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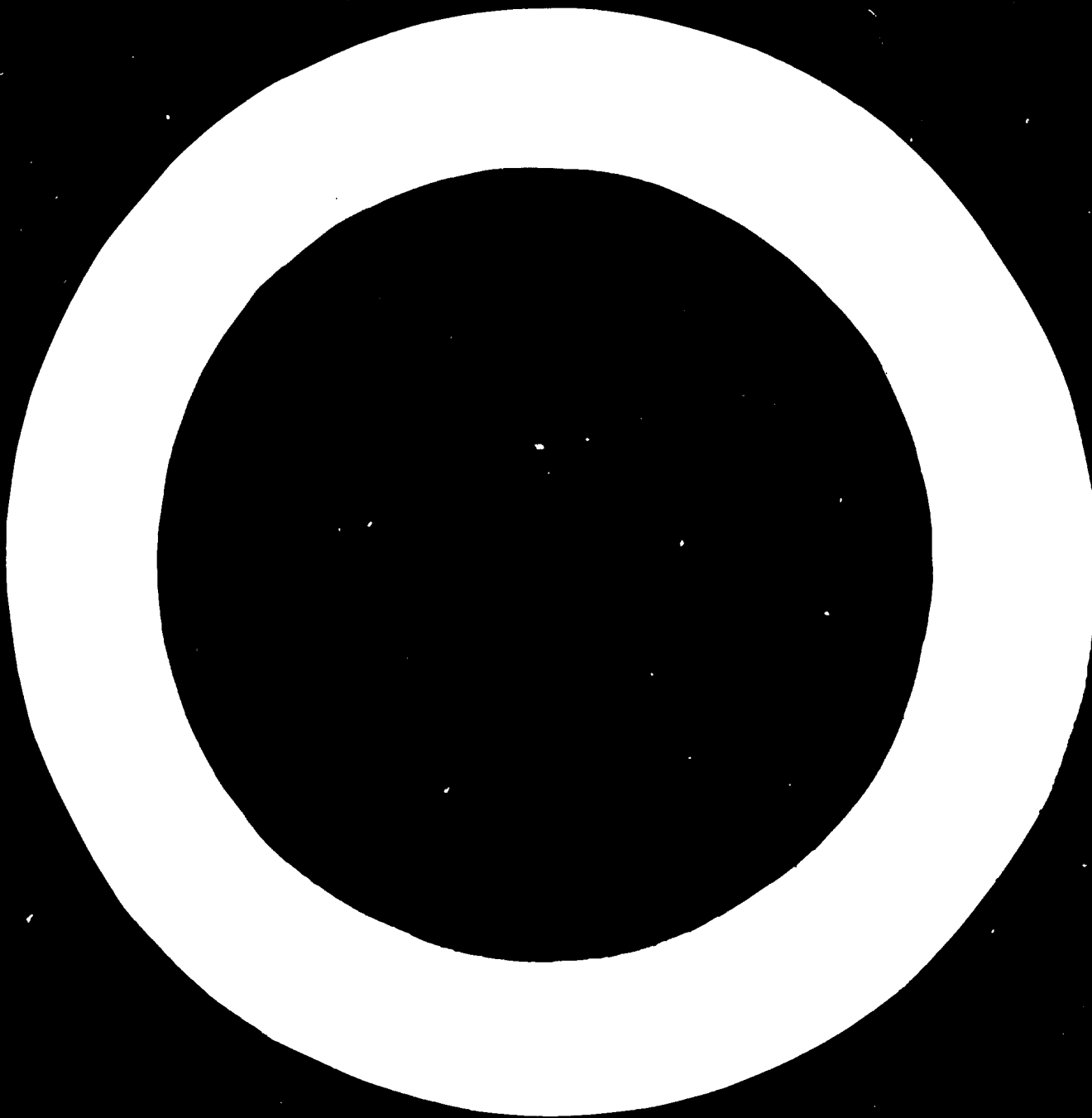

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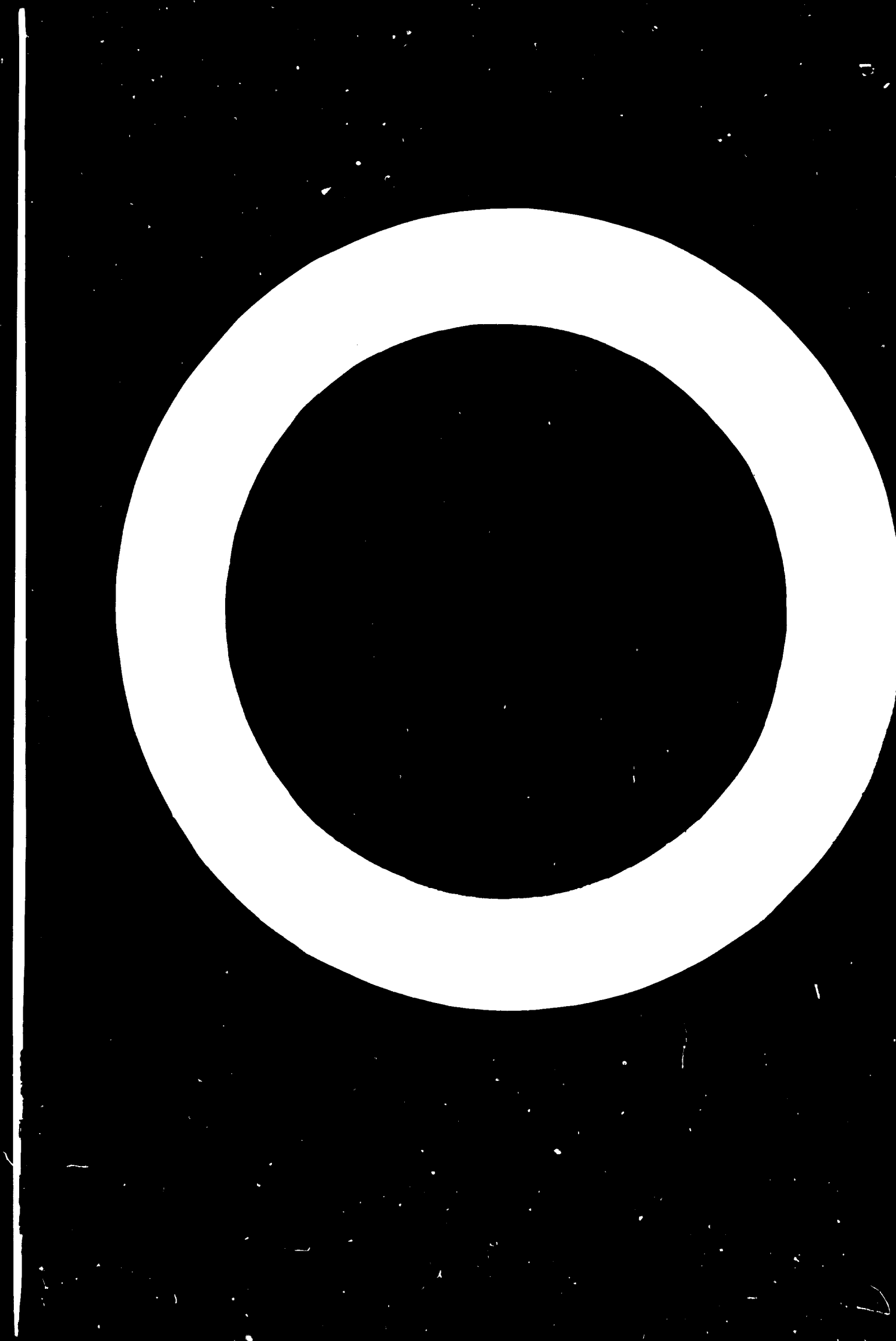

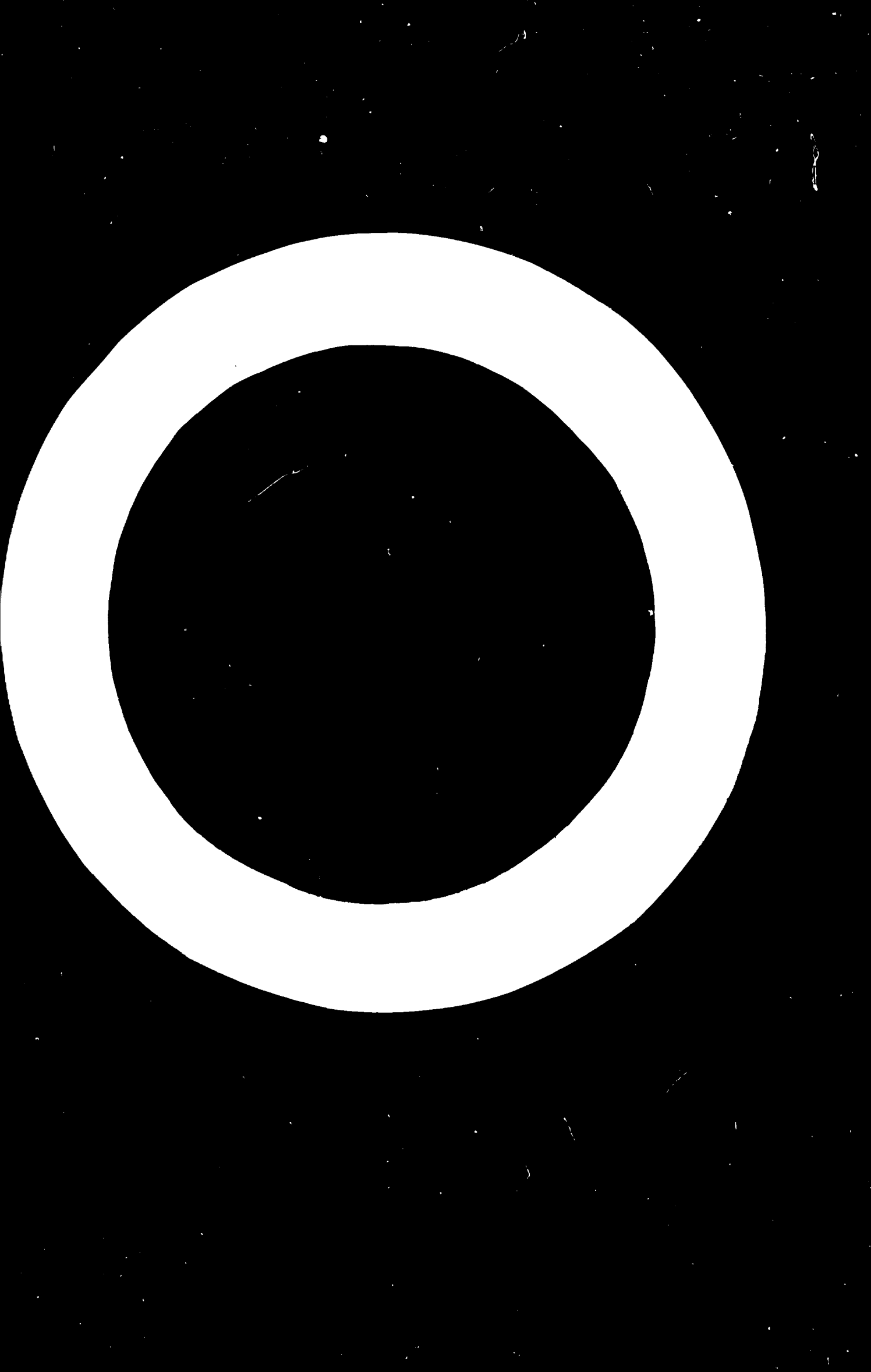

In this issue

Cover illustrations:
Top: The Acropolis, Athens
Below: Ceremonial transfer of "Panteics" conference building to the UN for the duration of the UNIDO Symposium.

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Preface

THE PRESENT ISSUE of the *Industrialization and Productivity Bulletin* focuses attention, as did the previous issue, on major problems encountered by the developing countries in carrying out programmes of industrialization, as assessed in technical studies and papers submitted to the International Symposium on Industrial Development held in Athens, Greece, from 29 November to 19 December 1967.

Complementing the seven technical studies contained in Bulletin No. 13, which reviewed major policy and operational aspects of industrial development discussed in the Symposium, the seven studies included in this issue of the Bulletin bear also on the industrialization process and its requisites, which the Symposium examined and on which recommendations were made. The selection of these seven articles was made with a view to balanced subject presentation. Bulletins No. 13 and No. 14 together represent a good cross section of the economic and social requirements for accelerating industrial development and industrial growth in the developing countries, viewed on a global basis. The principal issues facing the developing countries in the achievement of industrial growth are analysed in these articles, which offer also an appraisal of possible action.

The introductory article, "The Role of the Industrial Sector in Economic Development", examines the nature and scope of the industrial structural changes associated with or brought about by economic growth and attempts to assess the contribution of industry to economic growth. A better understanding of the role of industry can be especially useful to policy officials responsible for economic planning and economic projection in countries in various stages of economic development.

The article on "The Need for an Export-Oriented Pattern of Industrialization" examines the traditional pattern of industrial growth in the developing countries where industrial development was predominantly oriented towards the domestic market and policy actions were formulated accordingly. The limitations of such a policy are critically examined and stress is laid on a recommended strategy of stimulating the growth of industry through an export-oriented basis of development.

The study prepared by the World Bank reviews the experience of the World Bank Group in rendering technical and financial assistance with regard to the creation or expansion of Development Finance Companies in the Group's member countries. The pattern of this assistance has included equity investment by the International Finance Corporation, loan funds from the World Bank, technical assistance in connexion with the expansion or re-organization of existing development finance companies and the establishment of new ones, and staff training.

The article on skill requirements for industrialization prepared by the International Labour Organisation, discusses the national and international actions required to determine the need for various skills in connexion with industrial development in low-income countries, and analyses the methods to be followed and the type of data that should be developed as a basis for making public decisions regarding the provision of the necessary industrial skills.

The article on the fertilizer industry is devoted to a broad examination of world fertilizer consumption and production and the significance of this industry for the developing countries. Projections are made concerning the future consumption of fertilizer; cost data are presented on the building of new fertilizer production plants; targets of consumption are indicated; and recommendations are made to developing countries concerning the establishment of fertilizer production. The close links between agriculture and the manufacturing industry entailed in fertilizer production make this an integral part of industry and agriculture, an industry meriting high consideration by the developing countries.

The article "Policies and Programmes for the Development of Small-Scale Industry" examines both the role of small-scale industry and its place in the over-all industrial framework. It examines especially the role of small-scale industry in a developing country and suggests the types of production that lend themselves to small-scale industry.

The final article, "Export Marketing Organizations", examines the nature of the problems confronting the developing countries in selling their manufactured and semi-manufactured products in the export market and discusses the various categories of export marketing organizations which can serve the developing countries in overcoming these problems.

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The Role of the Industrial Sector in Economic Development

Introduction

During the period 1938—1961, the industrial production of the world tripled while the share of the industrial sector in the world gross domestic product rose from 30 per cent to 38 per cent. Furthermore:

> "The importance of the industrial sector in total production increased at the expense of the role of agriculture. The growth between 1938 and 1961 in the agricultural output of the market-economy countries of the world approximated a third of that in the domestic product, and a fourth of that in industrial output. The proportion of the domestic product contributed by agriculture during 1961 was, therefore, less than two-thirds of that during 1938."[1]

Changes in the relative importance of agriculture and industry are the core of the process of growth, and in industry it is the role of the manufacturing sector that appears to be the strategic factor in modern economic growth. The role of industry in economic development is of particular concern because of important economic policy considerations in countries on their way to industrialization. The interrelationship of changes in agriculture and industry and the importance of providing for an expanding population require that great care be taken in determining which area of development will contribute most to the economy as a whole.

The purpose of this paper is to present factual evidence of structural changes which take place during economic development and which may be employed in economic planning and projection in countries undergoing industrialization. A study was made of the pattern of quantitative change in the composition of output which accompanies economic growth. Research was undertaken in two steps: first an exploratory analysis was made; then regression equations were fitted to sectoral data.

An exploratory statistical analysis

A preliminary statistical analysis of the data available for 41 countries for 1958 was made in order to reveal the changes in the composition of the gross national product which characterize the complex growth process known as "industrialization".

Since *per capita* income is commonly accepted as a yardstick of economic development, it is logical to study industrial composition in relation to levels of *per capita* income.[2]

The gross domestic product (GDP) at factor cost was first disaggregated into eleven sectors according to their industrial origin, thus:

1. Agriculture, forestry, hunting and fishing;
2. Mining and quarrying;
3. Manufacturing;
4. Construction;
5. Electricity, gas and water;
6. Transportation, storage and communication;
7. Wholesale and retail trade;
8. Banking, insurance and real estate;
9. Ownership of dwellings;
10. Public administration and defence;
11. Services.

The proportion of GDP originating from each sector was considered for 1958. Since not all of the countries included in the sample have a uniform degree of disaggregation the sample size differs

[1] United Nations, *The Growth of World Industry, 1938 – 1961*, ST/STAT/SER.P/3, pp. 1 -2. Mining and public utilities are included with manufacturing in the industrial sector in this publication.

[2] The structure was related to the level of *per capita* income rather than to the rate of change of *per capita* income. The rate of change may be the relevant variable in the context of a dynamic process. However, in this cross-section analysis, the level of *per capita* income was used.

from sector to sector. For example, the agriculture sector has data for 41 countries, while the banking, insurance and real estate sector has been separately classified for only 31 countries. The first step in the analysis was to establish for each sector a frequency distribution based on *per capita* income, the data for which was obtained from the United Nations *Yearbook of National Accounts Statistics*, 1962. The next step was to compute the mean value of the percentages of *per capita* income in each group.

The results are presented in table 1 below. Table 2 presents the frequency distributions and their standard deviations and the coefficients of variation.

Table 1

THE PERCENTAGE COMPOSITION OF GDP AT FACTOR COST BY *per capita* INCOME GROUP, 1958[a]

(based on cross-section data for 41 countries)

	Per capita *income of the 41 countries*					
	Under $ 100	*$ 101–250*	*$ 251–500*	*$ 501–1,000*	*Over $ 1,000*	*All countries*
1. Agriculture	52.0	35.7	21.6	13.8	9.6	30.3
2. Mining and quarrying	1.1	2.1	3.8	2.1	3.1	2.4
3. Manufacturing	7.8	12.6	20.8	26.7	30.8	16.8
4. Construction	3.7	4.2	5.8	7.4	7.4	5.3
5. Electricity, gas and water	0.5	1.1	1.3	2.3	2.1	1.3
6. Transportation, storage and communications	4.2	5.9	7.2	6.9	7.2	6.5
7. Wholesale and retail trade	16.7	14.8	15.7	12.7	12.7	14.7
8. Banking, insurance and real estate	1.1	1.9	2.7	2.6	3.0	2.1
9. Ownership of dwellings	3.5	6.0	6.2	5.4	5.1	5.4
10. Public administration and defence	6.1	7.3	7.0	6.1	6.4	6.8
11. Services	5.8	9.0	8.5	6.7	11.5	8.4

[a] Values here and elsewhere in this paper are stated in US$.

