industrial growth and the fullest satisfaction of the people's needs in each country, with a minimum expenditure of social labour;

1/ Compare: L. Ciamaga, Od współpracy do integracji. Zarys organizacji i działalności RWPG w latach 1949-1964, Warsaw 1965

2/ Compare: A. Bodnar, Gospodarka europejskich krajów socjalistycznych. Zarys rozwoju w latach 1950-1975, Warsaw 1962.

3/ Compare: O.T. Bogomolew (Editor). The economic efficiency of the international socialistic division of labour. Moscow, 1965, and F. Rakowski. Efficiency of Investment in a Socialist Economy. Pergoman Press, Warsaw 1966, p.288-303.

4/ Compare: Council of Mutual Economic Assistance - Selected material and documents, Warsaw 1964.

"International specialisation of production in combination with comprehensive (versatile) economic development of each socialist country for the fullest and most rational use of natural and economic prerequisites of production, including manpower resources, in all countries; and

"Gradual elimination of history-rooted economic disparities, primarily by industrialising the countries with a relatively low economic level, and by making the maximum use of internal resources of each country and of the advantages of the world socialist system as a whole". 1/

The influence of the development of the activities of CMEA on industrial location in the years 1954-1966 can be indicated mainly in two fields. The first can be described as the promotion of specialization of industrial production in the member countries.2/ The main-stream of this activity was concentrated on the specialization of the already existing plants, especially of the metal, metallurgical and chemical industries. But in the co-ordination of investment plans the CMEA promoted the specialization of the new plants which could achieve sizeable economies of scale. In other words, the first channel of influence of the integration activity on industrial location in eastern Europe has been through the promotion of the construction of larger production units.

The second field can be described as the promotion of the establishment of international systems of infra-structure and transport which create new stimuli for the development of international economic integration and specialization. The achievements of CMEA in this field are very important. They include the establishment of an integrated system of electric power transmission, international crude oil and natural gas pipelines, and international arrangements promoting more efficient use of the railway system.

These improvements of the infra-structure and of the transport system have created more favourable conditions in many regions of the member countries. In some cases these investments are a necessary condition for the location of new plants. The role of the Friendshippipeline in the location of new petrochemical plants in Eastern Europe is a very good example. These achievements augur well for future developments.

From the point of view of economic theory, new theoretical generalizations relating to long-run international co-ordination of investment programmes are the most important factor in these developments. The solution of this problem will also make possible a new long-term approach to international aspects of industrial location.

1/ Basic Principles of the International Division of Labour quoted after the UN Study: Economic Integration and Specialization among the Member Countries of the Council for Mutual Economic Assistance, New York 1966 - Department of Economic and Social Affairs, p.13.

2/ Compare: p.17-27 in the Study, Economic Integration and Specialization. op.cit.

Section V.

Problems of industrial location in developed and developing countries.

1. Introductory remarks.

One of the purposes of this study is to establish a starting point for the discussion of the validity of European and North American experience in the field of industrial location for the developing countries.

It might be said that such a discussion is extremely difficult or even impossible since the conditions of industrial location are quite different in developed from those in developing countries. Such an approach overlooks the basic fact that there are conditions governing industrial location which are determined by the type of applied technology and which operate universally or semi-universally.[1/]

The second important consideration in the utilization of locational experience is the existence of underdeveloped regions inside developed countries, where the economic and social conditions have certain elements in common with conditions prevailing in developing countries.

In this discussion two approaches can be distinguished: the general and the analytical.

The first approach restricts the discussion to overall comparisons where certain general conclusions on the locational experience of the developed countries are examined with a view to their application in developing countries.

1/ Compare the following statement of O. Lange on the scope of technical and balance laws of production: "The laws with the widest application in history are those arising from the production process - the technical and balance laws of production. The most general of these laws are universal in character, which means that they are valid at all stages of social development in which production is a conscious and purposive human activity - i.e. beginning with the appearance of mankind. A general technical and balance law of production of this kind arises from the very existence of certain necessary technical and balance relationships in the production process". Oskar Lange, Political Economy, Vol.1., New York 1963, p.64.

The second approach recognizes the basic fact that both the developed and developing countries do not constitute internally homogeneous groups. 1/ For the purpose of locational analysis these two groups of countries should be sub-divided according to the following criteria:

(a) the level of economic development;

(b) the economic and social system;

(c) the size of the country;

(d) the density of population.

Such a classification would create a framework for comprehensive comparisons of the problems of industrial location on a national scale. It is quite clear that for the locational policies of India the experience of the Soviet Union or the United States has a greater validity than that of Bulgaria or Belgium.

If the locational experience is compared regionally there is a much greater choice. The examples of industrialization of underdeveloped regions in Poland, Yugoslavia and Italy can be cited. The experience in these regions will have some validity for selected regions in developing countries irrespective of the size of such countries. A proposal might be put forward to establish permanent bilateral working relations between similar institutions promoting industrial growth in developed and developing countries. For example, one could explore the idea of an exchange of experience between the Cassa per il Mezzogiorno and Sudene - the institution responsible for the development of north-eastern regions of Brazil. 2/

2. The locational implications of industrial economics in the developed and developing countries

In Section II of this study an attempt is made to analyse the locational implications of industrial economics in the developed countries. The same question now arises in respect of the developing countries. In this connexion, two groups of manufacturing industries in the developing countries require to be distinguished:

1/ Compare the maps and analytical materials presented in the Atlas of Economic Development, edited by N. Ginsburg, Chicago 1961.

2/ Compare: S.H. Robock, Brazil's Developing Northeast. A study of Regional Planning and Foreign Aid. The Brookings Institution, 1963.

(a) the industries which have to apply the same technology as in the developed countries;

(b) the industries which can apply a more traditional and in most cases less capital intensive technology.

The failure of the Chinese experience to produce steel using small-scale labour-intensive techniques shows that in some branches, like the steel or the chemical industry, there is, in practice, little, if any, choice of techniques.[1/]

In the case of such industries the locational implications of the change in the size of industrial plant or the locational implication of technological integration and specialization outlined for the developed countries would appear to be fully applicable in the developing countries.

A different situation exists in the second group of industries which can apply a different technology from the same industries in the developed countries. In this case the validity of contemporary European and North American experience is much more restricted. At the same time, it would seem to be wrong to conclude that the criteria for location of these industries should reflect the situation of the developed countries at, say, the beginning of this century. The basic difference is due to the emergence of macro-economic criteria which are, or should be, applied now in the developing countries and which were not applied in the developed countries fifty years ago.

These remarks are only an attempt to open a discussion on the locational implications of industrial economics in the developing countries. The solution of this problem can be achieved only within the framework of industrial sectoral programming activities. (cf. Fig. 7 in Section III).

3. The locational implications of regional economics in developed and developing countries

Section III might be a good starting point for the discussion of the following problems of regional economics applied to industrial location in developing countries.

The first problem concerns the validity of European and North American experience in the field of industrialization of underdeveloped regions. As already mentioned in the introductory remarks, this is one of the most important considerations in the utilization of locational experience of the developed countries in the developing

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1/ Agreement can be expressed with the opinion of those authors who accept the priority of the choice of the structure of investment in relation to the choice of techniques. Compare: Z. Dobrska, Wybór technik produkcji w krajach gospodarczo zacofanych, Warsaw 1963.

countries. The key role of this factor is explained by the fact that in this case not only the technological experience but also the economic and social experience could, it would seem, be applied in the developing countries.[1/]

The second problem in the suggested comparative discussions and studies is the problem of industrial growth poles. The analysis of the economic and technological mechanism of an industrial growth pole[2/] or an industrial complex[3/] can be regarded as one of the leading problems in the field of industrial location in developing countries.