Table 2

STANDARD DEVIATION AND COEFFICIENT[a] OF VARIATION OF THE PERCENTAGE DISTRIBUTION OF GDP BY LEVEL OF *per capita* INCOME, 1958

Number of countries in sample is shown in parentheses ( )

Per capita *income group (US dollars)*	*Agriculture*	*Mining and quarrying*	*Manufacturing*	*Construction*	*Electricity, gas and water*	*Transport, storage and communication*	*Wholesale and retail trade*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Under $100	52.0 (8)	1.1 (8)	7.8 (7)	3.7 (7)	0.5 (7)	4.2 (6)	16.7 (4)
$101 250	35.7(15)	2.1(14)	12.6(14)	4.2(13)	1.1(12)	5.9(13)	14.8(13)
$251 500	21.6 (8)	3.8 (8)	20.8 (8)	5.8 (8)	1.3 (8)	7.2 (8)	15.7 (8)
$501 1,000	13.8 (5)	2.1 (3)	26.7 (2)	7.4 (5)	2.3 (4)	6.9 (5)	12.7 (5)
Over $1,000	9.6 (5)	3.1 (5)	30.8 (5)	7.4 (5)	2.1 (5)	7.2 (4)	12.7 (4)
Total countries	— (41)	— (38)	— (36)	— (38)	— (36)	— (36)	— (34)
Mean percentage	30.3	2.37	16.8	5.3	1.3	6.5	14.7
Standard deviation	14.24	0.934	7.67	1.45	0.58	1.09	1.33
Coefficient of variation	47%	39%	46%	27%	45%	17%	9%
Significance[b]	***	**	***	**	***	*	n.s.

[a] Coefficient of variation 45% and over,
coefficient of variation 25% 44%,
coefficient of variation 10% 24%,
coefficient of variation less than 10%.

Principles underlying the statistical procedure

The objective of this analysis was limited to the empirical aspect of one of the facets of changes in the economic structure which accompany economic growth. The type of structural change that the study seeks to discover is a concomitant of economic growth and seems to be inherent in the growth process itself. It is, therefore, logical to attempt to relate the structure to some measure of economic growth.

The difficulties involved in "quantifying" economic growth need not be enumerated. It is sufficient to begin with *per capita* national income as perhaps the best available indicator of economic growth. In defining the structure in terms of the breakdown of national income by sectors of industrial origin, the fundamental problem is to relate this structure systematically to the *per capita* national income.

It is to be expected that not all of the countries within a given *per capita* income group will exhibit a uniform structure. At a given level of *per capita* income, a host of factors – both economic and non-economic – are responsible for dissimilarities in structure. Among the economic factors are: size of the country and the national resource endowment. Among the non-economic factors are: differences in the institutional set-up, the culture and political organization. (These dissimilarities may not be negligible.) As a first approximation, a study could be made of the structural differences among the various *per capita* incomes, leaving aside the structural variations within a particular *per capita* income group.

Some broad conclusions

The analysis of cross-section data shows a significant relationship between changes in the structure of output and the level of *per capita* income. The most significant structural change accompanying the increase in the level of *per capita* income is characterized by a decline in the share of agriculture and a rise in the share of manufacturing.

The share of mining and quarrying does not show a consistent pattern but increases as *per capita* income rises from levels of under $100 to a peak of $250 to $500, and declines thereafter until *per capita* income reaches about $1,000, at which point it begins to rise again although not to the level of the previous peak. The share of construction shows an upward trend.

The proportion of the transport, storage and communication sector in the total GDP probably shows an increase in the early stages of growth of *per capita* income and levels off at higher stages of income. The contribution of the electricity, gas and water sector shows a marked upward trend as the level of *per capita* income increases.

The rise in the share of the banking, insurance and real estate sector with *per capita* income is significant; it is faster at lower levels of income. The share probably tends to be stable at high income levels. The wholesale and retail trade sector shows a remarkable constancy of proportion.

Ownership of dwellings probably shows a perceptible increase as *per capita* income begins to increase from a low level. The proportion appears to reach a stable level at an early stage of growth of *per capita* income.

There is no significant trend in the share of public administration and defence. The services sector probably shows an upward trend with rising levels of *per capita* income.

Relative importance of sectors in structural change

The analysis of cross-section data on GDP has brought out the major structural characteristics relating to different levels of *per capita* income. The most significant difference in the structure was confined to the relative shares of agriculture and manufacturing. Significant trends in other sectors have also been noted.

The change in structure is the result of the differences in the relative rates of growth of sectors. There is a second dimension to this aspect of structural change, namely, the relative importance or weight that each sector holds in the aggregate product. The relative contribution of a sector to structural change is thus dependent not only on its rate of growth but also on its share in the economy.

Banking, insurance, real estate (8)	*Ownership of dwelling* (9)	*Public administration and defence* (10)	*Services* (11)
1.1 (7)	3.5 (7)	6.1 (7)	5.8 (5)
1.9(11)	6.0(14)	7.3(14)	9.0(12)
2.7 (5)	6.2 (6)	7.0 (8)	8.5 (7)
2.6 (4)	5.4 (4)	6.1 (5)	6.7 (4)
3.0 (4)	5.1 (4)	6.4 (4)	11.5 (4)
– (31)	– (35)	– (38)	– (32)
2.1	5.4	6.8	8.4
0.659	0.993	0.5216	1.66
31%	18%	8%	20%
**	*	n.s.	*

b *** Highly significant,
** significant,
* probably significant,
n.s. not significant.

Using the cross-section data, the average or "typical" structure of the GDP corresponding to each of the five groups of *per capita* income was arrived at earlier. These structures show a consistent pattern. There is a significant difference between the structures at any two levels of *per capita* income. Some sectors contribute more than others to this structural difference. The predominance of the agriculture and the manufacturing sectors in structural change is expected. The pattern seems to be stable enough to justify generalization. In interpreting the results, however, it is necessary to proceed with caution. Observations based on the empirical findings can be regarded at best as a hypothesis concerning the sequence of sectors in the process of growth.

Certain shifts occur in the relative contributions of sectors as the *per capita* income rises. In the early stages of growth, when the *per capita* income is at a low level, the most significant shift is found in the manufacturing sector. Once this shift has taken place, the second stage seems to indicate a significant response of the agriculture sector to structural change as well as a spurt in the activity of the wholesale and retail trade sector. In the final stage the services sector bears the brunt of structural change.

One might call the sectors which shift their relative contribution to structural change the "leading sectors" with reference to the appropriate stage of growth. On that basis, it becomes clear that there is a definite sequence in the expansion of sectors as the economy passes from one stage to the next.

In an interdisciplinary conference held in Geneva in 1965, the following opinion was voiced:

> "Faith in the viewpoint that agriculture and industry should develop hand in hand had been severely shaken by some research carried out in the United States in the last two or three years. These studies had pointed out that historically, in all countries from which evidence could be obtained, the agricultural take-off had invariably followed the industrial take-off and by a considerable period of time. It has not been argued, however, that all that was needed was to industrialize and agricultural development would inevitably follow, but there were indications that it was the accumulated scientific knowledge, accumulated industrial capital and materials, industrial processing of agricultural output, etc., which had provided the incentive to agricultural take-off."[3]

[3] M. Clawson, *The Strategy of Industrial Development in Developing Countries*, Summary of Papers and Discussions of Interdisciplinary Conference, Geneva, June 1965. Edited by E. E. Papanicolau and D. Peart, p. 13; Society for International Development, Washington, D.C.

THE MAIN HYPOTHESIS

The starting hypothesis was that economic growth as measured in terms of *per capita* income gives rise to changes in the structure of GDP, (i.e. the composition of output by industrial origin). The pattern of these changes is such that a study of countries in terms of the *per capita* income variable would tell much the same story as a time series analysis of individual country experiences. The discrepancies from the general pattern would be due to differences in additional explanatory variables such as size and natural resources.

Although it can be claimed that each country or national unit is a special case, uniqueness in economic growth can be expressed generally in one or more of the following factors: size, availability of natural resources, level of *per capita* income, and cultural, social and institutional aspects having a bearing on behaviour related to economic activity.

Income

The process of economic growth is seen here as both effect and result of the accumulation of capital and skills to satisfy similar human wants through the application of similar techniques and the access to world markets. As *per capita* income grows, changes in the composition of demand are reflected in concomitant changes in the composition of domestic product and trade.

The similarity of human needs and wants and the relative satiation of the more basic needs (e.g. food and shelter) at low levels of income lead to an increased proportion of manufacturing in the composition of the domestic product as economic growth proceeds. Thus, according to Kuznets:

> "The substance of modern economic development lies in the adoption of the industrial system, a term denoting widespread application of empirical science to the problems of economic production. One corollary that follows is the shift in the distribution of the labour force away from agriculture, first towards manufacturing and public utilities, and subsequently towards trade and service pursuits. This commonly observed shift is due, at bottom, to the structure of human wants, their easy long-term satiability by products of agriculture—so that increasing productivity of labour in the latter releases an increasing proportion of labour to other pursuits."[4]

The process of relative satiation of the need for

[4] S. Kuznets, "Under developed Countries and the Pre-Industrial Phase in the Advanced Countries—An Attempt at Comparison". *Proceedings of the World Population Conference*, 1954. Volume V (reprinted in *The Economics of Under-development* by A. N. Agarwala and S. P. Singh, Oxford University Press, 1958, pp. 141—142).

food, as described by Engel's Law, finds its parallel in the relative saturation of demand for manufactured goods which takes place at higher levels of *per capita* income and leads to the allocation of an increased share of output to the production of services. Two additional factors help to accentuate this trend: first, the fact that technological change has been rather slow in the services sector; second, the fact that replacing the product of domestic factors with imports is seriously constrained in services as a result of the nature of the product. Thus, low productivity and limited trade possibilities contribute to reinforce this effect. This may be formulated as follows: at high levels of *per capita* income, additions to income are spent in increasing proportion on the consumption of services, while the share spent on the consumption of goods declines. Thus, the transition between being poor and of middle income lies in the decline of the relative importance of food in the national "budget", while the shift from middle income to rich lies in the decline of manufactures and the rise in the share allotted to services. The introduction of a second degree term in income in the equations tries to capture these two stages of saturation or satiation of human demand.

Size of market

Gross domestic product and population have been taken as indicators of market size. Since the two dimensions defining the size of a market are population and *per capita* income, if population size were perfectly correlated with national income size, population would be an adequate variable to capture the influence of market size in determining the composition of GDP by industrial origin. However, this is not the case. Countries such as India or Indonesia, although they have a large population, have a smaller GDP than other much less populated countries. Experiments have been made with both variables, population and GDP, and the latter gave better results. The size effect is generally described as being due to the presence of economies of scale. Countries with a large market will have a larger share of manufacturing industry because of the added incentive of reaping scale economies while increasing output, and also because lines of production which could not otherwise be efficiently developed in small countries would be undertaken in the case of larger markets.

The extent to which present national boundaries encompass small economic units, a phenomenon increasing in recent years as a result of decolonization following the Second World War, is clearly shown in table 3 below. Thirty-four countries with less than 5 million population have less than US$ 5,000 million in gross domestic product. There are 24 countries with populations larger than 5 million which have less than US$ 5,000 million in gross domestic product: 16 of these with populations between 5 and 15 million and 8 with populations of more than 15 million. Thus, of the 73 countries included in the table, 58 have less than US$ 5,000 million in gross domestic product.

Natural resources and international trade

Although the level of *per capita* income (as an indicator of the stage of economic growth achieved by a country, together with its size as a market for goods and services) may be expected to "explain" most of the variation in the composition of GDP by industrial origin, it is still necessary to account for the variations arising from unevenness in the distribution of natural resources.

Table 3

DISTRIBUTION OF COUNTRIES BY GROSS DOMESTIC PRODUCT AND POPULATION SIZE, 1964

Population in millions	*Number of countries according to gross domestic product*						
	Under $ 5,000 million	*$ 5,000 – 9,000 million*	*$ 10,000 – 19,000 million*	*$ 20,000 – 39,000 million*	*$ 40,000 – 99,000 million*	*$ 100,000 – 299,000 million*	*Over $ 300,000 million*
Over 300				1			
150–300							1
75–149.9		1	1		1		
30– 74.9	1	1	2		3	1	
15– 29.9	7	2	2		1		
5– 14.9	16	2	4	1			
Under 5	34	3					

A certain degree of association is to be expected between the availability of natural resources and country size measured by area. Other things being equal, a large country is more likely to be endowed with all the resources necessary for autarkic development than smaller countries which must necessarily rely on external sources of supply because of the non-availability of certain raw materials. The uneven distribution of natural resources and considerations of comparative advantage have led some countries to be heavily dependent on international trade. Because of this phenomenon, some significant deviations should be expected from the "standard" pattern in the industrial composition of output "prescribed" by the level of economic well-being (as measured by *per capita* income) and market size (as measured by GDP). Such a deviation would occur, for example, in Great Britain, which has a larger share of manufactures and a smaller share of agricultural products because it must export manufactured goods to pay for the import of food which cannot be produced economically, or one may take for example Iran, Kuwait and Venezuela with their higher share of oil production.

As a variable to account in general, for natural resources or trade dependence, the proportion of commodity trade to GNP was first tried. A certain degree of collinearity is to be expected between the size variable, the GDP, and the natural resources or trade orientation variable *T*. It is well established that the bigger and more developed a country is, the smaller would be *T* — the proportion of trade in the GDP.[5]

More explanatory value may be achieved by splitting the *T* variable into two variables, one measuring the proportion of agricultural exports to total trade, the other the proportion of mining exports to total trade. In this way it becomes possible to deal with concentration in both agricultural and mineral raw materials and to "explain" countries with a high degree of concentration of exports in particular commodities, for example: Peru (fishmeal); Brazil (coffee); Argentina (meat and cereals); Ghana (cocoa); Iran, Kuwait and Venezuela (oil); Bolivia (tin); Chile and the Democratic Republic of the Congo (copper); etc.

Cross-section analysis methodological aspects

Level of aggregation

Pioneering quantitative work in this field, notably that of Colin Clark and Simon Kuznets, was based on a high degree of aggregation because of the difficulties of procuring statistical data. The old classification into primary, secondary and tertiary sectors is sometimes used even today, although it is realized that further disaggregation is more useful. The situation with regard to statistical material, especially on a cross-country basis, has been improving, thanks to the co-operation of international bodies. However, there continues to be a wide gap between the type and quality of data desirable for meaningful analysis and those now available.

As indicated above, this study started with eleven sectors ranging from agriculture, forestry, hunting and fishing, to services. At an early stage of the analysis it became clear that the minimum levels of aggregation necessary for a meaningful analysis of structural changes were as follows:

1. Agriculture, forestry and fishing;
2. Mining;
3. Manufacturing;
4. Infrastructure: construction, electricity, water and gas, transport and communication;
5. Banking, insurance and real estate;
6. Public administration, defence, services, ownership of dwellings, wholesale trade and retail trade.

As stated above, the sectoral breakdown was considered as the necessary minimum for analysing structural changes in broad terms. For detailed work relating to planning and programming of industrial development, it goes without saying that disaggregation must be carried to the most practicable level. Further disaggregation is desirable in 3 (Manufacturing) and 6, which appears above as a "catch-all".

For structural analysis some further observations must be made on the above sectoral classification:

(a) In an international economic comparison, the mining sector needs special treatment and as such it cannot be combined with proximate sectors such as agriculture or manufacturing, as has often been done for similar purposes. The behaviour of this sector happens to be quite unlike the behaviour of agriculture or manufacturing. To treat mining, for example, as part of a "primary" sector together with agriculture would seriously limit the usefulness of the model.

(b) Construction is treated as a sub-group under infrastructure in the model. Analysts have sometimes included construction in manufacturing. Ideally, one would get more information by treating construction as a sector by itself, as in fact has been attempted here. It appears from this analysis that manufacturing is best treated as a sector that does not include construction. When a higher level of aggregation becomes necessary, it appears to be

[5] *T* is defined as $\frac{X \quad M}{GNP}$ where *X* equals the value of commodity exports and *M* the value of commodity imports.

appropriate to include construction as part of infrastructure but not of manufacturing. The loss of information is minimal in this procedure.

(c) The "catch-all" sector, No. 6 above, which includes trade, ownership of dwellings, public administration, defence, and services, is perhaps the most difficult sector to handle. The heterogeneity arising from aggregation is obvious. The definitions are conceptually weak, as is also the statistical material. There is still much to be learned about the growth behaviour of the various components of this sector. After carrying out a preliminary analysis of available information, it was decided to treat it as a "residual" after "explaining" the variations in all the other sectors.

Per capita *gross domestic product as a measure of the level of economic development*

Since the structural characteristics of an economy are intimately tied up with the level of economic development, analysis of the structure rests on the selection of a quantitative indicator of the level. Despite its many shortcomings, *per capita* GDP comes closest to the concept of the level of development that is appropriate to the analysis of economic structure. Statistical comparisons based on the conventional measure often tend to exaggerate the contrast between the developed and the developing countries. While it is important to note this point, it does not appear to be necessary, as some have attempted, to exaggerate the magnitude of this problem. Nor is it necessary to discard this measure. Analytical precision can be enhanced, if desired, by improving the existing measure but not by discarding it altogether.

It is in the light of the above observations that the choice of *per capita* GDP as the measure of the level of development is justified. To cope with the question of precision, two sets of currency conversion rates have been used for each country, as explained below.

The monetary unit for international comparisons

The structure of output is viewed in this analysis in terms of its composition by industrial origin. Measured in their respective national currency units, the output structure thus defined would boil down to proportions for each country, making them apparently independent of the units of measurement. Although this is a matter of considerable practical convenience, the problems of relative valuation of sectoral outputs between different economies appear to remain latent in them. These problems tend to grow more difficult as the gulf between the levels of any two economies being compared becomes bigger, and are perhaps most perplexing in the case of the services sector.

One point which seems to indicate the need to use different sectoral parity rates is the well-known divergence between prices and factor remuneration in many developing countries, where agricultural prices tend to be lower and manufacturing prices higher than warranted by relative factor scarcities. This affects not only the comparison of shares in GDP but also the value of *per capita* income.

Despite the limitations of this procedure, the exchange rates fixed officially under the present international monetary system have often been used for international comparisons for the simple reason that more realistic conversion rates were not obtainable for most countries. More recently, estimates of parity rates have been made available for selected years.[6]

In general, parity rates were estimated by adjusting official or free-market exchange rates in 1938 by the relative change in the level of prices from 1938 to the year in question between the United States and the country concerned. In some cases, where analysis of the official or free rates for 1938 indicated, in the light of other available rates of conversion and prevailing economic and political conditions, that they were too unrealistic to be utilized, the starting point for calculating the parity rates was either the official rate of exchange in 1929 or the purchasing-power equivalent for 1950 derived from the Gilbert-Kravis study.[7]

In view of the importance of finding a satisfactory set of conversion rates for all countries included in the analysis, it was considered necessary to experiment with both sets that were available. In most cases the performance of the new parity rates was found to be superior to that of official exchange rates.

The search for a satisfactory conversion rate is, of course, far from finished. The possibility of utilizing an index of real consumption per head has recently been discussed, and further work in this direction will no doubt be encouraged.[8]

Cross-section versus time series

There is a tendency among the growth specialists to regard the growth experience of a given country over a long span of years as the appropriate basis for analysing the structural relations underlying the process of economic growth. Ideally, one would not

[6] *Yearbook of National Accounts Statistics*, 1965, table 9B, United Nations, New York, 1966.