In recent years at United Nations conferences, much attention has been given to the problem of industrial estates.[4/] However, the main difficulty in the field of industrial location in developing countries is not that of the physical layout of an industrial estate but one of the establishment or development of nuclei of industrial growth. From this point of view the material of the United Nations Tashkent Seminar and the material of the European Economic Community deserve special attention.

The third problem of regional economics which is of importance to the developing countries is the proper spatial co-ordination of industrial and urban growth.[5/]

1/ With this in mind, it might be suggested that the Co-ordination Centre of Social Sciences in Vienna, which carried out a valuable research project on the underdeveloped regions in Europe, start a second project in this field and promote parallel studies on the industrialization of selected regions in developed and developing countries.

2/ European Economic Community; Study on the promotion of an industrial development pole in southern Italy, Brussels 1966.

3/ A. Probst, Industrial and territorial productive complexes in the USSR - a paper presented during the United Nations Seminar on the role of industrial complexes in economic development, Tashkent 1964.

4/ Establishment of industrial estates in underdeveloped countries, New York 1961. Industrial estates in Asia and the Far East, New York 1962. Industrial estates in Africa, New York 1965. Industrial Estates Policies, Plans and Progress, NY. 1966.

5/ Compare the materials presented in the following United Nations publications: Urbanization in Asia and the Far East, report of a UN-UNESCO Seminar, Bangkok 1956; UNESCO Research Centre on the Social Implications of Industrialization in Southern Asia, Calcutta 1957, UNESCO, Paris 1957; Urbanization in Latin America, report of a UN-UNESCO Seminar, Santiago 1959, UNESCO, Paris 1961; Report of the Joint Urbanization Survey Mission in the Mediterranean Region, November-December 1959, document ST/TAO/SER.C/51. United Nations, New York 1960. Urbanization in Africa - report of a joint UN-ILO-UNESCO-WHO Workshop held in Addis Ababa from 26 April to 5 May 1962, E/CN.14/170-ST/TAO/Ser.C/57 - ST/SOA/Ser.T/4.

This is an extremely difficult problem. In many developing countries the rate of urban growth is higher than the rate of industrial growth. There exists, especially in the over-congested metropolitan areas, an agglomeration of urban population which is much greater than is justified by the level of economic activity. This encourages the location of additional industries in the over-congested areas. But the efficiency of this policy is affected by the fact that although the newly located industries create new jobs in the metropolitan areas, they do not change the existing situation in other areas of the country. It is therefore arguable that new poles of growth should be established outside the over-congested areas in order to create other points of attraction for migration movements.

It is clear that both in the developed and developing countries 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 of the given country, which will put forward valid solutions of such problems as the rates of growth of over-congested and developing regions, the spatial co-ordination of economic activity and infrastructure investment and the spatial co-ordination of industrial and urban growth.

An internationally valuable evaluation of Polish experience in this field is presented in the recent publication edited by J. Fisher.[1/]

4. The conflict of sectoral and regional approaches to industrial location in developed and developing countries

Following the argument presented in Section IV as a hypothesis for discussion and study it could be said that the conflict of sectoral and regional approaches is one of the most important phenomena in the explanation of industrial location in the developing countries especially in countries of medium and large size.

This point of view is supported by the following analysis of the Indian experience as presented by S.C. Kuchhal.[2/]

> "Industrial location in India presents sharp contrasts. On the one hand, there is disproportionate growth of a few large scale industries in a few selected areas and, on the other, the virtual absence of such enterprises in the great part of the country. Most of the large scale industries are located in Calcutta and Bombay, primarily as a result of the unregulated freedom enjoyed by industrialists in promoting manufacturing enterprises and selecting these locations....These two centres with 12 per cent of the total urban population accounted for 63 per cent of the total workers...

1/ J. Fisher, Editor, City and Regional Planning in Poland, Cornell University Press, 1966.

2/ S.C. Kuchhal, The Industrial Economy of India, Allahabad 1965, p. 262.

[illegible] may [illegible]. This fact was painfully experienced in the Belgian and German coal mining industries when the optimistic forecasts of the demand for coal made by the Coal and Steel Community in 1956 failed to materialize. As a result of the decline experienced by these industries from the relatively favorable position they had once held, the areas in which they were located became, in a few years, seriously distressed.

We are of the opinion that continuous development research should be carried out in all areas. This would make possible the early detection of favorable and unfavorable economic trends as well as the early evaluation of their possible ultimate consequences.

The mere existence of distressed areas, of course, amply justifies research on redevelopment. But this approach is insufficient in comparison to continuous development research. Redevelopment research must cure; continuous development research can prevent serious economic ills.

It is reasonable to conclude that a permanent economic area monitoring agency should be charged with the responsibility of carrying out a programme of continuous development research.

In the conclusion the point should be stressed that industrial location should be recognized as one of the important tools of redevelopment policies.

Industrial location and the stability of [illegible] areas

In the opinion of A.O. Hirschman 1/

"We may take it for granted that economic progress does not appear everywhere at the same time and that once it has appeared powerful forces make for a spatial concentration of economic growth around the initial starting points ... In addition to the locational advantages offered by existing settlements, others stem from nearness to a growing center where an "industrial atmosphere" has come into being with its special receptivity to innovations and enterprise. It was largely the observation of the latter connections that suggested to Marshall the concept of external economies." 2/

1/ A.O. Hirschman, Interregional and International Transmission of Economic Growth, p. 623 in Regional Development and Planning. Edited by J. Friedmann, Cambridge, Mass., 1964.

2/ Compare, E.A. Lampard, The History of Cities in Economically Advanced Areas, Economic Development and Cultural Change, January 1955.

"The lopsided industrial growth had adversely influenced income distribution and the relative standards of living of the people in different parts of the country. In particular, it has introduced wide disparity of income between the industrialized areas and the underdeveloped regions: as in 1950 the per capita income of mining and factory workers was RS.800 per annum as against RS.200 for agricultural labourers. The situation has not improved much since then..."

After this description of the basic facts S.C. Kuchhal makes the following generalization.[1]

"In an underdeveloped economy balanced regional industrialization is attained at a somewhat slower rate in the early stages of development due to the urgent need to secure the maximum possible increase in national income in relation to the resources available.

However, as resources increase and development programmes are enlarged diversified stimuli to growth begin to function over a wide area resulting in higher living standards in all regions.

But such a policy yields results over a fairly long period."

The same problem is stated by Sh. Subramaniam[2] in the following way:

"To a certain extent the predominating trend in the last decade in India - that the already industrialized States... are absorbing the biggest share in economic development... in the long run could be advantageous too for the backward areas. This type of development raises the rate of capital formation and accumulates more savings for the future investment in the backward areas."

After presenting this purely economic evaluation Sh. Subramaniam stresses the necessity for considering the non-economic side of the problem.[3]

"The problem is an even regional development and the distribution of the resources is not a pure economic one: pure economic solutions are impossible. In this field there exists a competition of national, social and regional aims. In a country like India the results of economic planning are so much dependent on the extent the population and politicians of the different States are convinced by the Planning Commission and the Central Government on the superiority of the economic logic in relation to the political pressures. The interest of the different States is concentrated on the distribution of incomes and the creation of new jobs."

* * *

In conclusion the following generalization can be made: in developing countries the solution of the conflict of sectoral and regional approaches to industrial location is more difficult than in the developed countries.

1/ S.C. Kuchhal, op. cit., p. 277

2/ Sh. Subraniam, Die Wirtschaftsentwicklung Indiens 1951-1961, Tübingen 1965, Kieler Studien V 69, p. 141.

3/ Sh. Subraniam, op.cit., p. 141.

The difficulty arises from the fact that in most cases the problem of industrial location is associated with the existence of drastic differences in income levels between the different regions. The economic logic demanding concentration of industrial investment in the "best" regions is therefore challenged by very important social and political considerations. There are also economic arguments for the promotion of the new industrial poles of growth in the backward areas in developing countries.

The arguments presented above should not lead to the conclusion that the solution of regional problems in the developing countries could be neglected or postponed. It is suggested only that, in the initial stages of economic growth of those countries, the regional problems are relatively less important.

Thus, if a developing country is preparing a long-run programme of economic growth the solution of regional problems should be planned in the final rather than the initial stages of the implementation of this programme.[1/]

5. Economic integration and industrial location in developed and developing countries

Considering the implications of the material presented in Section IV for the developing countries, one should stress the basic difference in the aim of economic integration in the two groups of countries.

In the developed countries the main aim of economic integration is to increase productivity via the International Division of Labour and the International competition. In the developing countries, especially those in the early stage of development, these aims are perhaps of secondary importance and the key issue of economic integration is the creation of employment opportunities through regional co-operation.[2/]

1/ Compare the following statement of L.R. Vagale expressed in a paper prepared for the Economic Commission for Asia and the Far East: "National Development Planning and Its Relationship with the Form and Structure of Urban and Regional Systems in the Countries of the ECAFE Region", E/CN.11/I&NR/PURD/L.2 -

> "In a developing economy, investible resources, which are meagre, have to be utilized to the best advantage, and regions which are already in the process of development and which have the urban infrastructure and economic overheads will therefore take precedence over the depressed regions. This is inherent in the nature of the regional growth process. This does not, however, mean that depressed regions should not be given due consideration. A practicable solution to this appears to lie in the preparation of short-term plans for the development of 'advanced' regions and long-term plans for the 'depressed' regions. A part of the economic return obtained from capital investment in those regions which have higher growth potential could be invested in long-term development projects in the under-developed regions. Such an approach would help to reduce the gap in the levels of economic development of the two types of region."

2/ Compare S. Dell, Trade Blocks and Common Markets, London, 1963, p. 184.

In this formulation the word "regional" is used in the sense of United Nations terminology where region is equal to a group of nations. In the developing countries, therefore, economic integration, especially of small nations, is in many cases a conditio sine qua non of the decision to build a new industrial plant of the optimum, or at least minimum, size. Without the existence of common market arrangements the construction of the plant would be impossible because each of the markets of the member countries would be too small[1/] to create demand for its output. In these conditions a new type of industrial location in developing countries is emerging - location based on a common market.[2/] After this investment decision there is a crucial difficulty. The new plant must be located in one of the member countries which will get the biggest share in the advantages deriving from the development of this plant.

In this context the necessity of intergovernmental agreements on industrial location is stressed by S. Dell as follows:[3/]

> "Two main arguments have been advanced against any programme of intergovernmental agreements on the distribution of industry; that it would interfere with the optimum location of industry, and that it would encourage monopoly.
>
> On the one hand, it is contended that strictly industrial considerations based on the principle of comparative advantage would cause new factories to be located in regions providing the best combination of transport and power facilities, trained labour and ample raw materials and intermediate products. The licensing of industry approach, on the other hand, would retard industrial efficiency insofar as new plants had to be located in countries or areas that were less suitable than the best sites available.
>
> The weakness of this argument lies in the static concept of the principle of comparative advantage that is implied. If, indeed, this static point of view were pressed to its logical conclusion, one would have to say that most of the new plants probably should not be placed anywhere in the less developed areas, but rather in North America or Western Europe. If, on the other hand, the principle of comparative advantage is reinterpreted within a dynamic framework, there is every reason to expect that even those countries that are industrially least developed at the present time will be operating viable industries in the long run.

1/ The money income of the "median" African country is probably less than that of an English towe of 100,000 inhabitants - A.J. Brown - Should African countries form economic unions - p. 180 in the Volume - Economic Development in Africa.

2/ Compare: W.T. Newlyn, Gains and Losses in the East African Common Market, Yorkshire Bulletin of Economic and Social Research - November 1965, p. 133

3/ S. Dell, "Regional Integration and the Industrialization of Less-Developed Countries", Development Digest, Vol. III, No. 3, October 1965, p. 42.

"It is also apparent that concentration of new industries in only one or two countries of a regional grouping would quickly cause the grouping to break up for lack of any incentive to the less-favoured countries to stay in. In the case of Central America, for example, there is no reason why Honduras should agree to import manufactured goods from El Salvador or Guatemala at prices higher than those at which it could buy them from the United States, unless El Salvador and Guatemala are, in turn, prepared to take manufactures from Honduras. Industrial development is just as indispensable an ingredient in the solution of the economic problems of Honduras as it is in the advancement of El Salvador and Guatemala. The same considerations have prompted Tanganyika and Uganda to ensure that they obtain their fair share in the overall industrial development of the East African Common Market, where free market forces operating without restraint would tend to locate most industry in Kenya."

Thus, in the case of industrial location in the framework of such arrangements as the Central American[1/] and East African Common Market, two interrelated issues are very important: primo, the proper allocation of new locations based on a common market among the member countries - secondo, the establishment of institutions which would promote the proper distribution of advantages derived from these industrial locations.

From the point of view of economic research in this field we have a valuable starting point in the model designed by A.J. Brown[2/] and developed by W.T. Newlyn.[3/] Another important contribution in this field we find in a recent study of the Research and Planning Division of the Economic Commission for Asia and the Far East.[4/]

When looking at the problem of industrial location and economic integration on a continental scale, especially in the case of Latin America, a second important topic for consideration arises. This is the trend set up by the sectoral forces towards a development in the first place of relations between the core areas of the member countries, while considering as less important the growing disparity of the levels of economic development between the core areas in the respective countries and their huge peripheries.

1/ Compare the Study: Central America: Industrial Policy Problems, p. 117-130. Economic Bulletin for Latin America, March 1964. Economic Community for Latin America, Santiago, Chile.

2/ A.J. Brown, "Economic Separation versus a Common Market in Developing Countries", Yorkshire Bulletin of Economic and Social Research, May 1961 and November 1961.

3/ W.T. Newlyn, op. cit.

4/ "A Model for International Harmonization of Development Plans", Research and Planning Division, Economic Commission for Asia and the Far East, United Nations 1966.

This problem is presented by P.R. Odell[1] in the following way:

"This paper has attempted to demonstrate that the moves toward Latin American economic integration do have some possible adverse consequences. The protagonists of integration have not, it would seem, examined the spatial consequences: this is hardly a surprising phenomenon in light of the fact that the prime motivators have been economists who - as a professional group - are not orientated to think in spatial terms (although there are, of course, some notable exceptions to this general rule). Were they to think spatially, they might argue that the stimulus to economic growth produced by integration will be so great that the limited industrial "core" areas will send out ever-strengthening ripples of "spillover" of "spread" effects to the less favoured regions which will thus be dragged up on the coat-tails of the core areas! But where is the evidence that this is likely to occur - the empirical evidence from most of Latin America to date - as well as from other parts of the world - suggests exactly the opposite: that, in fact, a developing area will - as it develops inevitably act as an increasingly powerful magnet drawing in population and capital from the remainder of the country and creating increasingly significant differentials in income levels between itself and the backward areas of the country. Ultimately, there is a danger that an integrated Latin America will become a series of inter-connected "core" areas feeding on and having close relations with each other. As an inevitable concomitant of this development each core area will be largely divorced from any effective and mutually beneficial contact with the remainder of the national territory within which it is situated."