[7] M. Gilbert and I. B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies*, Organisation for Economic Co-operation and Development, Paris, 1954.

[8] W. Beckerman, *International Comparisons of Real Incomes*, OECD, Paris, 1966.

hesitate to subscribe to this view. Even a superficial survey seems to be enough to confirm the heterogeneity in the structural characteristics of a cross-section sample. Every country regarded as an economic unit is unique. Every country has a history of its own, a culture of its own. While it is true that international dissimilarities are striking to the casual observer, a closer examination of the international plane is bound to reveal the real strength of the currents cutting across the arbitrary boundaries of a country in various forms, such as the basic structure of human wants, scientific knowledge, and the entire spectrum of technological advances.

The strength of these and other factors manifests itself in the observable characteristics of a country's economic structure despite the countervailing influence of many arbitrarily created barriers impeding international flows. Up to the present, this important point does not seem to have received adequate attention from experts interested in enhancing analytical knowledge of economic growth. Lack of appreciation of this point has led to the view that meaningful analysis of structural changes associated with economic growth can be done only by taking at a specific time a country's past experience.[9]

This historical approach need not be discarded. But its value appears to be such that it cannot of itself provide a valid basis for understanding the nature of structural changes associated with economic growth and much less for policy purposes. Quantitative analysis based on international comparisons must, despite severe limitations, play a vital role in filling the gap.

International comparisons, despite some of their inherent weaknesses, may prove more useful for obtaining analytical understanding of modern economic growth than similar analysis based on historical data of a given country. One of the problems, in which the superiority of the cross-section over the time-series approach is very likely to be evident, is, for example, that of analysing the relationship between economic "size", as measured by GDP, and the level of economic development as approximated by the concept of *per capita* income. The time-series approach often poses the problem of positive association between the size and the level, for the country's economy is likely to have grown over long periods of time at an even pace with *per capita* income. Further, the size itself grows rather gradually as does the *per capita* income. On the other hand, the variety of information available at the cross-section level, and the fact that with this variety the seriousness of the problem of multi-collinearity is likely to be reduced, make the use of cross-section information more desirable for the purpose of analysis.

[9] S. Kuznets, *Modern Economic Growth, Rate, Structure and Spread*, Yale University Press, New Haven, 1966, pp. 431–437.

PRESENTATION AND ANALYSIS OF THE RESULTS

The model

Sectoral proportions

p_a	p_1	Agriculture
p_{mi}	p_2	Mining
p_{mf}	p_3	Manufacturing
p_{infra}	$p_{4,5,6}$	Infrastructure
p_{bank}	p_8	Banking, insurance and real estate
$p_{serv.}$	$p_{7,9-11}$	Trade, ownership of dwellings, public administration and services

Explanatory variables

y : *per capita* income
Y : gross domestic product
X_a : proportion of agricultural exports in total trade
X_m : proportion of mining exports in total trade

The equations

$$p_a = \alpha_1 + \beta_1 y^2 + \beta_2 y^2 - \beta_3 Y - \beta_4 X_a + \varepsilon_1$$
$$p_{mi} = \alpha_2 + \gamma X_m + \varepsilon_2$$
$$p_{mf} = \alpha_3 + \delta_1 y - \delta_2 y^2 - \delta_3 Y - \delta_4 X_m + \varepsilon_3$$
$$p_{infra} = \alpha_4 - w_1 y + w_2 y^2 + w_3 Y + \varepsilon_4$$
$$p_{bank} = \alpha_5 - \mu_1 y - \mu_2 Y + \varepsilon_5$$
$$p_{serv.} = 1 - \hat{p}_a - \hat{p}_{mi} - \hat{p}_{mf} - \hat{p}_{infra} - \hat{p}_{bank}$$

The regression equations for agriculture, mining, manufacturing, infrastructure, and banking, insurance and real estate are shown in table 4 below. The results are discussed below at two levels of analysis: by sectors, and by variables.

Results by sectors

The regression equations for 1958 and for 1964 and the results of pooling the 1958 and 1964 data are shown in table 4.

Agriculture

The regression equations show a significant negative association of the share of agriculture with *per capita* income. This association is weakened as *per capita* income increases, as indicated by the positive term in y^2 of the regression equations. This result is in agreement with the hypothesis of a declining share of agriculture with economic growth as measured by *per capita* income, and also of the slowing down of this shift at higher levels of income. Close correspondence has been observed between these results of cross-section analysis and time-series data for 1953, 1958 and 1964, showing the association between the proportion of agriculture in GDP and *per capita* income.

Table 4

RESULTS OF CROSS-SECTION ANALYSIS

Sector	Year	Regression equations[a]	R^2	Sample size
Agriculture	1958	$p_a = 30.9 - 4.3y + 0.18y^2 - 0.065Y + 0.34X_a$ (4.3) (1.02) (0.068) (0.049) (0.087)	0.70	56
	1964	$p_a = 30.4 - 3.7y + 0.13y^2 - 0.06Y + 0.29X_a$ (3.1) (0.64) (0.034) (0.028) (0.065)	0.72	67
	1958, 1964	$p_a = 29.6 - 3.6y + 0.13y^2 - 0.05Y + 0.32X_a$ (2.4) (0.49) (0.027) (0.023) (0.051)	0.72	123
Mining	1958	$p_{mi} = 0.43 + 0.52X_m$ (0.59) (0.036)	0.82	44
	1964	$p_{mi} = 0.7 + 0.51X_m$ (0.4) (0.027)	0.85	63
	1958, 1964	$p_{mi} = 0.6 + 0.51X_m$ (0.3) (0.022)	0.84	107
Manufacturing	1958	$p_{mf} = 8.6 + 4.6y - 0.22y^2 + 0.09Y - 0.20X_m$ (3.1) (0.63) (0.041) (0.029) (0.055)	0.79	44
	1964	$p_{mf} = 7.8 + 3.5y - 0.13y^2 + 0.06Y - 0.12X_m$ (1.3) (0.38) (0.019) (0.015) (0.047)	0.74	63
	1958, 1964	$p_{mf} = 8.1 + 3.5y - 0.13y^2 + 0.05Y - 0.14X_m$ (0.9) (0.28) (0.015) (0.012) (0.035)	0.74	107
Infrastructure	1958	$\log p_{infra} = 2.3 + 0.29 \log y - 0.06 \log Y$ (0.06) (0.05) (0.03)	0.53	32
	1958, 1964	$\log p_{infra} = 2.3 + 0.29 \log y - 0.06 \log Y$ (0.045) (0.036) (0.021)	0.46	88
Banking, insurance and real estate.....	1958	$p_{bank} = 1.6 + 0.10y + 0.0096Y$ (0.22) (0.035) (0.0028)	0.65	32

[a] Numbers in parenthesis are the standard errors of estimate of the coefficients.

The equations also show a negative association of the share of agriculture with size as measured by gross domestic product. This could reflect economies of scale in agriculture or may be just an indication of that part of the total "income effect" which is included in Y. Both hypotheses are plausible, and further elaboration on this point is left for later when the regression results for manufacturing and the symmetric nature of the results are analysed.

The last variable included (X_a) is positively associated with the share of agriculture; it accounts for the proportion of agriculture output directed to exports and is an indication of the influence of natural resources.

Mining

The regression equation for mining indicates a linear relationship of the share of mining in GDP (p_{mi}) with the proportion of mining exports in total trade (X_m). Although more than 80 per cent of the variance in the share of mining in GDP is "explained" by the proportion of mining exports in total trade, a scatter diagram would show two clusters of points, one at low levels of p_{mi} and the other at high levels of p_{mi}, the latter composed mainly of the oil-exporting countries. The equation indicates that with nil mining exports, the share of mining in GDP would be 0.6 per cent (the value of the constant term), and that the sensitivity of the share of mining in GDP to X_m is such that any increases in X_m would originate as a response an increase a little less than half its size in p_{mi}.

For mining it would probably be worth while to try to relate mining output to the level of output in manufacturing especially since after a certain level of industrialization the mining sector would supply manufacturing with the necessary mineral raw materials inputs.

Manufacturing

The regression equations for manufacturing show a positive and significant association between the share of manufacturing in GDP (p_{mf}) and *per capita* income (y) and a negative association with y^2, indicating non-linearity in the association.

There is also a positive association between p_{mf} and size of GDP (Y) and a negative association with the share of mining exports in total trade (X_m). The regression equation for manufacturing depicts a relationship which is like a mirror image of the equations for agriculture. Comparing the 1958 and 1964 equations both with respect to the share of agriculture and of manufacturing, which are reproduced below,

$$p_a \quad 29.6 \quad 3.6y \quad 0.13y^2 \quad 0.5Y \quad 0.32X_a \quad (1)$$

$$p_{mf} \quad 8.1 \quad 3.5y \quad 0.13y^2 \quad 0.5Y \quad 0.14X_m \quad (2)$$

we see that for the explanatory variables in common, y, y^2, and Y, the coefficients have a similar value or the same value, although they have opposite signs. While the share of agriculture declines with rising *per capita* income, the share of manufacturing rises, and the decline in the share of agriculture is almost exactly matched by an equivalent increase in the share of manufacturing. The non-linear term in *per capita* income shows a positive effect with respect to the share of agriculture corresponding to a saturation of the trend towards an increasing share of manufacturing with the growth of *per capita* income. The coefficients are the same and have, of course, opposite signs. This is also the case with respect to the size of GDP (X).

Infrastructure

Under infrastructure is included: construction, electricity, gas and water and transport, storage and communications. Although the equation for infrastructure is better than most of the equations for individual component sub-sectors, the explained variance is rather low, indicating an over-all correlation coefficient a little below 0.7. The equation in logarithms gave a better fit, so we can read off directly the elasticities.

The equation shows a positive and significant association between the share of infrastructure in GDP and *per capita* income and a negative association with the size of GDP.

$$\log p_{infra} \quad 2.3 \quad 0.29 \log y \quad 0.06 \log Y.^{10}$$

The elasticity of the share of infrastructure with respect to *per capita* income is 0.29, and with respect to GDP it is 0.06. In this case, the negative association of the share with size could perhaps be best explained simply in terms of scale economies in infrastructure.

It would probably improve the results to establish a relationship of complementarity between the share of infrastructure and that of manufacturing in GDP.[11] Moreover, the very validity of the concept of a prerequisite "infrastructure" could, in this way, perhaps be quantitatively asserted; but this is beyond the scope of the present study.

Banking, insurance and real estate

The regression equation has been estimated only for 1958 data. It indicates a positive and significant association between the share of banking, insurance and real estate (p_{bank}) and *per capita* income as well as between p_{bank} and the size of GDP.

In order to pinpoint the relative importance of the different variables, their effects are presented below, taken one by one, with *ceteris paribus* assumptions for other variables.

Income effects

Taking two economies with different ***per capita*** income levels I, US$ 200 and II, US$ 500—with the same GDP (5,000 million dollars) and the same proportion of agricultural and mining exports in total trade (30 per cent and 3 per cent respectively), the predicted shares of GDP in percentages are as follows:

	p_a	p_{mi}	p_{mf}	p_{infra}	p_{bank}	*Total*	*Residual*
I	37.0	2.1	14.4	11.07	1.8	66.37	33.63
II	24.2	2.1	22.2	14.5	2.1	65.1	34.9

The main differences are between the shares of agriculture and manufacturing. The rise in *per capita* income from US$ 200 to US$ 500, is accompanied by a 50 per cent increase in the share of manufacturing and a 50 per cent decrease in the share of agriculture.

Size effects

Next, we consider two economies with the same *per capita* income, US$ 500; different quantities of GDP (US$ 5,000 million and US$ 40,000 million); and the same proportion of agricultural and mining exports in total trade (30 per cent and 3 per cent respectively). The predicted shares of GDP in percentages are as follows:

	p_a	p_{mi}	p_{mf}	p_{infra}	p_{bank}	*Total*	*Residual*
I	24.2	2.1	22.2	14.5	2.1	65.1	34.9
II	22.4	2.1	23.9	12.8	2.5	63.7	36.3

The effect of a change from a 5,000 million dollars GDP economy to one with a 40,000 million dollars GDP is depicted in the accompanying table. There are no drastic changes; there is a slight increase in the share of manufacturing. The proportion of infrastructure declines and that of banking, insurance and real estate rises.

[10] In exponential form, the equation is $p_{infra} = 9.97\, y^{0.29}\, Y^{0.06}$.

[11] Preliminary results of analysis of the relationship between employment in manufacturing and in infrastructure show a positive and significant association. The equation is $N_{infra} = 0.725\, N_{mf}^{0.898}$; $R^2 = 0.96$.

Natural resources effects

Agriculture: Assume two economies with the same ***per capita*** income, US$ 500; the same GDP, US$ 5,000 million; and the same proportion of mining exports in total trade (3 per cent) but different proportions of agricultural exports in total trade (30 per cent and 10 per cent), the predicted shares of GDP in percentages are as follows:

	p_a	p_{mi}	p_{mf}	p_{infra}	p_{bank}	*Total*	*Residual*
I	24.2	2.1	22.2	14.5	2.1	65.1	34.9
II	17.8	2.1	22.2	14.5	2.1	58.7	41.3

The main difference in this case corresponds to a decline in the share of agriculture owing to the decline in the proportion of agricultural exports in total trade. This could be assumed to be the result of export diversification or a shift in comparative advantage.

Natural resources effects

Mining: Consider two economies with the same *per capita* income, US$ 500; the same GDP, US$ 5,000 million; the same proportion of agricultural exports in total trade (10 per cent); but different proportions of mining exports in total trade (30 per cent and 3 per cent). The predicted shares of GDP in percentages are as follows:

	p_a	p_{mi}	p_{mf}	p_{infra}	p_{bank}	*Total*	*Residual*
I	17.8	15.9	18.4	14.5	2.1	68.7	31.3
II	17.8	2.1	22.2	14.5	2.1	58.7	41.3

Other things being equal, the main effect of a decline in the proportion of mining exports in total trade is a drastic drop in the proportion of mining in GDP (from 15.9 per cent to 2.1 per cent) and a 20 per cent increase in the share of manufacturing.

USE OF THE RESULTS AND CONCLUSIONS

The assumption that the general pattern of sectoral relationships with the explanatory economic variables – income, size, and natural resources – describes fairly well the changes in the composition of domestic product with economic growth does not imply that the individual circumstances of each economy are fully taken into account and "explained". On the contrary, it is precisely the need for more specific work in projecting and planning that justifies the preparation of special or "case" studies. On the other hand, for analysing long-term development prospects, projections using sectoral regression equations like those presented in this paper could help, for example, in analysing alternative policies and targets for development planning.

The results obtained should be useful for long-term projections where estimates of sectoral proportions in total output (GDP) are required. Although in many cases estimates are still used only at a more aggregate level, i.e. only distinguishing primary, secondary and tertiary sectors, it is generally desirable to make use of a finer sub-division of sectors. For example, in Japanese planning, the set of equations used for the central plan includes two types of supply equations: output by sectors and capital stock equations by sectors.[12]

Results could be used directly in the case, for example, where it is desired to project the structure of GDP or the level of a given sector at a certain future date, using either the level of *per capita* income and the population or the rates of growth of income and population. In such a case it would also be necessary to use estimates of future level or projected rates of growth of agricultural and mining exports.

Alternatively, the equations can be used to check on projected rates of growth or on the consistency of a set of separate sectoral projections by assuming or imputing between two points of time, given changes in the composition of GDP and computing the implicit rates of growth of income and other variables.

The set of equations is not a substitute for more detailed inter-industry models, such as input-output tables or linear programming models, but the applicability of the latter is generally restricted to economies that have achieved a certain level of industrial development and already have a substantial volume of inter-industry transactions.[13]

Further disaggregation of the model is necessary and, as previously indicated, it is planned to do so in two ways. First, a breakdown of manufacturing in twenty sectors at the two digit ISIC level is planned, and further disaggregation is foreseen for the services sector. It is expected that the introduction of an additional trade variable – the proportion of exports of manufactures in total trade – will probably enhance the explanatory value of the regression equations. It is also planned to break the countries into two groups of developed and developing countries. While the results of applying separately the same type of equations to these two sub-groups were not good, this was probably due to the fact that the underlying time-

[12] Reply by the Government of Japan to questionnaire on Industrial Planning and Development (United Nations document E/C.5/24/Add.31).

[13] "Use of Models in Programming" in *Industrialization and Productivity Bulletin No. 4*, United Nations, New York, 1961, p. 12, where it was suggested that, as a rule of thumb, this is the case in countries having a *per capita* income of US$ 150 or more or at least 15 per cent of their gross national product originating in industry.

tional relationship may be different, and also to the problem of the continuity along the *per capita* income variable, namely: where is the cut-off point between developing and developed countries to be made.

A similar analysis of the structural changes in the composition of employment is under way, and this also will permit the derivation of a set of estimates of average sectoral productivities or output per head, and their changes with economic growth.

Summary of conclusions

The main features of this study may be summarized as follows:

(*a*) An attempt was made in the regression analysis to account for observed non-linearity by introducing a second degree term in *per capita* income.

(*b*) Two trade variables were used to account for the structural differences arising from concentration of exports in mining products (especially oil) and in agricultural products.

(*c*) Gross domestic product was used instead of population as a size indicator.

(*d*) New data relating to 1958 and 1964 have been used when they were available as well as two types of foreign exchange rates—official and parity rates. The latter generally gave much better results.

Although cross-section regression analysis like that in this study has many limitations, it may perhaps become a helpful tool for new countries that lack historic data and are forced to resort to the experience of older and more developed countries in devising their own long-term strategy for industrialization.

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The Need for an Export-Oriented Pattern of Industrialization

THE TRADITION OF INWARD-ORIENTED DEVELOPMENT

MANY GENERALLY ACCEPTED approaches to economic development are still dominated by the ideas and policies that took shape shortly after the Second World War, when many former colonies became independent and the new pattern of international relations that subsequently arose raised the problem of accelerating the economic growth of developing countries to the first rank of international importance.

Up to the early 1950s theorists and policy-makers dealing with developing countries concerned themselves primarily with the larger Latin American countries (Argentina, Brazil, Mexico and to a lesser extent Chile, Colombia and Peru) and the newly independent Asian countries (India, Pakistan, and Indonesia, followed by the Philippines and Burma). With respect to the Middle East, the United Arab Republic, Turkey and Iran attracted the main attention. Thus it was the larger countries that tended to serve as prototypes for policy formulation.

It was recognized, to be sure, that there were great geographic, economic, social and political differences even within this small group of countries, and particularly between the countries of Latin America on the one hand and most Asian countries on the other. Yet they had this in common: that economic growth was viewed as mainly "inward-directed"—as a combination of (*a*) the direct substitution of new domestic production for pre-existing imports and (*b*) the production of new goods and services for the domestic market by means of balanced growth, with or without displacement of a traditional artisan sector that might previously have supplied similar wants.

The balance-of-payments problems resulting from the need to import, particularly capital goods, seemed easiest to solve in the case of direct import substitution. It was expected that as soon as the new investments matured, part of the foreign exchange revenue available from traditional exports would be set free for the repayment of loans taken up to finance the initial imports of capital goods and for further imports for investment. On the other hand, in the case of new output producing no direct savings of foreign exchange, the solution was considered to be more difficult and roundabout: it might require an increase in the savings ratio, and the devising of means, such as possibly currency devaluation, to convert the savings obtained into exports or reduction of imports. Nevertheless, the belief was that if only an initial impetus could be given to the developing economy, the overall level of productivity would ultimately be raised so much that the necessary savings could be realized without having to cut into existing levels of consumption. Both processes would of course be facilitated by the availability of foreign exchange reserves, by foreign grants and long-term loans, and by private investment from abroad.

Thus, it seemed reasonable to suppose that the typically large developing countries, as visualized twenty or fifteen years ago, could realize sufficient gains in productivity and in savings capacity to permit them, within a reasonable span of time, to get over the hump of initial foreign indebtness and balance-of-payments strains and proceed on a steady course of self-sustained growth thereafter. Given the initial capacity to import the required capital goods, the application of modern science and technology, and a will to effect the necessary institutional changes, they would be able in time to attain what the more advanced countries had achieved before them.

Experience, however, soon showed that continued growth within such an inward-directed pattern was by no means automatic. By the early 1950s this was clearly evident in Latin America, where the process of industrialization had progressed considerably since the 1930s, and where the difficulties of further import substitution had

already begun to be discerned. Some of the reasons for these difficulties will be discussed later; attention must first be drawn to the far-reaching changes that have taken place since the early post-war years with respect to the characteristics of the "typical" less-developed country.

Most of the countries that have achieved independence in the past fifteen years are very small in terms of population, territory and known resources potential. Further, on gaining independence they were often more retarded in their economic development than the larger countries on which attention was previously focused.

Table 1 illustrates the changes that have taken place since 1950: the size of the average developing country is now two-thirds smaller than those of fifteen years ago and the median developing country is now only about half as large. It is of course true that the weight of these numerous small countries in the total population of the less-developed parts of the world remains small – less than seven per cent of the total population, not counting mainland China. But it is equally true that in many respects the problems of economic development in the international sphere are considered in terms of the number of national entities affected rather than the number of individuals. The number of Member States of the United Nations commonly considered as less developed (excluding the socialist countries and the poorer countries of Europe) has grown from 42 in 1950 to 85 in 1965, and the number of developing countries with populations of less than five million (on the basis of their 1965 populations) has increased from fifteen, or slightly more than a third of this group and less than a quarter of the entire membership of the United Nations, to 45 – more than half of all developing countries, and nearly two fifths of all countries.

The traditional approaches to industrialization, shaped in accordance with the problems presented by larger countries such as India or Pakistan on the one hand, or Brazil or Argentina on the other, fall into two broad groups: those having the maximization of total or average income as the immediate objective and those giving priority to the alleviation of the employment problems created by rapidly growing populations. Frequently the two were regarded as complementary if not identical. But whatever goal was given first priority, industrialization was generally envisaged as oriented predominantly towards the domestic market, and the policies concerning income disposition, resource allocation, the structure of production, the choice of techniques, and industrial organization were formulated from that point of view. Expansion of exports was often recognized as essential, but it was usually considered only from the balance-of-payments viewpoint, and hardly ever as a significant aspect of industrialization itself. Exports, accordingly, were thought of as either of the more or less traditional type or as a spillover from import substitution and from the over-all rise in the level of domestic productivity in general.

In Latin America, which had started to industrialize earlier, disenchantment with the possibilities

Table 1

FREQUENCY DISTRIBUTION OF LESS-DEVELOPED COUNTRIES,[a] MEMBER STATES OF THE UNITED NATIONS, IN 1950 AND 1965

Size class	*Number of countries*		*Total population (millions)*	
	1950	*1965*	*1950*[b]	*1965*
0 – 5 millions	15	45	38	115
5 – 10 millions	8	15	55	108
10 – 15 millions	4	8	45	93
15 – 20 millions	2	3	33	49
20 – 30 millions	5	5	122	122
30 – 50 millions	4	4	142	142
50 – 100 millions	1	2	81	138
over 100 millions	3	3	677	677
Total, all countries	42	85	1,193	1,444
Median			9	5
Arithmetic mean			28	17
Geometric mean			9	5

Source: M. Merhav, *Technological Dependence, Monopoly and the Limits to Growth*, Pergamon Press, Oxford, England, 1968, Chapter 1.

[a] Excluding the socialist countries and the poorer countries of Europe.

[b] Based on population in 1965.

of sustained industrialization afforded by the import-substitution and inward-directed pattern of development set in soon. It became increasingly recognized that the foreign exchange constraint on further growth was much more persistent than had originally been thought. Far from automatically alleviating the balance-of-payments difficulties, import substitution and the direct and indirect rise in import requirements coming in its wake tended to aggravate them; what was first believed to be a temporary hump more and more appeared to be a continuing obstacle. As time went on the opportunities for further investment in import-displacing industries seemed to shrink, so that growth along these lines began to run into internal barriers as well.

Equally, experience soon showed that the earlier hopes for easing the employment situation through industrialization had been far too sanguine. Even under favourable conditions with respect to the savings rates attainable in practice, the domestic accumulation of industrial capital usually fell far short of that needed to absorb even the increment to the labour force, let alone that required to do away with the open or disguised unemployment in the traditional sectors of the economy. Conceivably, investment could be diluted to the point where some kind of employment might be found for larger numbers, but only at the cost of foregoing all significant productivity gains. And, as has been pointed out, this is not what is wanted, although in theory "any society, if it could rid itself of enough technique and capital, could keep every one of its ambulatory members fully employed grubbing for roots and berries" (Lewis 1962, p. 203).[1] Given the purposes and technical conditions of industrial development and the accepted patterns in which it takes place, the investment per worker needed is much larger than that which would be consistent with the existing rates of population growth in relation to the savings ratios that can be attained in reality. This is true even for the less capital-absorbing types of production, which still represent a meaningful shift from traditional to modern techniques of production.

A simple numerical example may illustrate this point. The relationship between the full-employment growth rate G, the savings ratio S, the import coefficient M, and the capital-output ratio C may be expressed by the familiar equation $G = S(1-M)/C$. Assuming a country with a population of 5 million and a labour force of 2.5 million, growing at no more than 1.5 per cent *per annum* and a *per capita* income of $200, the savings ratio S and the investment per worker I/W that could be sustained with different capital-output ratios and import coefficients would be as shown in table 2, if the total savings are to create employment for the entire increment to the labour force.

These figures may be compared with the results of some cost estimates for 113 small-scale industries prepared by the United States Agency for International Development, according to which the fixed capital needed to employ an additional worker is on the average about $11,000, or $7,700 if the six most capital-absorbing industries in this sample are excluded (US AID 1966). Only about a third of this investment goes for building and construction, i.e. predominantly domestic expenditure; the rest is for equipment, most of which must be imported. If these estimates come close to representing the technically given lower limit of capital per worker, then any absorption of the additional labour force is out of reach on any reasonable assumptions. In this example, even if a savings ratio of 25 per cent could be attained, it would not be possible to absorb the entire increment to the labour force unless the import coefficient of investment were reduced considerably.

Given technology as requiring investment for industrial workers of $11,000 or more, the crux of the problem evidently lies in the low investment multiplier that characterizes the developing countries and particularly reflects their dependence upon imports for the supply of the capital goods they need for industrialization. In the absence of

Table 2

SAVINGS RATIOS REQUIRED AND SUSTAINABLE INVESTMENT PER WORKER, WITH DIFFERENT CAPITAL-OUTPUT RATIOS AND IMPORT COEFFICIENTS

C	M = 0.3		M = 0.5		M = 0.7	
	S	I/W	S	I/W	S	I/W
2	0.043	$ 1,146	0.060	$ 1,600	0.100	$ 2,667
3	0.064	1,706	0.090	2,400	0.150	4,000
4	0.086	2,293	0.120	3,200	0.200	5,333
5	0.109	2,905	0.150	4,000	0.250	6,667

[1] All references are listed at the end of this article.

major capital transfers from abroad, only a reduction of the over-all import coefficient through an expansion of domestic income and demand can sustain the investment needed for a substantial absorption of the additional workers, within the context of current technology.

This reduction of the over-all import coefficient can come about either through expansion of exports or through import substitution, or through both. In the larger of the less-developed countries, and particularly in those that had built up a substantial volume of external trade before they embarked upon industrialization, import substitution, which can take advantage of the saving on transportation costs and the protection of tariffs, was practically the only path envisaged for a reduction of the import coefficient. As has been mentioned earlier, the initial deterioration in the balance of payments that might occur because of the rising import requirements of the import-displacing industries was viewed as a temporary phenomenon: as the new investment bore fruit, domestic income and demand would grow and would afford new outlets for further investment, and the import coefficient would drop. This would continue until the economy attained full employment of resources and a level of foreign trade dictated by economic choice rather than technical necessity.

This would indeed have been the result had it not been for the emergence of an increasing number of obstacles to continued import substitution. These obstacles even now have not yet been adequately taken into account. The fact is that the opportunities for establishing industries that could save on transportation costs and be protected by tariffs not exceeding a self-defeating level gradually became exhausted. As investment moved away from the more location-bound and simpler industries the increase in domestic output obtained for a given amount of investment tended to fall off. The resulting lag of growth of domestic income and demand in turn reduced the incentives and markets for further investment. At the same time the terms of trade under which the less-developed countries sold their traditional exports and bought the capital goods they needed also frequently tended to deteriorate, thus making the foreign exchange constraint on growth even more severe. To some extent import substitution and industrial development in general could still be pushed further through various measures; the net effect, however, was generally to raise the economic and social cost of industrialization. Much of the burden of this higher cost had to be borne by the population at large, and in particular by the peasantry and other under-privileged strata in the traditional sectors.

The present article is not concerned with analysing in detail the reasons why the continuous and self-sustained growth that was expected to result from this inward-directed pattern of industrialization has failed to materialize or has been frustratingly slower than anticipated or desired. None the less, a few observations must be made on this subject in order to see which paths industrialization must now follow if it is to be successful.

THE TECHNICAL DETERMINANTS OF DEVELOPMENT

The internal obstacles to growth arising in an inward-directed mode of industrialization have been traditionally underrated for two reasons. The first is that the concreteness of the historical process of industrialization has nearly always been ignored. In analysis and policy formation parametric changes, which are of the essence of history, have often been assumed away. The frequent assumption is that all countries will, broadly speaking, pass through the same stages of growth — at most with variations due to innate differences — and all will therefore end up, sooner or later, in an essentially similar condition, irrespective of when and how they start. History, in this view, repeats itself; the pattern of industrialization is really timeless, and all countries must and will go from immaturity to maturity. Just as today's advanced economies have evidently managed to overcome the obstacles in their path of development, so the developing countries will be able to achieve a high level of industrialization on a similar, even if not always smooth, path of progress.

The second reason why the difficulties of industrialization based on import substitution have often been overlooked is the belief that if only impeding traditional institutional restraints are removed, growth will take place in a competitive framework. No account is taken of factors that might, under modern conditions, preclude the emergence of such a competitive structure. This implicit or explicit assumption of competitive structure is closely related to the above-mentioned approach to history.

The issue can be much clarified if under-development, instead of being defined for the sake of brevity simply as poverty, is looked at from the supply side and is regarded as the implanting of extant, modern techniques in archaic economic structures. This is a "discrete historical process through which the economies that have already achieved a high level of development have not necessarily passed" (Furtado 1964, p. 129), because their technical progress was essentially endogenous, while the growth of the less-developed countries of today almost wholly depends on foreign technology. This approach has the advantage of concentrating

attention upon the crucial technical determinants of industrialization, which, being different in different historical periods, affect both the form industrialization can take at any given time and the degree to which the newly developing industrial structure can remain competitive, and thus maintain the pre-conditions for its continued expansion.

Modern techniques, on which the less-developed countries must rely for their industrialization (given the time span determined by their development goals), are largely incorporated in physical objects—in plants and equipment. This equipment is typically imported from the more advanced countries, where it is naturally produced, like all other commodities, according to the demand in the vast internal markets of the advanced countries and to their factor proportions. The techniques embodied in this equipment largely determine how a given basket of goods can be produced at any given time, i.e. what the factor proportions will be, and on what scale it must be produced. In the advanced countries there is a secular tendency for the scales of production to rise with time. The rise in the scale of physical output per establishment in the United States manufacturing industry between 1904 and 1947 was 15 per cent every five years, or an increase of three and a half times over the entire period (Sands 1961). At the same time revolutionary changes have taken place in the methods of making those products that have remained in demand during this period; even more important, new products, new qualities, and new designs have been introduced on a vast scale.

These factors strongly influence the pattern of industrialization, making it vary according to the period in which each country begins its industrial development and to the differences in the techniques that are adopted from abroad. An inward-directed pattern of development will naturally lead to the adaptation within the limits set by the techniques available from the advanced countries of the product-mix, quality, design, and methods of production to the exigencies of domestic market and to its factor proportions, and to the actual state of its entrepreneurial, managerial and technical skills, as well as to other domestic factors. In pure theory and on the basis of a simple reading of the law of comparative advantage, such an adaptation could be considered economically rational.

According to this approach, a less-developed economy should tailor its techniques and its structure of production to its relative factor endowments and to its domestic demand. If the dependence of industrial growth on imports of capital goods makes it necessary to increase exports, these should also conform to comparative advantage, that is to say, they should be of the traditional types or very close to them in terms of their factor utilization. The developing countries, lacking skills and capital, while abundantly endowed with unskilled labour and possibly with easily exploitable natural resources, should -according to this approach -economize on the scarce resources and concentrate on production that takes advantage of unskilled labour and readily available natural resources with respect to both the domestic and the foreign market. In time the gradual accumulation of skills and capital would bring about a shift towards more advanced types of commodities and more sophisticated techniques.

Even under ideal conditions it is doubtful whether these gradual structural changes would come about with the speed necessary to provide economic growth compatible with the aspirations of the developing countries. In any event the expansibility of the traditional exports of the less-developed countries, a pre-condition for their accelerated growth, is limited and further restricted by tariff and other obstacles and is thus unable to provide these countries with the import capacity they need for their industrialization. Their production of non-traditional commodities, on the other hand, has been predominantly geared to the domestic market and generally fails to meet the requirements of foreign markets in terms of costs, variety, quality and design of goods.

In the case of a larger developing country it might still be argued that if only the time horizon allowed for industrialization is extended, as it must be in a realistic view, the initial difficulties will ultimately be overcome and a high level of economic development, embodying modern techniques and based on a diversified productive structure, will be achieved in the end. The validity of this argument depends on whether it is safe to assume that the initial development will leave the industrial structure flexible enough to produce adequate and continuing technical progress sufficiently great to ensure that goods produced in the first instance for the domestic market will become fully competitive in quality and cost with those produced in the advanced countries.

Such an assumption cannot, however, be safely made when the technical determinants of industrialization are fully taken into account, and when their impact on the competitive structure is given its proper weight. The scales of output, determined by the equipment available from the advanced countries, are generally large in relation to the existing market. The result is that almost as soon as industrial development starts on any significant scale, oligopolistic and monopolistic structures emerge in place of competitive ones. Such forms of industrial organization possess a high degree of structural stability and cannot be regarded merely as teething troubles of industrialization.

A non-competitive structure of industry, arising in part from technological dependence on the more developed countries, restricts the expansion of the domestic market and thus the desired progress towards higher productivity. These market-restricting effects can at best be offset only very partially through diversification and public investment, and the former may in fact bring about further losses in efficiency. The technological dependence initially responsible for the non-competitive industrial structures also involves a dependence on imports. This means that even if the erosion of competition did not tend to make investment outlets shrink — say, if it were counteracted by public investment — the domestic market would still expand only fractionally. Thus, progress from small-scale, high-cost production to larger-scale and correspondingly lower real costs, and from obsolescent techniques, inferior quality and design standards to the advanced techniques, the quality and the designs required for successful competition abroad, cannot be expected to be achieved on a wide enough scale; and the facts support this conclusion. Technical backwardness tends to lead to more technical backwardness, and the domestic orientation of industrialization perpetuates itself.

Nevertheless, if a country had an initial domestic market large enough to sustain the introduction of modern, large-scale techniques — possibly with modifications of the technical coefficient to allow for the differences in relative factor prices by comparison with those ruling in the countries where these techniques originated — together with a substantially competitive structure; or if it had an efficient system of planning, which would force the adoption of the most efficient techniques the market could sustain — irrespective of their effects on employment or market structure; or if the public development effort could effectively reduce the technically necessary dependence upon imports and promote the indigenous development of capital goods — an initial orientation towards the domestic market might not preclude steady, self-sustained growth. These conditions, difficult in themselves, can at best be approached only in the larger and more industrially advanced of the developing countries. In the smaller and poorer countries, with a foreign exchange constraint on growth, industrialization based on orientation towards the domestic market cannot be expected to lead to significant spillovers of exportables. In fact, the productive structure often is not viable even for the domestic market without a high degree of protection against foreign competition.

In view of the exceedingly small size of the majority of the newly independent developing countries compared with those considered typical a decade and a half ago, the pattern of industrialization that ought to be adopted should be reconsidered. Only a few aspects of this complex problem can be singled out here for very brief discussion, mainly because of their immediate policy implications: first, the difficulties encountered in expansion of the so-called traditional exports; second, the choice of product-mix and techniques; and third, the role of the public sector and of planning in achieving an export-oriented pattern of industrialization.

Difficulties in the Expansion of Traditional Exports

As is well known, the developing countries have run into serious difficulties in expanding their revenue from traditional exports — mainly primary goods and, to some extent, simple manufactured goods. These difficulties are partly due to objective causes, such as the low income elasticity of demand for many primary goods as well as simple manufactures, the substitution of man-made materials for natural products and the materials-saving effects of technical progress; and, particularly in regard to manufactured goods, they are partly due to artificial trade barriers, of which more will be said later.

The insufficient growth in the export revenues of the developing countries, as reflected in the statistics for the period 1950–1965, becomes more apparent when the data on the aggregate trade flows between developing and developed countries are broken down and considered in somewhat greater detail. The statistics on trade in all commodities between these two groups of countries seem to show that the import capacity of the developing countries rose in this period at an average annual rate of 3.3 per cent, but when fuels are excluded from the calculation, the growth rate falls to 1.6 per cent. Furthermore, the capacity to import machinery is obviously of special importance to the developing countries, and in this respect the data seem to indicate no improvement at all during this sixteen-year period. Despite an annual increase of 5 per cent in the quantity of their total exports, and of 3.2 per cent if fuels are excluded, adverse price trends made it impossible for the developing countries to increase their capacity to import machinery. Although the statistical significance of these figures is low because of the short period covered, their relative magnitudes and directions of change are highly suggestive (Merhav 1968, Chapter 5).

The proposition is still sometimes put forward that the less-developed countries might lift the foreign exchange restraint on their industrialization by expanding their exports of primary goods.

The same reasoning, based on the law of comparative advantage, is extended to the so-called resource-based, or "processing" industries, where the obstacles applying to primary goods on the demand side are less severe in some respects although perhaps more severe in others.

But this suggestion often overlooks the fact that the major problem of the developing countries is to increase their export capacity, not to expand exports from installed productive capacity. Natural resources are not factors of production but become so only after prior investments have been made to make them accessible (Robinson 1956). These investments may sometimes have a very long, or even infinite, economic lifetime, so that while the capital intensity of current production may be low, the investment-output ratio for primary products may in fact be very high. Even in the favourable case, where unexploited land or mineral resources exist, much capital may be required to make them economically available. Thus, the developing countries may have a comparative advantage in the current production of primary goods provided the necessary investment has already been made; if not, they will be at a comparative disadvantage in developing them because of their paucity of capital. The same will be true, other things being equal, of the processing industries based upon them.