This is a very important point presented, however, not without exaggeration. It is not professional bias, but the sequence of economic analysis and policy which have induced the protagonists of integration in Latin America to concentrate their attention in the first stage on the balanced development of regional economy, defined as the necessity to diminish the differences in the levels of economic development of different countries in Latin America, and not on the interregional differences inside each country.[2] Here we can see a parallel to the experience of the European Common Market where the interregional differences within the member countries were not a subject of concern in the first stages of development of this institution.

6. Comprehensive national economic programming and industrial location in developed and developing countries

The materials presented in this study lead to the conclusion that both in the developed and developing countries the problems of industrial location cannot be treated as an isolated phenomenon. These problems are deeply involved in the macro-economic

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1/ P.R. Odell, Latin American Economic Integration and the Location of Industrial Activities, a paper to be read to the Latin American Regional Conference of the International Geographical Union, Mexico, D.F., August 1966.

2/ A.B. Cortes, Crecimento economico de America Latina, Santiago de Chile 1960 - quoted from the Polish edition, Warsaw 1964, p. 234.

process of the sectoral and regional transformation of the national economy of a given country and of the relation of this economy to that of other countries. It appears, therefore, necessary to stress that both in the developed and in the developing countries comprehensive national programming should be recognized as the best framework for the macro-economic solutions of the problems of industrial location.

In the post-war period many authors and institutions devoted their attention to the methods of construction of long-run plans and programmes.[1/] The solutions proposed represented a high level of aggregation and did not recognize the regional dimension of national economic growth. In the last few years there have been a growing number of publications trying to eliminate this deficiency of long-run economic planning and programming.[2/]

1/ Compare M. Kalecki, Outline of a method of construction of a perspective plan, paper presented during the United Nations Conference on the Application of Science and Technology to the Developing Countries. Document C/Conf. 39/12. The approach of M. Kalecki is presented too in Economic Planning in Europe, Geneva 1965, Chapter II.

2/ Compare: V.S, Dadajan, A Model of Interregional Relationships of a Single System Optimum Plan of the Economy; T.A. Reiner, Sub-national and National Planning: Decision Criteria; both papers in Regional Science Association Papers, Vol. 14, 1965. K. Secomski: The Basic Problems of Perspective Planning, Warsaw 1966, L.R. Vagale, op. cit.

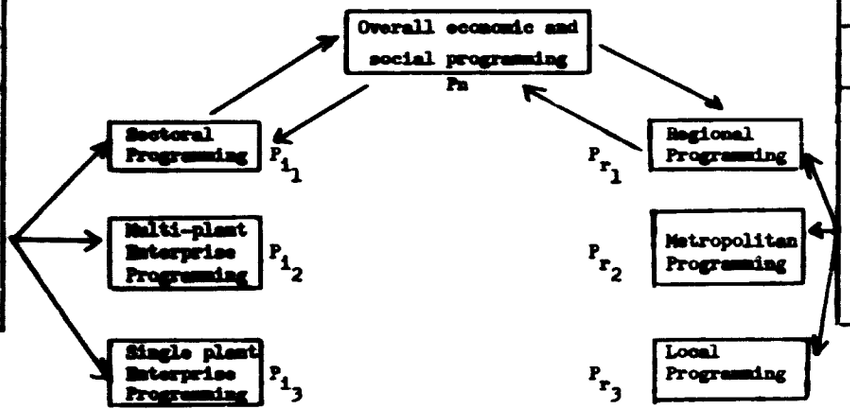
Criteria and levels of decisions in industrial location

Criteria applied in national programming

1. Maximisation of national rate of growth
2. Maximisation of per capita consumption
3. Optimisation of the inter-regional balance of National economy
4. Minimisation of inter-regional differences in the levels of per capita consumption

Criteria applied in industrial programming

Criteria	Branches	Factors of location
maximisation of profit or minimisation of costs	Metal Chemicals Food Timber etc.	input orientation output orientation Transport " Labour " External economies Physical space Natural endowment



Criteria applied in regional programming

Types of Region	Criteria
"Normal" Overcongested Depressed Under-developed	1. Maximisation of the rate of growth. 2. Maximisation of per capita consumption. 3. Optimisation of land use and infrastructure investment 4. Conservation of natural and historical values

SECTION VI

Conclusions and prospects

1. Introductory remarks

Directly or indirectly the problem of the criteria and levels of decisions in industrial location has been discussed in all sections of this study, but in no place has an attempt been made to consider it in a comprehensive way.

Such an attempt will be presented in Section VI. In the following paragraphs of this section the most important elements of Figure 11 will be analysed. This Figure was designed as a schematic outline for further discussions in this field.

2. Programming and decision units

There are three types of programming and decision units[1/] which can be involved in the process of industrial location: the national, the industrial and the regional units.

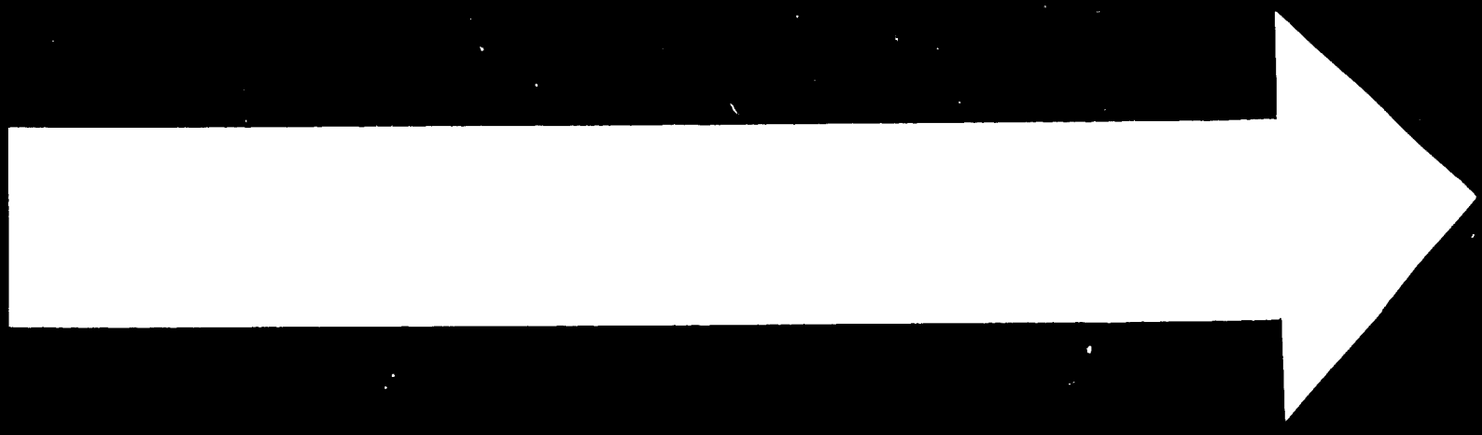
It is clear that not every location has to be analysed or decided by all seven units distinguished in the scheme. One can indicate three factors of differentiation in this field.