The developing country's shortage of domestic savings might not be an obstacle to the development of its natural resources, if the capital required could be attracted from abroad. But such foreign investments in natural resources, often of a depletable nature, raise problems of their own, which are beyond the scope of this article. Unless these problems are solved by mutual adjustments on the part of the investors and the developing countries, the foreign investments may remain enclaves in the developing countries rather than generators of self-sustaining industrialization.

In this respect also, the difference between the large and the small developing countries is relevant. There is no necessary connexion between population size and natural resource endowment, but the investment necessary to develop the natural resources is often not only high in relation to output but also unevenly distributed because of indivisibilities in production or in commerce. A country that can draw on the savings of a large population, even if poor, is better placed to accumulate the big chunks of capital required, if it chooses to develop along these lines, than a smaller country.

There is now wide agreement that the developing countries cannot rely on the expansion of primary exports to provide further imports necessary for industrialization. In the case of manufactured and semi-manufactured goods, barriers on the demand side are formidable, and this has led to proposals to remove artificial restrictions on trade, or even to give tariff preferences to the less-developed countries, so that they may enter the markets of the advanced countries with just those manufactured goods that are eminently a spillover from their import substitution.

If the advanced countries felt politically, socially and economically able to abandon or reduce the tariffs that protect the domestic production of goods such as textiles and effectively discriminate against processed imports, a wide field for the expansion of exports from the developing countries would open up. A shift of the producers in the advanced countries away from these industries would no doubt go very far to alleviate the balance-of-payments difficulties of the less-developed countries before they could come up against the limits imposed by the low income elasticity of demand for these goods. But there certainly can be no assurance that this will happen, and the adjustment problems of the advanced countries would by no means be negligible.

It is not even certain that merely removing trade restrictions or instituting preferences for imports in the advanced countries would vacate an economic space the developing countries could fill. It is equally possible — and there are already indications of such a trend — that industries in the advanced countries would respond to the shock of exposure to competitive imports by introducing technical innovations, such as higher levels of mechanization and automation. The less-developed countries could do likewise but not so easily. Their exports then would no longer be a spillover from production primarily geared to their domestic markets but would be based on a technology essentially dictated by the requirements of competition in the foreign market, and presumably out of step with the requirements of their domestic market. In this case the developing countries might just as well have produced other goods having no sizable base in the domestic market but which might have higher income elasticities of demand abroad and meet with fewer institutional barriers to trade. This leads to the problems related to the choice of product-mix and of techniques, and their connexion with the orientation of industrialization towards the domestic as against the foreign market.

Market orientation, product-mix and choice of techniques

The over-all structure of production reflects the allocation of resources between consumption and investment. In the developing countries, exports substitute for the domestic production of capital goods in that they alone make it possible to convert

domestic savings into investments. The orientation of industrial development towards the domestic market, which has in practice been the main path of growth along the line of least short-run resistance, affects the structure of production in two important ways. First, it weights it heavily with products which, because national income levels are low, still have a high income elasticity of demand at home, but the markets for which tend by the same token to be saturated in the richer countries. Thus, even after the domestic demand for these products becomes less elastic with respect to income, the surpluses that then become available can be converted into exports only with great difficulty because demand conditions abroad are adverse.

A second way in which the domestic orientation of industrialization affects the productive structure is less obvious but is none the less highly important. The domestic market of a developing country may tend to become broadly similar to markets abroad as far as composition by commodities is concerned; but even when domestic production is not artificially shielded, significant differences in the nature of the products, their design and quality, are bound to appear. The requirements of the foreign market are everywhere considered more stringent than those of the domestic. This applies even for trade among developed countries. Between countries with a similar level of income and a high degree of cultural affinity, these differences may be relatively minor and may not affect the basic methods of production. The disparities between the developing and the advanced countries are much greater, and very often involve different techniques of production. A productive structure geared to the requirements of the domestic market and producing goods perfectly acceptable there, will often not be able to produce for the foreign market without changing its techniques even if the products satisfy essentially similar wants. A spillover from domestic production into exports thus cannot generally be expected to be a simple matter; on the contrary, the initial orientation towards demand conditions at home may make it all the more difficult to export later. To sum up briefly: a domestically oriented productive structure is primarily consumption-oriented, with a built-in low rate of investment.

It is natural to assume that the simpler techniques needed to satisfy the domestic market are easier to learn and will serve as a stepping stone towards further technical progress and refinement of skills. The possibility cannot be excluded, however, that the use of the simpler technology may produce inertia or vested interests that may become an obstacle to the transition to a more complex one. In any case, the differences in techniques relate as much to the type of equipment installed as to the skills involved in operating it. Simpler, and presumably less costly, equipment may suffice initially to supply the domestic market, but if the goods that can be produced with it are unsuitable for export, a new productive set-up with different plant and equipment may be needed for the foreign market. Such a shift may make the cost of shifting into export production prohibitive. It might be possible for export production to be concentrated in new firms, emerging on the margin of growth, which would adopt the appropriate techniques. But such a specialization within the same industry with some firms producing primarily for the domestic market and others mainly for export would not be practicable in most instances, and would in any case not be a direct spillover from domestic production in the usual sense.

To the extent that techniques of production are limited to a certain product-mix, orientation towards the domestic market makes them inadequate for the different and more stringent demands of the foreign market. An industrial structure, once established, is in the nature of things long-lived and not easily modifiable; if it has been adapted to a domestic market differing significantly from the demand characteristics of the foreign market, no substantial spillover into exports can be expected. Historical examples to the contrary from the early days of the industrial revolution are not conclusive, since the technological conditions of economic development and the structure of international trade of this period were highly different.

The choice of techniques, when it does not relate to differences in product-mix, involves different methods of producing identical goods. Although the commodity structure of demand broadly determines the possible methods of production, techniques can often be varied within a certain range. Differences in prices and various other factors affect the particular technique chosen; and, obviously, the higher the protection against competition a given industry enjoys, the lower the maximum level of efficiency it must attain. The kind of competition that comes to mind immediately in this connexion is that from imports, against which high-cost domestic industry can become competitive when protected by tariffs and a variety of subsidies. Such industries will not become competitive in exports unless there are factors at work that will gradually bring down the level of real costs.

In part, the factors making for high-cost production result from the infant status of the new industries, and these might be expected to disappear in time; in part, however, they are connected with the scale of output, which is closely related to the choice of techniques. Once a given variant of technique is chosen, the scale of output is also determined and thus also market shares. These are

structural, long-term factors that do not change easily or rapidly, and they have an important influence on the degree to which the domestic market can expand continuously.

The point has often been made that, in general, the markets of the less-developed countries are too small to sustain efficient, large-scale methods of production, so that import substitution creates a vicious circle of small markets enforcing production at high cost; this in turn precludes a widening of the market through exports and thus the ultimate lowering of the cost level through economies of size. This is no doubt true as far as it goes, but it fails to explain why the internal markets of the developing countries do not expand as development goes on to the point where they could sustain the more efficient techniques that would make their products competitive abroad.

Two reasons why the domestic market in a less-developed country tends only to expand slowly have already been mentioned: on the one hand, domestic income and demand increase less than is warranted by the volume of investment at any given time because a large fraction of it must consist of imports; and on the other hand, the introduction of modern techniques, which are the essence of industrial development and which are embodied in plant and equipment designed for the much larger markets of the advanced countries, tends to create non-competitive market structures.

The oligopolies and monopolies or quasi-monopolies that subsequently emerge are not as they often are in advanced countries the end result of a long competitive struggle in which the less efficient firms and methods of production have had to yield to the more efficient, thus leading to a market structure which although restrictive, yet possesses a high level of technical efficiency. They are, rather, the outcome of the initial transplantation of a foreign technique usually not the most advanced and efficient of those available. Thus, the oligopolies of the developing countries may be giants in their small domestic markets but pygmies by comparison with their potential competitors in the advanced countries. In the export market, therefore, they are unlikely to be competitive. Furthermore, being dependent at first on essentially imitative techniques and being small in absolute terms, they do not unlike their counterparts in the advanced countries possess the internal resources to produce further technical progress, at the same time their relative size at home gives them a market position that does not put them under constant pressure to modernize and that impedes the entry of others who, if the existing markets had not already been pre-empted, might have achieved a higher level of efficiency.

These tendencies have appeared even in the larger among the developing countries and, as noted before, there are indications that the scales of output to which the techniques developed in the advanced countries are adapted tend to rise fairly rapidly with time, so that the disparity between them and the size of the markets in the less-developed countries increases. But the larger and relatively less poor countries can evidently sustain larger scales of output without producing a high degree of market concentration. Hence, in such countries the gap between the cost level of domestic producers and that of their potential competitors abroad is smaller. Furthermore, compensatory measures that the Government might take always involve costs, and a larger country can better afford these costs.

The difficulties arising from the disparity between the scales of output that technology permits and the size of markets and from the dependence upon imports of capital goods are most severe in the smaller and poorer of the developing countries. Therefore, the efforts to overcome these difficulties must be correspondingly greater, even though the possibilities for doing so are smaller. In what follows, an attempt will be made to outline broadly what the general direction of these efforts might be, although it is clear that development problems are always concrete and that the actual policies adopted in each case must vary according to the circumstances.

Directions of an Export-Oriented Industrialization Effort

Mention was made earlier of the difficulties faced by the developing countries in expanding their exports of primary products. On the supply side similar difficulties exist with respect to the production of semi-manufactures, or the conversion of primary products that are already being exported into more highly processed goods. No generally valid argument can be made either in favour of or against such processing, except to say that its comparative advantage cannot be assumed merely because it is based on domestic raw materials. Each stage of processing must be judged as a distinct industry and on its own merits. It may well be that there is a comparative advantage in producing and exporting the raw materials, whereas the next stage of fabrication may be less advantageous than some other industry that may perhaps be based on imported raw materials.

In many cases, however, the further processing of a primary product now exported is not at issue but rather the development of the raw materials supply together with the fabrication stage. The large capital requirements and likely need for foreign

investment in such cases have been mentioned previously.

In theory there is no difference between the saving of foreign exchange through import substitution or its earning through exports. But experience has shown that the foreign exchange constraint on growth lasts much longer than was originally supposed and that import substitution does not provide an adequate solution for the balance of payments problem. Furthermore, the markets of many of today's developing countries are much smaller than those whose development started in an earlier period. An adequate base for industrialization therefore cannot be found in domestic demand alone; industrialization must be more oriented towards those products enjoying favourable demand conditions abroad.

This does not mean that there is no room for a substantial adaptation of the productive structure to the factor proportions and demand conditions at home. In any country there will always be a large number of industries whose products do not normally enter into international trade. These products are naturally adapted to the needs of the domestic market, and the choice of technique for them is also wider. Not so, however, in the import substitute industries that enter into international trade. Here a change in market orientation necessarily produces differences in the commodity composition of the productive structure that is being set up, in terms of both the broad categories of goods produced and the detailed specifications of these products. An orientation of industrialization towards those products for which demand abroad is rapidly expanding usually means that domestic demand for them, which is based on a lower income level, is still limited. Therefore, instead of a spillover from domestic production into exports, as expected in the conventional image of industrial development, the opposite sequence must be expected and aimed at. As domestic demand grows, the goods initially produced for the foreign market begin to enter domestic demand on a larger scale, and a spillover into the home market can occur.

In practice, exportation and import substitution will often have to be simultaneous, particularly where essentially similar products are involved and a domestic orientation mainly reflects itself in variations of design or differences of quality standards. Here, production can be geared relatively easily to the requirements of the foreign market, and it can safely be assumed that the goods produced for export will be acceptable also in the domestic market, whereas the opposite is generally not true. Also, production for the export market will often yield a certain proportion of output that cannot be sold abroad but that may be satisfactory for the less discriminating domestic market. By contrast, when the top quality standards are no higher than what the domestic market finds acceptable, no exportable output at all may be produced.

The choice of technique is of even greater importance when it determines the scale of production. In order to allow advantages of factor costs to express themselves in cost advantages of the final product, and thus become competitive in the export market, a technique similar to that used by these competitors must be chosen. Highly different factor prices may permit some variation, for to be competitive it may not be necessary to make use of the full differential in factor costs, and some of its advantages may be traded off against some degree of lower technical efficiency. Within these limits – which must be evaluated from a long-term viewpoint, taking into account possible future changes in factor costs and further technical progress by the competitors – the technique and scale will be determined by the cost level that must be attained to meet the prices ruling abroad, and not by the costs that can be sustained at home.

If there is a substantial difference between domestic and foreign prices, and if there is a policy of restricting the domestic sales of such commodities, simultaneous production for the domestic and the foreign markets makes it possible to resort to differential pricing. When the domestic market, at prices established by the alternative imports, is large enough to have exports significantly subsidized by the domestic consumers of the same products, it may be possible to forego some advantages of technical efficiency and scale, although from a welfare point of view it would be preferable to have the costs of such export subsidies borne by the domestic economy in general, rather than by the users of the particular goods that happen to be exportable.

Goods with a high income elasticity of demand in the foreign market are usually those to be found on the margin of growth of a sophisticated demand structure, and frequently they also involve sophisticated techniques of production. Among consumer goods they include the latest innovations of durable goods, which are often technically complex and require a large scale of production, or commodities that derive their consumer appeal from variations in design. Production of the latter presupposes an intimate knowledge of prevailing tastes and the resources, organization and ability to carry out large-scale sales promotion. Among the intermediate goods, such as semi-manufactures or components, production is less exposed to the vagaries of changing tastes – which are difficult to follow and even more difficult to influence from a distance – and probably requires a less diversified and complex industrial supporting productive structure than do consumer durables. With respect to semi-

manufactured raw materials, however, the requirements of large scale are similar, while the standards of quality and precision of components are usually strict. Production for export in all these lines must therefore strive to minimize the gap in techniques and scale of production as compared with potential competitors.

It would be unrealistic to believe that developing countries can enter into the production of the most sophisticated branches of industry on equal terms with their competitors in the advanced countries. The latter are by definition technically leading, and the best that the developing countries can expect to accomplish during their stage of early growth is to follow and adapt successfully. Nevertheless, it makes a considerable difference whether a less-developed country tries to attain the most advanced techniques that can be absorbed within the limits set by the available skills or can be developed as an integral part of the industrialization effort, or whether it attempts, by orientation towards what the domestic market will tolerate, to save on capital in the short run, to disperse it, or to maximize employment rather than output, through the introduction of inferior techniques. In the former case the country will exploit its objective opportunities to the fullest extent. Because its choice of techniques and scale is governed by the external market, which for all practical purposes is unlimited, a basis will be created for further progress, whereas the latter course will more often than not produce built-in deterrents to subsequent development.

The limited capability of a developing country to absorb the best available techniques of production and their associated scales of output leads to a dilution of technique where development is inward-oriented. To save foreign exchange through import substitution it is necessary to spread domestic production over as wide as possible a spectrum of commodities and industries. If the scale or the specific nature of domestic demand does not require, or cannot sustain, the most efficient techniques, industrialization will resort to obsolescent methods. The advantage usually claimed for the use of techniques other than the most up-to-date is that they save on capital or require less skill. Neither of these assumptions is necessarily true for the economy as a whole, and it should be emphasized that in the case of an export oriented pattern of industrialization, which is not restricted by the extent of the market, a higher degree of specialization is possible. The differences in the capacity to absorb technique will, in other words, be reflected in the choice of the goods to be produced and exported, rather than in acquiescence in substantial gaps of technology and cost levels across a wide spectrum of industries.

The high degree of specialization implied in a pronounced export orientation of industrial development undoubtedly carries a considerable risk, for the economy as a whole and even more for individual producers. The real alternative, however, is not a similar degree of industrial development with less risk but a slower rate of industrialization. Even the smaller of the advanced countries are more dependent on foreign trade, and the developing countries cannot hope to be an exception to this rule. For the economy as a whole the risk of a high dependence on exports can be reduced by efforts to spread exports over many markets, but since there is usually a minimum scale on which entry into any one market is feasible, this will generally require a larger scale of output than would be required with a higher degree of concentration on a few markets. The reduction of risk to the individual producer can be achieved to a certain extent through various forms of insurance, but to cover some types of risk government support may be required.

An important factor reducing the rate of expansion of the domestic market, as mentioned before, is the dependence of the developing countries on imports of equipment. These imports differ from others in that they are technically unavoidable so long as the developing country is not yet able to produce its own capital goods. At the same time, import substitution in this area is much more difficult than with respect to other commodities. The production of capital goods requires considerably higher skills, domestic demand for these goods is much more sensitive to quality differences, and the limited size of the market affects these goods more than the final products. A narrow market for final products represents an even more restricted market for the machines to make them, in terms of both the scale of output in any given line and the range of the capital goods that can be produced.

The production of capital goods, however, plays a special role in the industrialization process. Not only are these goods the instrument by which investment creates its own markets and facilitates sustained growth, but they are also the main breeding ground for new skills and the vehicle for introduction of new techniques. It is often recommended that the developing countries should develop their own specific technologies and should adapt those they borrow from the advanced countries to their own requirements. Although in the early stages of development successful imitation is probably a difficult enough task, the domestic production of equipment facilitates the adaptation of imported techniques to domestic conditions.

The importance of the capital goods sector for successful and self sustaining industrialization makes it necessary to devote special efforts to its development. The domestic market is nearly always inadequate for a competitive development of the

capital goods industries, so that an effort at import substitution can hope for success only if it is simultaneous with production for the foreign market. At first glance exports of capital goods from developing countries may seem to be an Utopian goal. The production of capital goods makes particularly heavy demands on skills, of which the developing countries are short, and demand conditions for these goods are much stricter not only abroad but also at home. But a closer look at the capital goods industries and at the list of products actually imported by the developing countries reveals that they include a wide range of fairly simple products; some of these, from the point of view of complexity of their production processes, are not further out of reach than many final products.

The foreign trade of the developing countries is often viewed, and with considerable justification, mainly as an exchange with the more advanced countries. This accords, by and large, with the development of their international trade in past decades. The great diversity among the developing countries nevertheless should make it possible to establish a broader network of mutual trade. In no area does this seem to be more called for than in the production and trade of capital goods. Furthermore, just as it is a waste of resources for the advanced countries to produce not only the most sophisticated but also the simplest of the capital goods for the developing countries, so is it a waste of resources, from their national as well as from the international standpoint, for them to produce the great variety of simple tools, components and accessories that serve as inputs for their own production. By contrast with many of the final-product industries, the skills and capital goods needed to produce these commodities are less specialized and can be more easily converted from one line of production to another. The problems created by a re-structuring of the international division of labour are likely to be less severe in some of the sub-branches of the capital goods industries than in the traditional industries, such as textiles, in which the less-developed countries have so far tried to expand their exports.

The evidence available seems to indicate that of the various categories of exports of manufactures from developing countries growth has, in fact, been most rapid in the capital goods industries. In part, the high rates of growth revealed by data simply reflect that these industries started from a low base, but to some degree the increase must also be attributed to the more favourable demand conditions abroad. It is reasonable to assume that the demand for capital goods is governed by more rational considerations than that for many consumer goods; the tariff rates and other trade barriers tend at present to be lower than for other commodities, and the share of transport costs in their final value is among the lowest of all commodity classes. In addition, in contrast to many other product groups, the capital goods industries are generally not highly concentrated, and least so in the international market.

Nevertheless, to develop a capital goods industry no doubt will often be a very arduous task, especially in view of a particularly wide disparity between private and social profitability in this sector. If the profitability of the production of capital goods necessary and justifiable from the social viewpoint is insufficient to call forth enough private enterprise, a case for a strong public support for these industries or for production by the public sector, even in an essentially private-enterprise economy, can be made.

Exports are in the nature of things more risky than production for the domestic market, which is a more familiar one and in which demand can often be manipulated to a considerable extent. Further, private entrepreneurs are usually reluctant to invest in industries that depend for a major part of their revenue on the external market. To achieve an export-oriented direction of industrialization, the Government may therefore have to provide relatively strong incentives to induce entrepreneurs to undertake ventures of this kind and often may even have to prime such a direction by helping to initiate certain industries on its own. This is in addition to the various supporting activities that Governments normally undertake in the field of export promotion and development. However, public enterprise in export industries raises problems of its own.

The difficulties of industrialization in the smaller developing countries, and also the bottlenecks to further import substitution in the larger ones have not gone unrecognized. Regional co-operation is regarded as one of the best possible ways of overcoming them. If much of the difficulty lies in the small size of initial markets, then any measure expanding the market opportunities for investment and permitting a higher degree of specialization will alleviate the problem. However, unless regional co-operation itself assumes an export-oriented form, with the industries set up on a regional basis producing to a substantial degree for the extra-regional market, or unless the area of regional co-operation is large enough to permit intense specialization, it will merely mean that import substitution is raised to a somewhat higher level. Some of the schemes of regional co-operation involve a relatively small number of countries with small populations. Even if they can successfully combine and pool their resources, change in the basic orientation will still be required if development is to go on unimpeded. Although regional co-operation alone provides no basic solution to the industrialization problems of

the small developing countries, it can certainly assist in bringing about a shift to an export-oriented pattern of industrialization. All the risks and difficulties involved can be considerably reduced if export-oriented industrialization is undertaken from a broader basis than that of the small national markets of so many of today's less-developed countries.

In conclusion it may be said that if the developing countries are to achieve an export-oriented industrialization, which alone seems a favourable pattern for ensuring their continued growth, far-reaching measures of co-operation will be required on the part of the developing countries, the advanced countries, and international organizations.

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The Role of National Development Finance Companies in Industrial Development*

INTRODUCTION

THE AIM OF THIS ARTICLE is to review the experience of the World Bank Group in helping the creation or expansion of development finance companies in the Group's member countries. The International Bank for Reconstruction and Development and its affiliates, the International Finance Corporation (IFC) and the International Development Association (IDA), known as the World Bank Group, are associated with development finance companies in twenty-one countries. However, most of the experience of the World Bank Group with development finance companies has been of fairly recent origin. In two countries, Ethiopia and Turkey, the association goes back to 1950, but in fourteen of the 21 countries it goes back no further than 1961. Given this qualifying factor and the additional factor of the diversity of the experience in different countries, it would be difficult at this point in time to attempt any definite conclusions about the actual impact of such institutions upon the industrial development process. But the Bank Group's experience is worth consideration to the extent that it identifies some of the potential contributions and some of the problems of these institutions.

A host of different types of institutions sharing the common objective of providing medium-term and long-term funds for productive investments and, usually, also the technical advice needed to formulate and carry out such investments are broadly identified as "development banks". One category of institution falling within this broad definition is the private development finance company. Institutions of this type are designed to provide medium-term and long-term loans and equity capital for industry and other private productive enterprises, to underwrite securities of such enterprises, to promote new enterprises and to assist entrepreneurs in preparing investment proposals. They also act as channels for foreign capital and technology, in particular by bringing together foreign and local investors in joint ventures. By becoming an important element in a country's capital market, they can help to mobilize domestic savings and, in combination with technical skills, canalize them into productive activities.

To perform these functions, the development finance companies need three main tools. The first is a supply of long-term capital, which will be particularly useful if part is available in foreign exchange. The second is experienced management, possessing both a world-wide acquaintance with modern investment techniques and a knowledge of national conditions, and capable of appraising objectively investment opportunities, market possibilities and investment risks and of assisting clients to obtain technical and managerial aid. The third tool is contact with foreign business and investment institutions and international financial and technical assistance agencies, to help in recruiting outside capital and technology.

WORLD BANK GROUP AND DEVELOPMENT FINANCE COMPANIES

This, in outline, is the nature and purpose of the private development finance companies whose establishment or expansion the World Bank Group has been encouraging. By the close of the fifties,

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the Bank was associated with six such companies—in Austria, Ethiopia, India, Iran, Pakistan and Turkey—and had made loans to them totalling $76.7 million.[1] By the end of 1962, five more institutions in four countries—China (Taiwan), Colombia, Morocco and the Philippines—had joined the list, and the cumulative total of Bank and IFC financing of development finance companies had risen to $167.1 million. The rapid growth at the beginning of the sixties in the Bank Group's interest in this type of institution resulted in the designation of IFC, in 1962, to act for the Group as a whole in this particular field.

There is an increasingly distinctive pattern to the World Bank Group's assistance to development finance companies. The pattern takes the form of an equity investment by IFC accompanied by loan funds from the World Bank. Two institutions, the China Development Corporation (CDC) and the Industrial Development Bank of Turkey (IDB), have re-lent at commercial rates the proceeds of IDA credits extended their respective Governments for that purpose. By the end of March 1967, the Bank Group's direct financial assistance to development finance companies in the form of loans, equity investments and credits amounted to $570.6 million to 25 companies in 21 countries. Of this total, some $512 million represented World Bank loans, $40 million was in the form of IDA credits and the remaining sum in IFC investments and underwriting commitments.

This, however, is an incomplete statement of the role that the Bank Group has played in supporting these institutions, for IFC has in several instances helped to expand and reorganize existing companies and has lent assistance in establishing new concerns of this nature. It has helped to bring in private investors and has provided a wide range of technical assistance, including help in drafting statutes, preparing policy statements, finding experienced management, training staff and developing proper procedures for project analysis. In some cases IFC has found it appropriate to cement its close working relationship with a company by acceptance of a seat on the company's board; at the moment it is represented on ten such boards. Although IFC's investments range through several categories of enterprise, the development finance company is, in fact, the only kind of enterprise in which IFC has accepted an offer of board representation.

Ownership

Before embarking on a more detailed discussion of the nature and role of development finance companies and the Bank Group's association with them, it is important to clarify the reason why, of the several categories of development finance institutions to which the name "development bank" is applicable, it is the privately controlled institutions that have attracted the support of the Bank Group. It is the experience of the World Bank and IFC that development finance companies are most likely to operate successfully if their ownership is predominantly private. This appears to be the best way of assuring continuity of sound investment policies and experienced management, so that operations will be conducted on sound business lines and with reference to economic rather than political criteria. Examples are numerous of publicly controlled development banks that have failed in their purpose because their investment decisions were dictated mainly by political considerations.

For this reason, the World Bank by choice limits its assistance to development banks to those that are in wholly or predominantly private hands. As far as IFC is concerned, there is no choice. By virtue of its Articles of Agreement, it may not invest in government-controlled enterprises. It does, of course, have the competence to associate with institutions in which the Government is a minority shareholder, which is sometimes the case. In certain circumstances it might be impossible to establish a new development finance company as a genuinely national institution—which it ought to be—without the presence of the Government among the shareholders. In some countries the paucity of domestic investors, combined with the presence of investment opportunities that offer a larger and more immediate return than that which a development finance company can offer may make it impossible to marshal more than a token amount of private domestic capital for investment in the company's shares. In such circumstances it may be necessary for the Government, as an interim step, to subscribe to a substantial block of shares to achieve the requisite degree of domestic ownership. So long as the Government remains in a minority, non-controlling position, this is no bar to an IFC investment; but when the Corporation has subscribed in such a situation, it has first satisfied itself that the company was effectively isolated from government control, and that the Government was prepared to sell its shares to domestic private investors as and when they could be interested. The Government and IFC, on several such occasions, have agreed to make such sales *pari passu* from their respective holdings.

Since IFC has been regarded as national in character and a combined IFC-domestic majority in the company conveys sufficiently the image of a national institution, the Corporation has a certain duty not to dispose of its shares to foreign investors in a measure that would destroy the company's national character. In recognition of this, IFC is

[1] Unless otherwise indicated, all sums are given in US dollars.

willing in certain cases that its sales from its holdings of the company's shares be confined to sales to private domestic investors. For example, when the Liberian Bank for Industrial Development and Investment (LBIDI) was set up in 1965, IFC and the Liberian Government both subscribed to the initial share capital and agreed to reserve their shares for sale to private Liberian investors as a means of encouraging wider local ownership of the institution. In addition to establishing and maintaining its national character, a development finance company will find it advantageous to achieve a broadly based ownership. By avoiding control by a single investing group, the company will be in a better position to persuade the Government that it is in the public interest for the company to receive some special benefits.

Capital structure

Even with considerable government aid, it is unusual for a development finance company to be very profitable in its early years. While its initial stockholders have therefore to be motivated by something other than immediate financial gain, the organizers of the company, on their part, must plan the capital structure of the enterprise in such a way that investors will at least feel that their capital is safe from impairment and that in the not-too-distant future they will begin to receive at least a modest return on their investment. Sufficient net earnings will have to be generated to cover the cost of adequate management and staff, the building up of adequate reserves, the payment of taxes and, as soon as possible, payment of a moderate dividend to shareholders. To achieve such earnings the company must plan on obtaining a substantial part of its resources from borrowed funds, which can be lent at a higher interest rate than the company has to pay, and thus provide "leverage" to enhance the return on equity. The problem, however, is that the "spread" between the interest rate the company can charge its borrowers and the rate it must pay to conventional sources of capital--domestic, foreign and international--is rarely sufficient for a new company to become soundly established.

Government assistance

Most of the development finance companies assisted by the World Bank and IFC have, with the help of their respective Governments, found a way round this problem. They have been able to obtain special government assistance, in the form of so-called "quasi-equity", that is to say a long-term loan - usually about 30 years with 15 years' grace - interest-free or with a very low rate of interest, which will be subordinated to or, at the most rank *pari passu* with the share capital in case the company has to be dissolved. The absence of interest gives the company a far better chance of reaching a profitable stage early in its life, while the subordination to equity provides a cushion to protect the shareholders in the years before adequate reserves have been established. For example, when the Industrial Credit and Investment Corporation of India (ICICI) was established in 1954, the capital resources of the Corporation included a 30-year, interest-free advance of 75 million rupees ($15.75 million) from the Government, with a fifteen-year grace period. Similarly, when the Pakistan Industrial Credit and Investment Corporation (PICIC) was established in 1957 with Bank assistance, the capital resources of the Corporation included a 30-year, interest-free loan of 30 million rupees ($6.1 million) from the Government of Pakistan. In both cases the loans were subordinated to the share capital. But a government loan on similar terms extended to the Industrial and Mining Development Bank of Iran (IMDBI) ranks *pari passu* with the share capital.

Other forms of government support that are helpful to the finance companies (but do not eliminate the need for quasi-equity or its equivalent) are preferential income tax treatment and guarantees of foreign loans. In some countries, the Government has entrusted the finance company with the management of special public investment funds, for which a managing agency fee is paid. For example, the Government of Iran turned over to IMDBI for management existing loan portfolios totalling the equivalent of $18.7 million and also made available a "special equity fund" equivalent to $12 million with which IMBDI could take up equity participations in private enterprise.

Thus a Government may support a development finance company in a number of ways: by taking a minority participation in the share capital, by providing long-term "quasi-equity" loans, by turning over investment funds for management by the company in return for a fee, by giving preferential income tax treatment and by guaranteeing foreign loans. It is now necessary to identify the non-governmental sources of equity and loan capital.

Private domestic investors

On the domestic front a development finance company looks to two categories of private investors for participation: institutional and individual. Institutional investors are usually motivated by a mixture of public-spiritedness and an expectation of indirect benefits to their own businesses through a general strengthening of the economy. But sometimes inducements are necessary. For instance, commercial banks, industrial firms and trade associations took up the entire initial share capital of the IDB of Turkey, but first the Government had to guarantee a minimum dividend.

Individual investors are harder to attract. For one thing, there are usually few to be found in the developing countries; and except where the known investment alternatives are considered less safe or attractive than investment in the finance company's shares, they tend to adopt a wait-and-see attitude. They may well come forward later. There were no individual subscribers to the initial share capital of IDB, but a capital issue four years later was over-subscribed, and many of the subscribers were individuals.

As has been noted earlier, ownership of a development finance company should be as broadly based as possible to avoid control by a single investing group and to demonstrate the nation-wide character of the institution. Some development finance companies reserve a percentage of the shares for individual investors as opposed to industrial groups and financial institutions. When ICICI was established, it reserved 30 per cent of the initial share capital for individual domestic investors. More than half the applications received were for fewer than 20 shares, the par value of the shares being 100 rupees (the equivalent of $21 at that time).

Foreign investors

Most development finance companies have substantial foreign shareholdings, and there are several advantages in such participation. For one thing, it may help to insulate management against local pressures to make or decline to make particular investments, thereby strengthening the company's independence. It may promote a flow of external capital to local industry and provide contacts with financial institutions in the capital-exporting countries. It may facilitate the importation of technical skills in industrial production and management. Finally, the evidence that overseas capital regards the company's shares as a fair risk may give confidence to potential domestic investors. Banks and insurance companies doing business in the country feature prominently among foreign investors, one reason being that they are able to pay for their shares in local currency, an advantage not enjoyed by non-resident investors, who are consequently somewhat more difficult to enlist.

According to preliminary figures for the close of 1966, foreign shareholders, largely United States, European and Japanese, have provided $47.5 million of the $280 million total share capital of the 25 institutions in which the World Bank and IFC have an interest. Local investors provided $218.5 million and IFC $14 million. A breakdown of the ownership of PICIC, as a fairly representative example, shows the investors, as of 31 December 1966, to be 60 per cent local, 10.9 per cent United States, 10.8 per cent British, 7.3 per cent Japanese and 6 per cent German, with IFC holding the remaining 5 per cent of the shares.

Additional resources

This equity base, supplemented in many cases by quasi-equity, has made it possible for development finance companies to obtain substantial additional resources in the form of fixed-interest loans. Loan funds have sometimes been provided by Governments at commercial interest rates (as distinct from the concessionary terms of quasi-equity loans), but more often such loans come from international organizations, such as the World Bank or the Inter-American Development Bank, or from foreign Governments as bilateral aid. Private foreign institutions have been a much less important source of loan capital.

If quasi-equity amounts to one and a half times the share capital (the usual proportion), then the "borrowing base" of a company with a share capital of $1 million is $2.5 million. Lenders like the World Bank (which has encouraged the adoption of this form of capital structure) feel that a finance company may in time borrow up to three, four, or even for some well-established companies five times the amount of capital, free reserves and quasi-equity. The company with $1 million share capital may thus in due course be able to command total capital resources of $10 million or more.

The amount of leverage this has provided for the operations of the 25 development finance companies associated with the Bank Group can be illustrated fairly simply. As previously mentioned, the total share capital of these institutions on 31 December 1966 amounted to the equivalent of $280 million. Their total resources (equity, quasi-equity and loan funds) as of that date amounted to the equivalent of $1,048.7 million. In turn, these resources had made it possible for the development finance companies to enter into commitments in excess of an estimated $1,700 million, chiefly in such industries as textiles, food processing, chemicals, iron and steel, machinery and equipment and pulp and paper.

Management

A suitable capital structure is one indispensable ingredient. Good management is another. Since there is generally a shortage of skilled people with managerial abilities and investment experience in the less-developed countries, at least the chief executive officer will often have to be recruited from abroad. Helping to find such a man is one technical assistance task that IFC has often undertaken. Putting an experienced manager in from the start is important not only to get operations off on the right footing but also to begin the process of training nationals for senior positions from the earliest possible moment.

There must also be from the beginning of operations sufficient skilled staff to carry out engineering

and financial appraisals and to follow up projects assisted. In IFC's experience it has proved a false economy for a development finance company to wait until its income is large enough to cover the cost of such a staff. In the absence of capacity to make adequate appraisals, the investment of the company's resources is almost certain to be slow, or poor investments may be made. The key to this problem lies in the capital structure which, as has already been pointed out, should be so organized as to produce an adequate level of earnings fairly soon.

Investment policies

Experienced and, above all, intelligent management is indispensable because the formation and execution of proper investment policies is by no means easy. A development finance company is both a development institution and a profit-making institution. Its investment decisions must principally take into account the economic and financial prospects of the enterprises being assisted without ignoring the credit and security factors.

For example, new enterprises often require substantial equity capital, and most development finance companies are willing to make equity investments (provided there are no managerial responsibilities to be assumed, except possibly in the initial promotional phase). But unless they operate in a reasonably well-developed capital market and with a fairly ready market for industrial securities (as in India), they would be imprudent to hold in their portfolios equities amounting to more than their paid-up capital and free reserves. One form of investment that may be especially well adapted to the needs of both the company and the client is the loan with equity features such as conversion rights or profits participation. Through this medium the development finance company should be able to secure a proper yield on its investment.

Equity investments

Equity investments have many advantages for a development finance company. It is true that at the outset of operations, a loan portfolio generating regular and immediate income can be invaluable for building up reserves, meeting administrative expenses, servicing borrowed capital and paying dividends on share capital. Turkey's IDB deliberately avoided equity investment in its early years, believing it too risky for a private finance company in the initial phase of operations. But once the finance company is a going concern, the attraction of equity investments becomes very real. They enable the finance company to share in the profitability of successful enterprises, thereby adding to the company's income, providing a cushion against possible losses on other investments and demonstrating the attractiveness of industrial financing. Furthermore, by selling equity out of its portfolio, the company can help to spread share ownership and develop a capital market.

Though an equity investment may very well suit the finance company, the company is still bound to take into consideration the attitude of the applicant towards outside participation. Businessmen are frequently reluctant to share their ownership, since it usually means disclosing the details of their operations. Furthermore, they may be concerned about the direction in which the finance company may eventually dispose of its shares. PICIC, for instance, has found that some entrepreneurs would rather pay more to borrow funds elsewhere in these circumstances.

Loan financing

In loan financing, a balance between the interests of the lender and the borrower must be reflected in the terms. The duration of loans must be long enough not to place undue hardship on borrowing enterprises, something that anyway would jeopardize repayment, and also must be related to the duration of the finance company's borrowings. The company's loans will generally include a substantial grace period to allow for construction and start-up of the project.

The level of lending rates cannot always be fixed by independent decision of the finance company. In some countries the Government sets the maximum rate. But whatever rates the finance company charges, they should bear a relation to the opportunity cost of capital. If Governments impose a much lower rate—as some have done—they thereby tend to encourage uneconomic investment and to diminish the profitability of the finance company's operations. Irrespective of government control over or influence on the lending rates, their upper limit is determined by the rate at which capital is available from alternative sources. Reluctance to borrow from a development finance company may indicate that commercial banks or insurance companies or equipment and materials suppliers are able to lend at lower rates, even if at shorter term.