(a) the economic and political system of the given country, recognizing or not recognizing the necessity of the existence of a comprehensive set of institutions involved in the national, sectoral and regional programming activities. Here one should mention not only the difference between the centrally planned and market economies but also the differences among Western countries.[2/]

(b) the size and regional differentiation of the given country. It should be stressed that the relationship of national and regional programming units is different in countries of different size: a regional decision in a large country often corresponds to a national decision in a small one.

1/ In Section VI the simplified assumption is accepted that the programming units are at the same time units of decision and implementation. In reality these functions are very often divided. However, this simplifying assumption does not destroy the validity of the arguments of Section VI.

2/ Compare chapters III and V in Economic Planning in Europe, Part 2 Economic Survey of Europe 1962, Geneva 1965.



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[illegible] creates [illegible] there the problem [illegible] overcongested [illegible] to a certain extent can be explained as a result [illegible] inconsistent over estimation [illegible] external economies [illegible] enterprises and inconsistent underestimation [illegible] carrying capacity of infra-structure investment in an overcongested area. The experience of Western countries in this field is compared and especially that of France,[1] the United Kingdom,[2] the Netherlands,[3] Hungary,[4] and Poland,[5] some general observations and conclusions can be put forward.

The first conclusion is that the solution of the problem of overcongested areas is extremely difficult and can be achieved only within the framework of a long-term and comprehensive set of economic and social policies designed on a national scale.

It is, at present, impossible to limit research and planning activity to the regional scale and see only the relation of the overcongested core areas of Paris or London to the surrounding region of Northern France or South-east England respectively. The national approach means that account should also be taken of the problem of relatively overcongested Northern France in relation to relatively under-developed Southern France, or the problem of South-east England versus the rest of the country.

There is no doubt that both in Great Britain[6] and in France[7] the national approach to the problem of overcongested areas is prevailing at the present time. When, however, the consequences of the policies of the past are analysed, it appears that these policies were more effective on the regional than on the national scale. In other words, it was easier to bring about a change in the relation of Paris to Northern France and that of London to South-east England, than the relation Northern to Southern France, or South-east England to the rest of the country.

1/ P. George. Nécessités et difficultés d'une décentralisation industrielle. (Needs for industrial decentralisation and its difficulties). France Annales de Geographie no. 1, 1961.

2/ Regional Economic Development in the United Kingdom. A paper prepared for the Third Meeting of Senior Economic Advisers, Geneva 1964.

3/ Physical Planning as a means of balanced development in the Netherlands. A paper prepared for the Third Meeting of Senior Economic Advisers, Geneva 1964.

4/ The excessive agglomeration of Industry and Population in Budapest: a problem of regional economic planning. A paper prepared for the Third Meeting of Senior Economic Advisers, Geneva 1964.

5/ S. Leszczycki - Concentration and decentralisation of industry in Poland. Geographia Polonica 7, Warsaw 1965.

6/ Regional Economic Development in the UK, op.cit.

7/ O. Guichard - Aménager la France, Paris 1965.

An empirical support to this conclusion is supplied by the cartographical inventory of the results of industrial decentralisation (see Figure 4).

Figure 4 illustrates the distribution of new industrial jobs created within the framework of the decentralisation activities of the Region of Paris in the years 1949-1963.

A more comprehensive evaluation of the problem of industrial expansion of the Parisian region is possible through the analysis of Figure 5, indicating the changes in the distribution of the manufacturing industries in France in the years 1906-1954.1/

Two conclusions emerge from this analysis:

(a) the growing share of the Parisian region in the country's industrial employment.

(b) the change in the relative rates of expansion of the core and of the fringe of the region. In the years 1906-1926 the core was growing quicker than the fringe, in the years 1926-1954 the fringe was growing quicker than the core, where the rate of growth was lower than the national average.

A map covering the period of the next 28 years (1954-1982) would probably indicate that the rate of industrial expansion of the whole Parisian Region was lower than the national average and that the region's share in the country's industrial employment was shrinking.

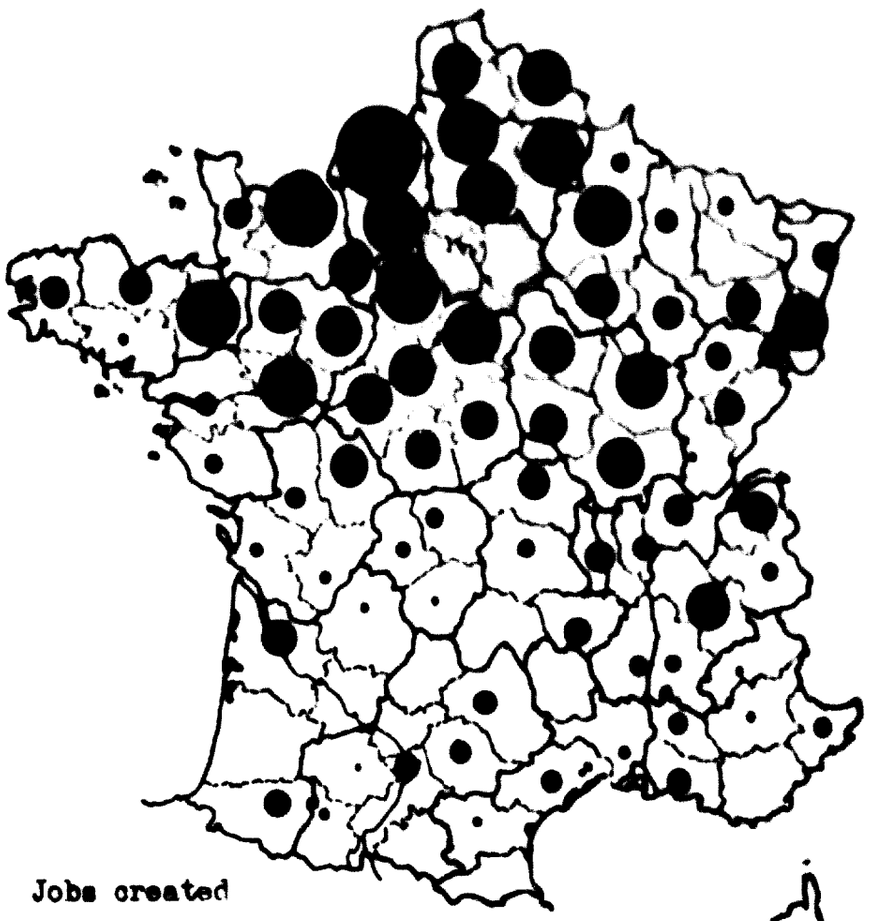
Analysis of the relative rates of growth of different regions in different periods is an important tool in the evaluation of the results of different economic and social policies as applied to the solution of the problem of over-congested and under-developed regions. Nevertheless, a comprehensive evaluation of the spatial differentiation of industrial growth should take into account not only the rate but also the volume of growth. In the analysis of Polish experience during the years 1946-1960, three types of industrial development may be distinguished from this point of view:2/

1/ Compare: F. Coront-Ducluseau - La formation de l'espace économique national Paris 1964.

2/ A. Kuklinski, op.cit.