Size of investments

The size of a finance company's individual investment is subject to rather severe limitations. Small loans and participations generally involve such a high degree of risk and, compared to the eventual yield, are so costly in terms of staff time absorbed in appraisal, administration and follow-up that companies are obliged to set a lower limit to individual operations, usually somewhere between $20,000 and $50,000. Thereby development finance companies almost completely remove

themselves from the field of aid to small enterprises, even though in many countries such aid appears to be of great social and economic importance, and in some countries may constitute the bulk of assistance needed in the private sector.

Attempts are being made to devise ways to remedy this situation. For instance, in 1963, as a condition of a government loan, Malaysian Industrial Development Finance, Ltd. (MIDFL) agreed to make up to 20 per cent of its annual commitments in amounts equivalent to $17,000 to $50,000. The small loan programme actually accounted for much less business than expected, with only 4 per cent, 5 per cent and 8 per cent of total commitments in the past three years being in amounts of less than the equivalent of $50,000. Many of these were hire-purchase and factory mortgage loans, which have proved somewhat less profitable than ordinary long-term loans. On the other hand, orthodox small loans have proved fairly remunerative, so that the small industry programme in total has not been significantly less profitable to MIDFL than the rest of its business. In an effort to raise the return on small lending, the company has taken steps to simplify appraisal and follow-ups and to increase the interest rate on hire-purchase loans. It has also formed a new subsidiary specifically aimed at assisting small industry by providing standard factory units on industrial estates that are sold for cash or through factory mortgage loans. This approach, however, is not typical, and its success has yet to be ensured.

At the other end of the scale, dictates of prudence, which call for diversification of the company's portfolio, set an upper limit on the size of a finance company's investment in any single enterprise. As a matter of policy few finance companies will commit funds representing more than 15 per cent of their capital and reserves to a single project. More liberal than most in this respect is the National Investment Bank for Industrial Development S.A. (NIBID) of Greece. NIBID is prepared to commit an amount equivalent to 20 per cent of its share capital and surplus in an equity investment and up to 25 per cent in a total commitment. The five Colombian Financieras will not normally commit more than 15 per cent of net worth to any enterprise, and in no event would they exceed 25 per cent.

Thus only to a certain limit can finance companies offer direct financial assistance to large-scale projects. But here their international connexions are especially valuable, for it is possible through them to secure participations from foreign or international financing institutions. The policy statements of most development finance companies stipulate that the company should not provide more than half the finance required for any given project. Often a company has successfully recruited foreign capital by taking the lead in the financing and allowing the example of its own commitment to draw in the foreign investors. A number of development finance companies have engaged in joint financing with another institution, where the terms and nature of the investments have often been identical. In a country with more than one development finance company it would clearly be logical for two or more of them to join in supporting large ventures, and indeed, this has been done in Colombia.

Joint financing with IFC

More and more frequently IFC has participated with development finance companies in the financing of larger projects. In fact, today IFC does not normally invest directly in an enterprise located in a country where it has relations with a development finance company except in co-operation with that company. In most cases the development finance company has turned to IFC because the project has been just too large for it to handle. Foreign exchange is usually the key factor, especially in the financing of large new enterprises, such as a textile mill or steel plant, where there is a high foreign exchange component in the project cost.

The case of Industria Ganadera Colombiana (INDUGAN), a Colombian livestock company, provides one example of the way IFC may join with a development finance company in a financing operation. INDUGAN was seeking financial aid to increase greatly its production of beef cattle and to begin a meat marketing programme. The company had been established in 1961 by a group of leading Colombian cattlemen together with local financial and industrial investors, including Corporación Financiera Colombiana (CFC), a privately owned development finance company in which IFC is a shareholder. The total cost of INDUGAN's expansion programme was estimated at the equivalent of $7.5 million. In June 1966, IFC agreed to an investment consisting of a nine-year loan of $1 million and the purchase at a cost of approximately $620,000 of one million new shares of the company, with CFC and the rest of the shareholders acquiring an equal amount of new stock. Most of the remaining cost of the programme was expected to be covered by cash generated from the company's operations.

Project selection

By and large the development finance companies with which the World Bank Group is associated have built up well-diversified portfolios through selection of a broad range of industries for assistance. India's ICICI, for instance, during the period 1955–1966 financially assisted over 20 different types of industry, while between 1963 and

1966 the Private Development Corporation of the Philippines (PDCP) engaged in financial operations in more than 15 different industries. No single criterion or rule in project selection by development finance companies can be established. Objectives and policies vary from company to company and from time to time. Furthermore, and this is basic, unlike purely financial institutions for which earnings are the exclusive test of economic efficiency, finance companies cannot reduce all the ingredients of investment decisions to a single measurable standard; as development organizations they are also concerned with the total impact of a project on the community. This does not mean that finance companies must formally apply an economic priority test. They do not establish preferred categories of industries nor do they require as a condition of financing that, for example, in a country with surplus labour, the enterprise be employment-creating, or in a country with balance of payments difficulties, that it earn foreign exchange or replace imports. In effect, the ability of a finance company to set any pattern at all is only as great as the choice of viable projects presented to it will allow. Moreover, if the country has an effective development programme, businessmen and industrialists will probably be granted the official licenses and sanctions without which a project could not go forward except in those areas designated as of relatively great economic urgency. This is particularly true of medium- and large-scale industrial enterprises in need of imported equipment and machinery. Thus, while development finance companies may not be bound by any set of rules regulating project selection, this selection tends to fall into a pattern set by the nature of a country's economy and the planned steps being taken to develop it. For example, in view of the importance of tourism to Morocco and Tunisia, it is not surprising that the development finance companies in these countries have been active in assisting hotel construction and transport facilities.

One special characteristic of the industrial lending patterns of development finance companies is the high proportion of resources devoted to new industries and to new enterprises. This is in part a reflection of the difficulties a new venture encounters in raising capital; as a general rule well-established industrial concerns are considered relatively creditworthy and therefore find it easier to attract investment. But often it is the result of deliberate policy on the part of the management in seeking to diversify the industrial base of the country. This has happened in India, for example, where the Industrial Credit and Investment Corporation of India (ICICI) has chosen to minimize its assistance to the country's traditional industries like jute and other textiles. Again, in Finland the Industrialization Fund of Finland has deliberately spread its assistance among newer industries like metals, furniture manufacture and textiles in an effort to reduce the country's industrial dependence on timber and paper. And in Greece, NIBID has typically devoted approximately half its assistance to new enterprises.

Technical and managerial assistance

A most important function of a development finance company is to provide technical and managerial advice and assistance to existing and new enterprises. The company's operational staff should be able to provide guidance to prospective clients in preparing their plans for establishing or expanding their businesses. When, as frequently occurs, a finance company is unable itself to provide technical assistance, it should be in a position to put its clients in touch with expert consultants, domestic or foreign, who can provide the needed help. Sometimes it may even be necessary to help a client find suitable management; in the case of enterprises promoted by the finance company itself, finding such management will be one of the crucial elements of success.

Promotional activities

Most development finance companies have at one time or another taken the initiative in promoting specific business projects. Systematic attempts by finance companies to interest private investors, both foreign and local, in particular investment opportunities can have important results in countries that lack an experienced entrepreneurial class or where the business community shows little entrepreneurial spirit. While the promotional function is, therefore, an important one, a development institution whose primary purpose is financing can engage in it only to a limited extent. For one thing, promotion is likely to be expensive and unlikely to produce an immediate return. Furthermore, to promote a proposal of its own and to induce others to join in it, a development finance institution must be even more sure of the prospects of success than it need be when it is financing someone else's project. This implies a degree of investigative, analytical and organizational work for which a finance company is not necessarily well prepared. Some special responsibility continues, very likely well into the start-up period of a new enterprise; and if the project runs into difficulties, the promoting group may have to become intimately involved in the management.

Effective promotion can thus require the devotion of an extraordinary measure of time and effort on the part of the finance company. In order not

to jeopardize the proper discharge of its regular functions, the company must be extremely selective and objective in its choice of what is to be promoted.

There are three basic types of promotional activity in which a development finance company might engage. The first consists of examining a project proposal and modifying it so that it takes the most economic and commercially profitable form. The second, and much more general kind of promotion, consists of surveying an economic sector or a geographic region that may be economically backward to see what opportunities for industrial development exist that may be of interest to entrepreneurs and investors. The third, like the first quite specific, consists of promoting the establishment of a particular enterprise to fill an important and well-defined gap in the country's economic structure.

The first type of promotional activity is one to which development finance companies should be particularly well suited. An appraisal by the finance company of the project's economic, technical, managerial and financial aspects may uncover the need for substantial modifications in the project proposals. For example, in a complex industrial undertaking, the need may be revealed for a technical partner, from abroad if necessary, willing to provide share capital; and the finance company, with its wide foreign and domestic connexions, should be prepared to assist in finding such a partner.

The second type of promotional activity—endeavouring to identify general areas of need in the economy—is in theory important. But, in the World Bank Group's experience, the practical results of such studies have not been very encouraging. For example, IFC was approached in 1961 by the Plan Organization of Iran and IMDBI to arrange a survey of the Iranian chemical industry. The completed survey indicated some promising areas for investment but failed to arouse the interest of any likely sponsors.

The third type of promotional activity has an important advantage over the general survey approach, since it concerns a project designed to meet a clear-cut market need. The expansion of the cement industry in Pakistan in 1961 provides an example of a successful operation of this type. The agreement reached the previous year between India and Pakistan over the division of the Indus River waters had resulted in the launching of a huge public works programme, which in turn had created a considerable demand for cement. PICIC then volunteered to be responsible for a general review of the industry and chose an American firm of consultants to undertake the survey. The survey report recommended the expansion of two of the four existing plants and the construction of three new plants. PICIC soon found two prominent industrialists willing to sponsor and invest in the cement companies. For one company, PICIC subsequently negotiated for financial assistance from the Kreditanstalt für Wiederaufbau of the Federal Republic of Germany and for the other it received assistance from IFC.

Assistance to development of capital markets

Reference has already been made to the development finance company's broad objective of helping to fill a gap in, and contributing to the growth of the national capital market. One possible means of achieving this is to induce domestic investors to buy shares in the finance company itself. To those who do so the company will have an obligation to conduct its operations as profitably and safely as possible. However, if the company is frank with the public it will not, in its early years, promise a very attractive return. Wider ownership of the equity of a development institution represents a major step towards gaining public confidence in industrial investment, but this is not likely to be achieved until a reasonable record of earnings and dividends can be shown. As was mentioned earlier, few private Turkish investors were interested in the shares of IDB when it began operations; today, as a result of seventeen years of productive operations and an active marketing effort by the company, there are almost 250 private shareholders, and the company's stock is among the most actively traded on the Istanbul Stock Exchange. BANDESCO, the Spanish development finance company, has no quasi-equity but relies on the public sale of its bonds for the major part of its total resources.

But these are the exceptions. Far more useful and important are the efforts of the finance company to promote the ownership of industrial and other shares, and other securities. Foremost among the techniques employed by a finance company to achieve this is the sale from its own portfolio of the securities of enterprises that have passed initial hurdles and have become successful. This, of course, encourages the broader ownership of industrial shares and increases the supply of marketable securities. But it also replenishes the finance company's resources. The replenishment can sometimes be quite substantial. By the end of 1965, IDB had received the equivalent of well over $2 million from share sales to some 200 investors in Turkey, with private individual buyers accounting for over half the amount. In 1966 IDB sold over $3 million of shares. In some cases development finance companies have been able to attract participations from private investors in particular commitments at the time these are made and on the same terms as the institution itself.

Another technique used increasingly by development finance companies is the underwriting of public issues of shares (and other securities) of

enterprises that it promotes or assists. The appraisal of an enterprise made by the finance company and its willingness to invest some of its own funds, should help to create in the investing public confidence that such an enterprise is sound. Although underwriting calls for special skills not always available to development finance companies, many companies have nevertheless achieved a position of some eminence in the field in their respective countries. For example, ICICI has engaged in 120 underwriting operations since its inception and has accounted for 12 per cent of all the shares underwritten and issued to the public in India in recent years. Many of the shares ICICI has been called on to take up for its own account have shown appreciable capital gains for the company when later sold. And C.A. Venezolana de Desarrollo (CAVENDES) has been instrumental in pioneering an underwriting activity in Venezuela, a country unfamiliar with the practice.

In many other ways the management of development finance companies can encourage and assist the flow of private savings into productive investment. The Turkish Bank, for instance, in cooperation with the Planning Bureau and the Union of Chambers of Commerce and Industry has sponsored a major study of the economic, legal and financial aspects of the capital market in Turkey. As a result of this study legislation has been set in motion to amend the country's commercial code, and tax laws have been drafted. The Industrialization Fund of Finland (IFF) has been actively studying the Finnish capital market and making recommendations for its further development.

In Iran, IMDBI's reputation as an investment institution is so well established that its advice is sought not only by private entrepreneurs but also by the Government. Its leading role in efforts to establish a stock exchange testifies to its ability to hold a central position in the financial field and to its impact on the economy of the country. Assistance of this sort, the devising of new forms of securities, advice to governments on many matters affecting the attractiveness of investment in productive enterprises in the private sector — these are a few of the possible methods open to development finance companies in their efforts to fill the gaps in their countries' capital markets.

Limitations on the Role of Development Finance Companies

A review of the World Bank Group's experience with private development finance companies would be incomplete without briefly discussing the suitability of this type of institution for any and all countries wishing to speed their industrialization. At least three conditions must exist if the institution is to perform a useful function and to grow. First, the development of a strong private sector must be consistent with the country's over-all aims. It would be pointless to establish such an institution in a country attempting to organize productive activity mainly on a socialized basis. Second, unless a country already possesses at least a nucleus of entrepreneurial and managerial talent, a reasonably broad market for the products of new enterprises, some natural resources and basic services (power, transport and water), a supply of trained or trainable labour, and a reasonably good investment climate, there would be little or no need for the type of financial assistance such an institution can provide. And unless it can look forward to a certain volume of business, a development finance company will not be viable.

Third, there must be a clearly defined gap in the capital market which this institution should be trying to fill. If other sources are willing and able to provide the same sort of financial assistance, no purpose is served by establishing such an institution. It so happens, however, that there are few suppliers of medium- and long-term capital in the new states. In many of them, those who have savings prefer to hold them abroad or to invest in the traditional, and sometimes more immediately lucrative, fields of real estate and commerce. Where credit can be obtained, it is usually on short term or at very high rates of interest. New and unfamiliar industrial enterprises, from which returns are often slow and which offer a prospect of risk, are bound, under such circumstances, to find it difficult to attract investment.

Among the new states, and particularly the smaller ones, meeting these conditions is exceptionally difficult. For them, alternative methods of financing the productive sectors have to be devised.

There are many gaps and weaknesses in the capital market of most developing countries, and no single institution can be expected to solve all the problems. However, in judging the performance of private development finance companies in those countries that have already crossed the threshold of development, it is fair to say that, in a number of respects at least, these institutions are furnishing the ingredients for industrial growth. To an extent determined principally by their own financial resources and the availability of viable projects, they are contributing to the growth of medium- and larger-scale enterprises as well as playing a promotional role in the establishment of new enterprises and new kinds of industry. Through sales of shares from portfolio and through underwriting arrangements, they are assisting the growth of local capital markets in a number of cases. These contributions can be expected to grow as the development finance companies themselves acquire more experience.

ANNEX I

Financing provided by the World Bank, IFC and IDA to development finance companies

(As of 31 December 1966)

Beneficiary		*Amount (millions of US dollars)*
Austria		
Österreichische Investitionskredit A.G. (IVK)	3 Bank loans	23.3
China (Taiwan)		
China Development Corporation (CDC)	1 IDA credit and 1 Bank loan	19.9
Colombia		
(a) Corporación Financiera de Caldas *(b)* Corporación Financiera Colombiana (CFC) *(c)* Corporación Financiera Nacional (CFN) *(d)* Corporación Financiera del Norte *(e)* Corporación Financiera del Valle	3 IFC investments and 1 Bank loan	29.8
Ethiopia		
Development Bank of Ethiopia (DBE)	2 Bank loans	4.0
Finland		
The Industrialization Fund of Finland (IFF)	2 Bank loans and 1 IFC investment	21.3[a]
Greece		
National Investment Bank for Industrial Development, S.A. (NIBID)	1 IFC investment	0.7
India		
Industrial Credit and Investment Corporation of India, Ltd. (ICICI)	6 Bank loans	139.1
Iran		
Industrial and Mining Development Bank of Iran (IMDBI)	3 Bank loans	40.1
Israel		
Industrial Development Bank of Israel (IDBI)	1 Bank loan	20.1
Ivory Coast		
Banque Ivoirienne de Développement Industriel, S.A. (BIDI)	1 IFC investment	0.2
Liberia		
Liberian Bank for Industrial Development and Investment (LBIDI)	1 IFC investment	0.2
Malaysia		
Malaysian Industrial Development Finance Limited (MIDFL)	1 Bank loan and 1 IFC investment	9.3[a]
Morocco		
Banque Nationale pour le Développement Economique (BNDE)	2 Bank loans and 1 IFC investment	34.0
Nigeria		
Nigerian Industrial Development Bank (NIDB)	1 IFC investment	1.4
Pakistan		
Pakistan Industrial Credit and Investment Corporation Ltd. (PICIC)	6 Bank loans and 1 IFC investment	109.3
Philippines		
Private Development Corporation of the Philippines (PDCP)	2 Bank loans and 1 IFC investment	44.4[a]
Spain		
Banco del Desarrollo Económico Español, S.A. (BANDESCO)	2 IFC investments	0.6
Thailand		
Industrial Finance Corporation of Thailand (IFCT)	1 Bank loan and 1 IFC investment	2.7
Tunisia		
Société Nationale d'Investissement (SNI)	1 Bank loan and 1 IFC investment	5.6
Turkey		
Industrial Development Bank of Turkey (IDB)	3 Bank loans, 1 IFC investment and 4 IDA credits	63.5
Venezuela		
C.A. Venezolana de Desarrollo (CAVENDES)	1 IFC investment	1.3
		570.6

[a] Includes underwriting commitments acquired by others.

ANNEX II

Resources outstanding as of 31 December 1966 of development finance companies

(Preliminary figures)

Institution	Amount[a] (millions of US dollars)	Institution	Amount[a] (millions of US dollars)
Austria IVK	57.8[b]	Philippines PDCP	23.6
China (Taiwan) CDC	37.4	Spain BANDESCO	63.3
Colombia CF Caldas	11.5	Thailand IFCT	6.4
Colombia CF Colombiana	35.8	Tunisia SNI	9.6
Colombia CF Nacional	21.2	Turkey IDB	82.9[f]
Colombia CF Norte	5.8	Venezuela CAVENDES	14.7
Colombia CF Valle	10.8	Total	1,048.7
Ethiopia IDBE	7.7		
Finland IFF	24.2		
Greece NIBID	15.6		
India ICICI	132.3		
Iran IMDBI	62.2[c]		
Israel IDBI	223.5[d]		
Ivory Coast BIDI	8.0[e]		
Liberia LBIDI	2.1		
Malaysia MIDFL	25.9		
Morocco BNDE	31.9		
Nigeria NIDB	15.7		
Pakistan PICIC	118.8		

[a] Consists of equity, i.e. paid-in share capital, reserves and surplus, and outstanding short- and long-term deposits and borrowing.