Fig 4

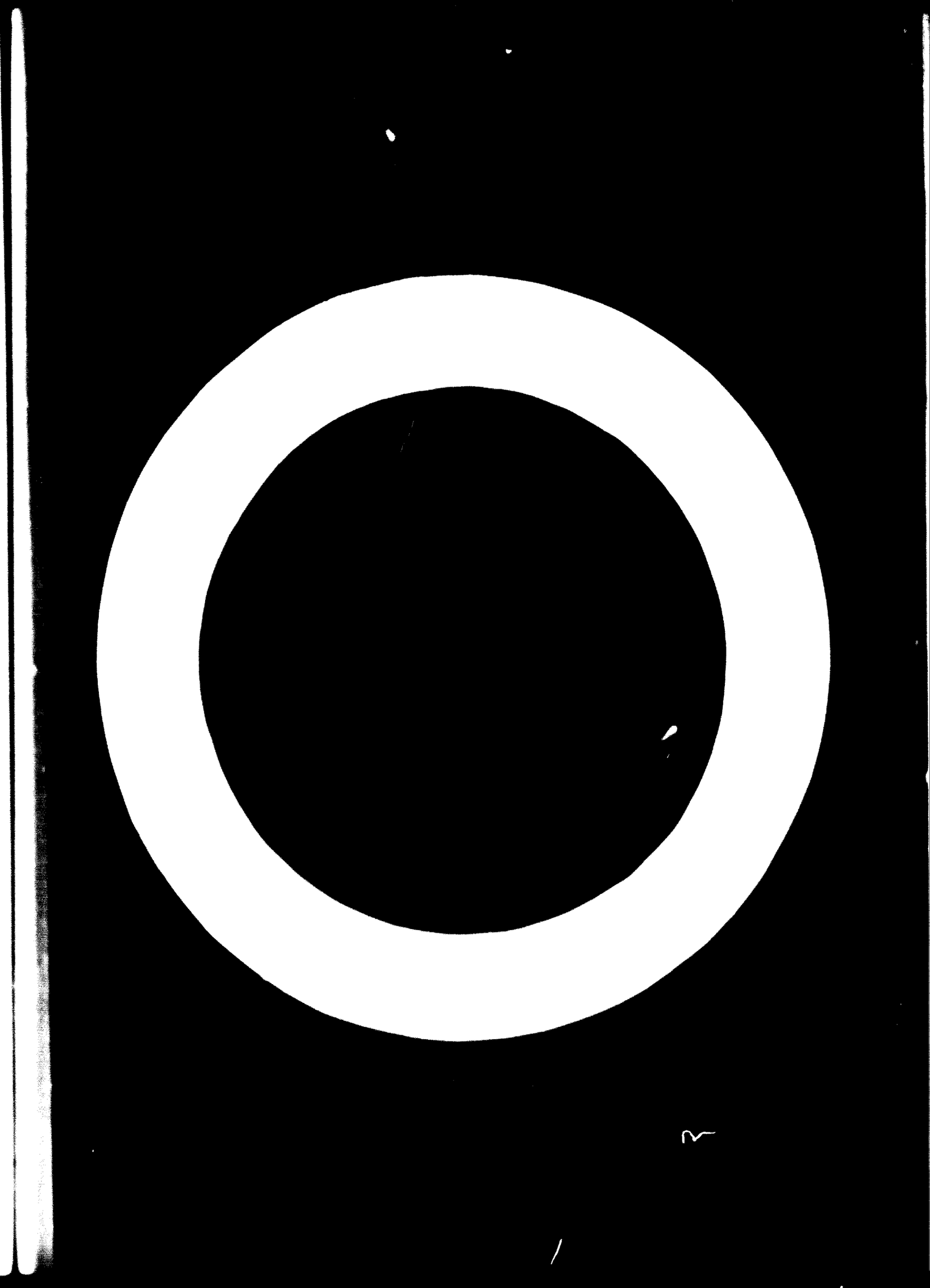
The results of industrial decentralisation in France in the years [illegible]



Jobs created

- over 10,000
- over 4,000 but not over 10,000
- over 1,000 but not over 4,000
- over 100 but not over 1,000

Source: O. Guichard, Aménager La France, Paris 1965, p.81



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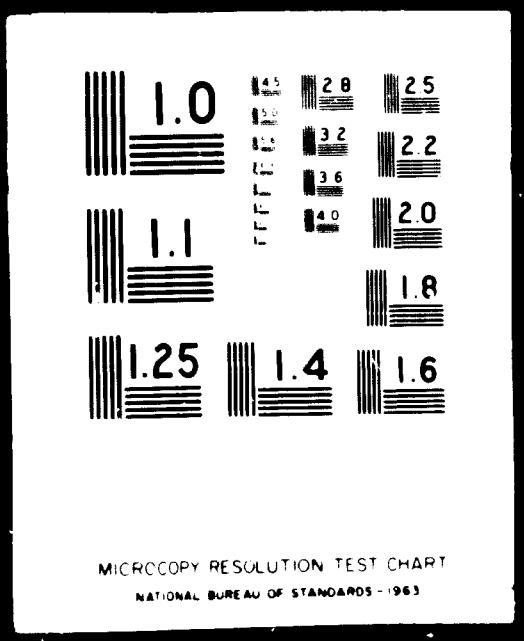
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963

With the growing importance of social factors in industrial location,[1] the validity of sociological studies in this field has also to be remembered. Industrial sociology is one of the most rapidly growing social sciences presenting new approaches in the field of industrial location.[2] Especially interesting are the sociological studies analysing the social consequences of industrial location implemented in regions representing different complexes of social conditions and relations.[3]

Ideas derived from these studies might well be valid for the formulation and implementation of locational policies in developing countries. There is no doubt that the interchange of the experiences of different disciplines in the field of industrial location is important for the solution of the problems involved.

However an interdisciplinary approach means much more than the interchange of experience. It means the study of the same problem at the same time, and perhaps in the same place by a team of scholars representing different disciplines. The promotion of such studies in the field of industrial location is most necessary.

Stressing the role of social sciences in the solution of the problem of industrial location, one should not underestimate the basic contribution of technological sciences - especially in the forecasting of the locational implementation of technical progress.

In the development of co-operation among different disciplines for the solution of the problem of industrial location, the application of quantitative methods is a very effective tool. These methods improve not only the channels of interdisciplinary communication but also facilitate the practical implementation of the results of the research activity.

1/ Compare: J. Drownowski - Social and Economic Factors in Development - Report No.3, UN Research Institute for Social Development, Geneva 1966.

2/ Compare: S. Florence. Economics and Sociology of Industry. London 1964.
J. Szczepański. The Present State of Sociological Investigations on the Social Processes of Industrialization. "Sociological Studies" 1964, no. 3/14/, pp. 5-50.
A. Touraine. Sociologie de l'action. Paris 1965.
Sociology in USRR, vol. II, Moskow 1966.

3/ Compare the results of a research project promoted by the European Co-ordination Centre for Research and Documentation in Social Sciences in Vienna.

In any generalizations relating to the development of quantitative methods and models as applied to industrial location[1] it might perhaps be said that the most important achievements are in two fields: primo, in the selection of the optimal location of an individual plant or groups of plants, and secondo, in the development of models of industrial growth of different regions or countries. The first type of model is in most cases associated with the application of micro-economic criteria and the second with macro-economic ones.

The basic difficulty consists in the development of a model which would facilitate the process of the proper selection of industrial location in which an integrated set of macro- and micro-economic criteria is applied.[2]

Concluding the final remarks of this study, one should emphasize the need to develop international discussion on the future trends of research in the field of industrial location.[3]

1/ Compare: S. Leszczycki. A Few Remarks on Economic Geography in Connection with the Conference in Osieczna. "Polish Geographical Review", vol. XXVIII, 1956, no. 3, pp. 464-486.
J. Rudziński. The progress of studies of Industrial Location Abroad and Directions of Research in Poland. "Polish Geographical Review", vol. XXVIII, 1956, no. 3, pp.505-532.
P. N. Stiepanow, "Geografiya promyshlennosti SSSR, Moscow 1955.
E. Otremba. Allgemaine Agrar- und Industriegeographie. Stuttgart 1953.

2/ It is quite clear that even the best possible development of quantitative methods will not eliminate the basic role in the process of industrial location of judgments of experienced professionals, managers and politicians.

3/ Compare: United Nations Center for Industrial Development, Industrial Location, Regional Development and Related Subjects. A partially annotated Bibliography. Working Draft - April 1966. Sowjet Po Isuczeniju.
Proisweditelnych Sil. Bibljografija po waprossn Razaieszczenija i Rajonirowanija Promyszlennosti SSSR, Moskwa 1960. Bibliographie selective sur: La Politique Régionale Européenne Communautes Européennes, Bruxelles 1966.

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(c) the size and market interrelations of the plant which is the object of the locational decision. There is a basic difference between the decisions concerning the location of a big plant serving international markets and a small plant serving local markets. Table 18 presents an inventory of possible situations when we assume the differentiation in the size of the country and the size of the plant.

TABLE 18

The size of the plant	Size of country			Type of market served by the plant
	small	medium	big	
Small	1	5	9	local
	2	6	10	regional
	3	7	11	national
	4	8	12	international
Medium	13	17	21	local
	14	18	22	regional
	15	19	23	national
	16	20	24	international
Big	25	29	33	local
	26	30	34	regional
	27	31	35	national
	28	32	36	international

Using the framework established in Figure 11 and Table 18, the question can be put: what decision units will be involved in the process of location when a new cement plant is built in the United States and in Poland?

The location of a new cement plant in the United States corresponds to situation 22 in Table 18. Let us assume that we are discussing the construction of the cement mill in Albuquerque, New Mexico[1] by the Ideal Cement Company which manages about 20 cement mills located in the western and south western regions of the United States. In this case the following programming units would be involved in the locational process. The headquarters of the Company in Denver ($^{P}i_{2}$), the Office of Industrial Development of the State of New Mexico ($^{P}i_{1}$), and the Local Authorities in Albuquerque ($^{P}r_{3}$).

1/ Production capacity about 400,000 tons per year.

The location of a new cement plant in Poland corresponds to situation 31 in Table 18. Let us assume that we are discussing the construction of the Nowiny[1] cement mill. In the process of this locational decision the following planning units would be involved.

1. The association of Cement Industry in Sosnowiec (P_{i_2}).
2. The Ministry of Building Materials Industry and Construction in Warsaw (P_{i_1}).
3. The Authorities of the Province of Kielce including the Regional Planning Office (P_{r_1}).
4. The Local Authorities of the County of Kielce (P_{r_2}).
5. The National Planning Commission in Warsaw (Pn).

These two cases are presented as examples of situations which can be interpreted in the framework of schemes adopted in Figure 11 and Table 18.

This identification is a necessary preliminary stage in the evaluation of the locational decision. Schemes proposed in Figure 11 and Table 18 are perhaps helpful in international comparisons in this field. The next step of the analysis is the evaluation of criteria applied by programming units of different types.

3. Criteria applied in industrial programming

The optimization of the performance of the enterprise, expressed via the maximization of profits or minimization of cost,[2] is recognized as the basic criterion of location in the framework of industrial programming, if this activity is implemented by P_{i_2} or P_{i_3} units.

The elements which should be taken into account in the computation of locational advantages and disadvantages, are different in different branches of industry. The technological and economic peculiarities of the given branch of industry are reflected in the difference in the relative importance of different factors of location. This is why in Figure 11 the column of branches is introduced between the column of criteria and the column of factors.

Let us now consider the application of the micro-criterion by the programming units of different levels. The most simple situation exists in the case of P_{i_3} unit. The locational problem of the single plant enterprise was analyzed rather thoroughly in the classical theory of location. The possibilities of progress in this field are limited.

1/ Production capacity about 1,000,000 tons per year.
2/ at a given level of production.

The location decisions faced by P_{i_2} units are much more complicated. In this case the location of new capacity must be related to the location of the existing plants. The evaluation of this locational decision must take into account not only the performance of the new capacity, but also the influence of this performance on the total activity of the multi-plant enterprise.

The role of P_{i_1} units in the process of locational decisions is very important, especially in the centrally planned economies.[1] These units, contrary to the practice of P_{i_2} and P_{i_3} units, apply, or should apply, not only the micro-economic but also the macro-economic criteria. In locational decisions the P_{i_1} units should take into account not only the "sectoral" efficiency of the given location but also the influence of this location on the interregional balance of the national economy.

4. Criteria applied in national programming

The analysis of the long-run economic policies of the ECE countries would probably justify the statement that the macro-criteria listed in Figure 11 are applied, or at least recognized, in almost all countries. The international differences in this field are expressed in the relative importance of the criteria distinguished in different countries, in the methods of their implementation[2] and in the results obtained.

The first two criteria are applied in the decisions concerning the growth of the national economy as a whole of the given country. Both criteria are made subject to certain constraints.[3]

1/ However, in some cases in the Western countries as well, the P_{i_1} units have a very important or even decisive role in the process of locational decisions. A very good example is supplied by Electricité de France in the field of long range programming of the location of electric power plants. Compare Investment 85 - Model of Electricité de France - Case Study submitted by France to the Fourth Meeting of Senior Economic Advisers, Geneva, June 1966.

2/ The different instruments of regional policy and planning in the ECE countries are discussed in the Study, Problems of Regional Planning and Development in Europe and in the United States, ECE Economic Bulletin for Europe, November 1965; compare, too, the papers of J. Paelinck, J. Boudeville, L. Davin and F. Lanckweirt, Efficacité des Mesures de Politique Economique Régionale, Colloque annual de l'Association de Science Régionale de Langue Française, Namur, September 1966.

3/ Perhaps the most important one is the balance of payment constraint.

But in general it can be said that in the first criterion the production aspect of economic growth is expressed, and in the second, the welfare aspect.

In the analysis of the interrelationships of these two criteria the time horizon is very important. Especially in short-run programming the application of these two criteria may lead to conflicting results. There are even proposals to interpret this conflict between the maximization of investment and maximization of consumption in the framework of the theory of games.[1]

The recognition of the fact that regional economic development in a given country is an important macro-economic problem led to the formulation of two additional macro-criteria which are applied in national policies.

The third criterion listed in Figure 11 has grown out of the negative experiences of different countries in the field of underdeveloped or depressed regions. In this context not only were the economic factors considered, but also the social consequences of such phenomena as rapid depopulation of some regions and overcongestion of others. In many countries this last problem was discussed from the point of view of national security. All these considerations led to the formulation of the notion of the interregional balance of national economy. It remains open to discussion as to whether this is a separate criterion of national policy or only a constraint which should be introduced in the application of the first criterion (maximisation of national rate of growth).

The fourth criterion - the minimization of interregional differences in the levels of per capita consumption - is both a criterion of social and of economic policy. Here too it may be asked whether this is a separate criterion or only a constraint which should be introduced in the application of the second criterion (maximisation of per capita consumption in national scale).

The problem of interregional differences in the levels of per capita consumption is in most cases discussed jointly with the evaluation of the scale and direction of interregional migration. The interregional consumption differentials are one of the

1. V. S. Dedayan - A Model of Interregional Relationships in a Single System Optimum Plan of the Economy - Regional Science Association Paper XIV. Ghent Congress 1964. Compare also: J. Svennilson - Planning in a Market Economy, Weltwirtschaftliches Archiv, Heft 2, 1965. H. Giersch, The Economics of Regional Policy, German Economic Review, No. 1, 1965.

very important factors generating interregional migration, which in turn tends to reduce the interregional consumption differentials but at the same time increases the differences in the density of economic activity (over-concentration and depopulation).1/

Therefore, the application of the third and fourth macro-criteria in national economic policy indirectly involves a set of attitudes and approaches to the problem of interregional migration.

There is no doubt that the location of industrial plants, especially of large size, is one of the very important tools in the implementation of national economic policies, as expressed by criterion No. 3 and 4. Therefore, the planning and programming units of Pn type, in a growing number of countries, are trying to find a proper solution in the application of macro-criteria to the problem of industrial location. In this way the Pn units act, or should act, as arbiters in the conflict of sectoral and regional approaches to industrial location.2/

5. Criteria applied in regional programming

It is true that the Pr units think in aggregative terms and use the basic notions applied in national economic policy (income, investment, consumption and so on). But these notions are applied to a regional economy and not to a national economy. In other words there exists a difference in scale and a difference in the external economic relations of the given areal unit.3/

Therefore the point of view of many regional planners - that their arguments represent the macro-criteria of national economic policy - cannot be accepted.

We know that the sum of regional plans does not create the national plan for a given country. It is clear that the accepted average rate of economic growth for a given country must include regional rates of growth, which for some regions are above and for some others below the national average. The decision on the interregional

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1/ Compare: A. Kuklinski - Criteria of the Comparative Assessment of Economic Levels of Different Regions. Paper submitted by Poland to the III Meeting of Senior Economic Advisers, Geneva 1964. A. Beltramone: La Mobilité Géographique de la population. G. Villars, Paris 1966. ILO - International Differences Affecting Labour Mobility - A study of Inter-Industry, Occupational and Geographical Mobility in Selected Countries of western Europe, Geneva 1965.

2/ Compare Section III.6 of this study.

3/ Among others, there is no balance of payments constraint in regional policies.

differentiation of the national rate of economic growth is a typical macro-economic decision reached at the central level of the Pn type units.[1/] In such conditions it is better to say that the criteria of regional programming represent an intermediary type between the micro- and macro-criteria.

The second characteristic feature of regional programming is expressed by the fact that, in different types of regions, different criteria are applied or there exists a difference in ranking of the importance of the criteria presented in Figure 11.

It is worth stressing that in the explanation of the difference in the application of a set of criteria in regional programming, the type of region is more important than the level of programming unit ($^{P}r_1$, $^{P}r_2$, or $^{P}r_3$).

Let us consider, therefore, what criteria are applied to industrial location by regional programming units representing normal, overcongested, depressed and underdeveloped regions. The characteristic features of overcongested, underdeveloped and depressed regions were analyzed in Section III of this study. Here we present an attempt to define a normal region which cannot be classified as overcongested.

In the case of a "normal" region - which cannot be classified as overcongested, depressed or underdeveloped - there is no necessity to design a special economic policy in order to solve special problems. Generally the regional programming units in a normal region are most anxious to attract the location of new plants.

Industrial development is recognized as one of the most effective ways in the maximization of regional rates of economic growth and in the maximization of per capita consumption.[2/] In practical discussion the application of these two criteria is expressed in most cases as the preference for the creation of new industrial jobs in a given region.

These preferences can be interpreted in both quantitative and qualitative terms. Not only is the quantity of new jobs created valid, but also the quality as a way to attract into the region the specialists representing very high levels of technical or managerial abilities.

1/ The regional rates of growth are determined mainly via the interregional allocation of investment. This is the field where interregional competition and interregional conflicts are manifested most clearly. In the discussion of this problem the time lag between the allocation of investment and the interregional change in the rates of growth should not be overlooked. We can imagine a situation where the allocation of investment in the underdeveloped regions of a given country causes, in the first stage, ar acceleration in the rate of growth of the developed regions, which supply the machines and other capital goods needed by the underdeveloped regions.

2/ The application of these two criteria can lead to conflicting results especially in short-run considerations.

However the regional programming units - in normal regions - will not try to attract new industrial location at any price. Each new industrial location is evaluated via the application of criteria 3 and 4, which to a certain extent could be regarded as constraints in the application of the first two criteria.

This means that the regional programming units accept new location only where it is not harmful to the implementation of land use and infrastructure investment programmes which are recognized as optimal at a given time.[1/] For example, the regional programming unit will not approve the location of a new plant in an area which should be developed as a place for recreation. Similarly, the regional programming units will reject a proposal of a new location which will destroy unique natural or historical objects.

The programming units of depressed or underdeveloped regions are less anxious to apply these restrictive criteria to proposed new industrial location. These programming units, very often overwhelmed by short-run considerations, are willing to pay a very high price for new industrial locations. In the long run this is not a good policy, since sometimes the industrial development of an underdeveloped region is a less optimal solution than the adaptation of this region to the growing demands of national or international tourism.

In the approach of regional programming units of overcongested regions to industrial location, the restrictive elements are most important. All kinds of measures are applied in order to prevent new industrial location in such areas. This negative attitude is generally expressed in the application of the third criterion, stressing that a new industrial location in an overcongested region will contribute towards further deterioration of the land use pattern and acute problems of infra-structure investment.

6. Final remarks

Two interrelated problems constitute the key issues of this study. The first is the emergence and growing importance of macro-criteria,[2/] and the second is the basic change in the structure and mechanism of the decision making process in the field of industrial location.

1/ There are also other considerations which should be mentioned here and especially the problem of the proper balance of manpower.

2/ Compare: Mihailovic, K, "Regionalni Aspekt Privrednog Razvoja", Ekonomist, No. 1, 1962. (English translation in Eastern European Economics, Fall-Winter 1964).

The simple classical situation of the XIX century - one decision making unit applying one micro-criterion - is no longer valid. In contemporary economic and social conditions[1] the locational decision is the result of a multi-stage and comprehensive process.

In this new situation a major practical and theoretical problem is emerging: how to improve the structure and mechanism of this process in order to supply optimal locational decisions in a limited amount of time. Since this is a comprehensive problem, the interdisciplinary approach should be the basic feature of research activity in this field. This research could develop the contributions of different disciplines and especially of economic, geographical, sociological and technoligical sciences.

First of all the basic change in the scope of economics as a research discipline has to be noted. In the last decades the relatively unimportant problem of locational analysis has been developed into a new specialized field of economic research which is defined as spatial or regional economics.[2] This change created new perspectives for the solutions of the problems of industrial location in the framework of national and regional economic development.[3]

In this context, the contributions of economic geography and sociology should be emphasized. A new field of geographical research called industrial geography has been developed in the past decade.[4] A suggestion has recently been discussed to create a special commission on industrial location and development within the framework of the activities of the International Geographical Union.

1/ We do not overlook the important differences in this field between the countries of centrally planned and the countries of market economies.

2/ Compare: remarks on the character and content of regional economies in: Problems of Regional Economic Planning and Development in Europe and the United States. ECE - Economic Bulletin for Europe, November 1965, p.3.

3/ Compare Resources for the Future, Staff Study - Design for a Worldwide Study of Regional Development - A report to the United Nations on a Proposed Research Training Programme, Washington DC, 1966.

4/ Compare: W. S. Niemcynow. Ekonomiko-matematiceskije metody i modeli. Moskwa 1965.
W. Isard. Methods of Regional Analysis, NY, 1960.
A. Gosh. Efficiency in location and interregional flows - Indian cement industry during the five year plans, 1950-1959. Amsterdam 1965. Contributions to Economic Analysis, No.34.