[b] As of 31 December 1965.

[c] As of 31 December 1966. Including public funds entrusted to IMDBI for management.

[d] Including managed loans on account of U.S. Agency for International Development (US/AID).

[e] As of 30 September 1966.

[f] Including public funds entrusted to Turkiye Sanayi ve Kalkinma Bankasi (TSKB) for management. TSKB is the Turkish name for IDB.

ANNEX III

Foreign shareholdings in development finance companies

(Preliminary figures)

Institution		Amount paid-in (Thousands of US dollars)	Institution		Amount paid-in (Thousands of US dollars)
China (Taiwan) CDC	as of 31/10/66	306.3	Malaysia MIDFL	23/5/66	4,021.2
Colombia CF Caldas	31/12/66	1,188.8[a]	Morocco BNDE	31/12/66	2,815.6
Colombia CF Colombiana	30/11/66	3,765.7[a]	Nigeria NIDB	31/12/65	4,143.6
Colombia CF Nacional	31/12/66	2,627.6[a]	Pakistan PICIC	30/6/66	3,359.9
Colombia CF Norte	31/12/66	362.9[a]	Philippines PDCP	31/12/65	2,128.6
Colombia CF Valle	31/12/66	600.0[a]	Spain BANDESCO	31/12/66	3,499.8
Finland IFF	31/12/66	625.2	Thailand IFCT	16/12/66	787.9
Greece NIBID	31/12/66	4,499.9	Tunisia SNI	31/12/66	798.0
India ICICI	31/12/66	2,978.8	Turkey IDB	4/3/67	925.3
Iran IMDBI	9/3/66	1,280.0	Venezuela CAVENDES	31/12/66	3,233.7
Israel IDBI	30/11/66	1,158.2[b]	Aggregate total		47,516.8
Ivory Coast BIDI	31/12/66	1,671.1			
Liberia LBIDI	31/12/66	738.7			

[a] Exchange rate of Col. $13.50 to $1 is used.

[b] Ordinary A shareholders only.

*Skill Requirements for Industrialization**

Introduction

THE PURPOSE OF THIS PAPER is to help define national and international action needed to determine the requirements for skilled personnel in industry in low-income, developing countries.

The importance of planning in this field is twofold. On the one hand, success in industrial development depends in part on the availability of skilled personnel, and it is the task of planning to ensure that skilled workers are available when needed. On the other hand, the cost of providing skilled workers is high: too much training for too many workers in some fields, too little training for too few workers in others and the recruitment of manpower abroad that could well have been trained at home are unnecessary burdens on poor countries.

The focus of the following discussion is on decisions to be taken by public policy makers. Each country has some facilities for skill formation the general education system, some enterprises in which workers can be trained, and possibly some schools or centres for vocational training. Also, each Government has some means of control over the provision and utilization of such facilities the budget may provide for increasing numbers of schools and teachers, the law may compel certain types of firms to provide specific kinds of training, the central bank may provide foreign exchange for study abroad, vocational guidance may be given, fellowships provided, and attractive salaries fixed with a view to inducing young people to seek certain kinds of training rather than others. Similarly many Governments can and do control the recruitment of foreign manpower to fill gaps in the national labour force.

General principles and methods of determining skill requirements

This paper is concerned with the "target-setting approach to human resources planning" (Harbison and Myers 1964, pp. 202 ff.).[1] The sources of industrial skills needed to meet the requirements of expanding industrialization in the developing countries differ according to the nature of the skill and/or the method of providing it. Hence, they also have different time dimensions, i.e. decisions taken now can yield results in the near future in some cases but only much later in others. The type of information needed for target-setting with regard to various sources of skill is also different; rather detailed data concerning short-term manpower requirements are wanted for some sources, more global figures about long-term requirements for others. In all cases this information must include expectations about future production and the kinds of work it would involve.

Four sources of skills may be distinguished: (*a*) general education; (*b*) formal institutions for specific vocational preparation at secondary and tertiary levels, such as technical schools, colleges and universities; (*c*) on-the-job training; and (*d*) institutions abroad and foreign teachers.

The functions of general education are far broader than the provision of skills for industrial development. But all advanced industrial skills require the competence in language, reasoning and mathematics that is achieved in general schools. Furthermore, adaptability to different types of work is enhanced by a relatively high level of general education; this is important when industrialization involves fast technological change. It is also important because precise forecasts of skill requirements are impossible, and trained personnel must be flexible. Therefore, the planning of general education should be part of the decision-taking processes with which this paper is concerned. Quantitative manpower targets to be met by the system of general education should be calculated as a basis

* Presented to the Athens Symposium by the International Labour Organisation.

[1] All references are listed at the end of this paper.

for action in that field. In practice, the main bottlenecks in general education in developing countries are at the secondary level (Harbison and Myers 1964, pp. 57, 81, 111).

Several types of vocational institutions provide various levels of training (including retraining) as distinct from general education. At the secondary educational stage, vocational and technical schools exist in which at the lower level specific skills in woodwork, metal working, etc., are taught. At the higher level a variety of scientific, technological, commercial and other fields may be covered. Beyond this a third level of formal training takes place in various fields of study as university or equivalent education. Most vocational institutions are provided by public authorities as part of a country's system of education, but others may be provided by industrial enterprises acting singly or jointly.

On-the-job training in a variety of forms is carried out wholly or largely within the enterprise in which the learner is employed. Such training includes apprenticeship programmes but also less formal methods of learning. It is provided for semi-skilled and skilled workers as well as for those in the middle-management categories. Much on-the-job training is arranged for newly recruited workers and employees, but advanced programmes exist also to prepare workers for higher grades of work or for new methods of production.

For a broad range of skills, a choice must be made between learning on the job and courses at schools. Public policy makers, too, must decide which method should be encouraged. For many types of training the cost of one method (assuming roughly equal efficiency of application) is much lower than that of the other. Training on the job is the more efficient method in many cases and should be more extensively used.

An important difference between the two methods is that it is easier to make the necessary advance calculation of industrial skill requirements in the case of training on the job than it is for institutions for formal training. First, whereas instructors and equipment used for training in an enterprise can normally also be used for production, the staff and installations of schools often cannot. Second, decisions to train specific persons on the job are usually linked directly to concrete jobs. These decisions normally rest with the employer, who decides in the light of his own production and investment plans. A decision to set up a school often rests with public authorities. This decision is based on a general expectation that, over a sufficiently long period of years, the number of people using the school will be sufficient to warrant its establishment. Moreover, actual training at schools is normally at the initiative of the trainee, who expects that his new skill will eventually stand him in good stead. But this expectation may not come true; the trainee may ultimately be employed in an occupation for which a different kind of training would have been more useful or cheaper. Even when employed in the occupation for which he was trained he may find his skills too advanced, or not advanced enough, or based on a different technology from that used in his job.

Therefore, it seems important that in general training should be within enterprises rather than in schools or other formal training institutions. Training of already employed persons should be connected with their jobs. In developing countries "pre-employment trade and technical training in secondary schools is probably a waste of both time and resources" (Harbison and Myers 1964, pp. 56, 68, 82, 96, 123).[2] Training in employment places considerable responsibility on employers, while reducing that of public authorities. For some kinds of training, however, formal courses in outside institutions (schools or centres) are preferable or indispensable.

Decisions for providing sources of skill must be based on targets. The period for target-setting is the time needed for the decisions to yield their results. The appropriate time span depends on the following factors:

(*a*) The period of learning needed to acquire the skill;

(*b*) When new facilities are to be provided—the period of constructing buildings, acquiring equipment, and providing teaching staff;

(*c*) When the number of trainees is to increase—the time needed to attract learners.

When new facilities are to be provided, it is also necessary to consider to what extent these are likely to be needed in the more distant future and whether the investment in new buildings and equipment is justified.

The actual length of these periods differs for the various types and methods of skill provision. But for most purposes one or more of three typical time spans will be relevant: the short-term (less than three years); the medium-term (from about three to seven years); and the long-term (more than seven years).

For secondary general education, the period for target-setting must be long, since this is, *inter alia*, the first stage in acquiring a wide range of advanced industrial skills. While long-term programming is hazardous and subject to great uncertainty, in the case of general education this is somewhat less so because the programming need not be detailed. Often only a distinction between scientifically and commercially oriented curricula is needed.

[2] Cf. also Foster (1965) and Thomas (1965).

In the case of formal technical education, greater precision in estimates of future requirements is needed because of the higher degree of specialization involved, but the period to be considered is shorter because years of preparatory general education need not be counted. Thus, medium-term forecasts are often helpful. However, when new facilities are needed, involving elaborate equipment—e.g. university departments of engineering—time must be added for fund-raising and construction, and estimates of long-term needs for such expensive new facilities must be made.

On-the-job training linked to specific jobs and conducted in large part with instructors and equipment that can also be used for production calls for much less advance planning than do formal education and training. It can be undertaken, and facilities made available, when a specific need arises.

Management should provide in its investment and production plans the spare capacity and time needed for ensuring that new recruits are trained and that established workers are up-graded to the extent called for by normal turnover and by growth in the labour force. The introduction of new products or of new methods and equipment may call for considerable retraining, and the enterprise's engineering staff who designed the new product or method should be available for this purpose. When ordering new equipment it may be necessary to stipulate that the enterprise supplying it will also help in retraining workers and higher employees. There is also some need for highly skilled staff to keep abreast of technological progress of interest to the enterprise.

The main difference between training abroad and at home is that if facilities are to be developed at home, teachers and instructors must be provided. Training requirements for such personnel have to be foreseen long in advance. It seems rational therefore that a large proportion of technical assistance experts in developing countries consists of teachers and instructors, many of whom train teachers and instructors in the country assisted. This means that education and training in developing countries can expand fast. It may also mean that in planning for the distant and very uncertain future some reliance should continue to be placed on a supply of teachers and instructors from abroad.

Technical assistance programmes have encountered considerable difficulties in recruiting highly qualified staff. If such programmes are to continue and even grow, some manpower planning at the international level will be as necessary as it is at the national level. Moreover, at lower levels of education and training, the language barriers reduce the extent to which foreign teachers and instructors can be employed.

Targets for industrial skill formation in the short, medium and long run must be derived from expectations regarding industrial output and technology. In recent years a number of methods have been developed to estimate skill requirements in terms of output expectations. Although these methods are all deficient in many ways, they do help to raise the level of decision-taking above the haphazard and the short-sighted. However, nearly all systematic methods of forecasting skill requirements or setting targets for meeting them concern general education. Much less attention has been paid to vocational education, and almost none to on-the-job training.

Some of the methods will now be briefly reviewed. The purpose of this review is threefold:

(*a*) To illustrate the nature of the work involved in preparing rational decisions;

(*b*) To indicate the kind of national facilities needed;

(*c*) To indicate what contributions could be made by international action.

The case of long-term problems on which little information is available with regard to output expectations is perhaps the simplest to examine. There are few variables to consider. Thus, the Tinbergen-Correa Model enables educational requirements to be determined at the secondary and third levels, for sequences of six-year periods (Tinbergen in Parnes 1963, pp. 159ff.). To this end the model assumes a certain rate of future growth in global production, certain fixed relationships between this output and the required numbers of workers with secondary and third-level education, certain teacher-student ratios and a six-year study period at each level. The numbers of persons with secondary and third-level education assumed to be needed per US$1,000 million volume of annual production were derived from United States data.

Illustrative results of this model for an 18-year period are as follows: Case A concerns an assumption of 30 per cent growth of national output per six years, or 4.47 per cent *per annum;* in Case B growth is assumed to be 40 per cent per six years, or 5.77 per cent *per annum.*[3]

The model also permits additional calculations for manpower with second and third-level education when the rate of growth is to be stepped up from 30 to 40 per cent per six-year period. Furthermore, it specifies how the use of foreign manpower can shorten the period of transition from the lower to the higher rate.

The limitations of this model are obvious. For instance, the assumed ratios may not be valid for

[3] The model is known to have been applied in practice in Greece, Spain, Turkey and China (Taiwan); cf. OECD (1965) and H. F. McCusker, Jr. (1964).

Table 1

PREDICTIONS OF TINBERGEN-CORREA MODEL FOR MANPOWER REQUIREMENTS AT VARIOUS VOLUMES OF PRODUCTION

30 per cent (Case A) or 40 per cent (Case B) growth of national output per 6 years
(Production in thousand millions of 1940 dollars; population in millions)

Time (years)	Case A				Case B			
	0	6	12	18	0	6	12	18
Volume of production	100	130	169	219	100	140	196	274
Manpower with secondary education	20.0	26.0	33.7	43.7	20.0	28.0	39.2	54.8
Manpower with third-level education	2.45	3.19	4.14	5.35	2.57	3.60	5.02	7.03
Students in secondary schools	9.4	12.2	15.8	20.5	12.0	16.8	23.5	32.9
Students in third level	0.98	1.27	1.65	2.15	1.29	1.80	2.54	3.53
Manpower with secondary education and less than 6 years' employment	6.2	8.0	10.5	13.6	7.2	10.1	14.1	19.8
Manpower with third-level education and less than 6 years' employment	0.76	0.98	1.27	1.66	0.93	1.29	1.80	2.54

many countries and will be constant in none. There is no distinction between major economic sectors and occupational groups. As a result, there is no distinction between the various types of second and third-level education to be developed. Length of study is certainly not uniformly six years, and so on. But the model makes explicit the main interrelated variables of output and education to be considered. It also provides a first approach to the balanced development of a country's educational system where no detailed information is available on which to base expectations regarding these matters. Of course, when additional information does exist, this should be substituted for, or added to, the original presentation of the model. (A less limited version of the model is that by J. Tinbergen and H. O. Bos in OECD 1965.)

At the same time a search should be made for methods and data enabling developing countries to establish more specific indicators of skill requirements as a basis for target-setting. Especially as regards the long and medium term, it seems clear that comparative international experience can be an important source of such data.

The usefulness of international comparison as a tool for projecting national trends was recently stated in the following terms:

> "There are two bases for projecting the future evolution of any social unit: its own past experience and the experience of other similar units. All economic forecasting methods represent some blend of these two approaches. At one extreme, the past history of a country may be formalized in an econometric model and predictions determined from assumptions as to the future values of the exogenous variables in the model. In this approach, the experience of other economies is drawn on in estimating some of the parameters in the model, in choosing the values of exogenous variables, and in judging the plausibility of the results. At the other extreme, generalizations from common experience in the form of patterns or stages of growth form the analytical core around which projections are built up. In this case the relation between the two approaches is reversed; the model of the particular economy serves to modify the conclusions reached from comparative analysis.
>
> "The choice of analytical techniques is more limited in less developed countries than it is in advanced ones. Econometric models based on time series for the country concerned have proven to be of very limited value, both because of the scarcity of historical data and because some of the structural relations are undergoing significant changes. Therefore plans and projections for these countries must rely more heavily on international experience, both of countries at a similar stage of development and of those that are more advanced" (Chenery with Taylor 1966).

In an early and simple application of this principle to the setting up of guideposts for long-term national educational development, Professor Harbison derived from comparative international data some rules of thumb relating annual rates of increase in required numbers of high-level manpower to desired rates of over-all economic growth (International Institute for Labour Studies 1963, pp. 40 and 41). More recently, on the basis of advanced statistical data, several interesting systematic relationships were established by the Unit for Economic and Statistical Studies on Higher Education of the London School of Economics (Layard and Saigal 1966, pp. 222ff.).

In this study, variables of interest to long-term planning of vocational guidance and skill formation are related to output per worker as an indicator of the level of economic development. From data

from eight to thirteen countries productivity was calculated for the economy as a whole and for major economic sectors (i.e. the eight one-digit sectors of the International Standard Industrial Classification). Intercountry differences in productivity were then correlated with the following indicators of manpower development:

(a) Distribution of the labour force within sectors by "major occupational groups", i.e. major groups 0, 1, 2 and 3 of the *International Standard Classification of Occupations* (ISCO) (International Labour Office, 1958);

(b) Educational attainment of the labour force within four major occupational groups;

(c) Educational attainments of the labour force by economic sector;

(d) Proportion of certain high-level minor occupational groups in the national labour force as a whole.

All data and findings related to years around 1960.

The provisional findings of the study may be illustrated as follows:

(a) A one per cent increase in productivity in the manufacturing sector tends to be associated with increases in the percentage within its labour force of professional, technical and related workers by 1.01 per cent; administrative, executive and managerial workers by 0.32 per cent; clerical workers by 0.54 per cent; and sales workers by 0.48 per cent.

(b) A one per cent increase in productivity in the economy as a whole tends to be associated with certain percentage increases in the proportions of workers in the above occupational groups holding degrees, having completed secondary school, attained matriculation level, completed middle schooling, or completed only primary schooling.

(c) A one per cent increase in productivity in the combined manufacturing and electricity sectors tends to be associated with increases in the proportion of the labour force in these sectors that has completed secondary school or higher education by 1.02 per cent, and middle schooling or more by 0.76 per cent.

(d) A one per cent increase in productivity in the economy as a whole tends to be associated with increases in the proportion in the national labour force of architects, engineers, surveyors, scientists, draughtsmen, and science and engineering technicians combined of 0.81 per cent.

A somewhat similar analysis was recently undertaken by the International Labour Organisation (Scoville 1966). In this case employment in the ten major ISCO groups was related to national income per head, to the rate of economic growth and to the size of a country's population. On this basis, using projections of economic growth made by P. N. Rosenstein-Rodan, total employment in the major groups was projected for each of the regions distinguished in the United Nations demographic statistics for the world as a whole for the years 1970, 1975 and 1980.

However, international comparisons of this nature can be applied to a national situation to a limited extent only. Thus, less-developed countries may gain some impression of skills available in the labour force of more advanced nations, but these are not necessarily the skills they need.[4] Also, the manpower structure of countries that advanced earlier to a certain level of development is adapted to technologies that may be inappropriate or out of date when newly industrializing countries reach that level. Besides, no precise conclusions can be drawn from comparisons in terms of whole economies and broad economic sectors because the composition of output and employment within such aggregates differs so widely.

If it is difficult to interpret international comparisons, it is also difficult to make them. Thus, the small number of countries on which the British study is based reflects the general shortage of data. Such data as are available can seldom be compared without considerable adjustment.

Many other shortcomings and qualifications of international comparisons and their use in long-term manpower planning could be mentioned. Yet in spite of these inadequacies relationships based on such comparisons do seem to provide some guidance in national long-term target-setting for education and vocational training. Conditions and expectations in any individual country can be compared with the international patterns. Deviations between the two do not mean that a country should blindly follow the pattern, but they will raise questions as to the reasons for the discrepancy and thus provoke either more explicit justification or correction of national policies.

A common procedure for estimating medium-term occupational requirements consists of three steps:[5]

(a) Statement of output expectations in the target year for the economy as a whole, for individual sectors and for principal industries.

[4] Striking differences in years of formal education distinguished skilled workers in different countries, e.g. the United States and Japan. It seems reasonable to conclude, in view of the size of these differences, that educational levels in high income countries are the result, in part, of a demand for education as an income elastic consumer good rather than as a requirement for needed certain types of work. See Centre for Industrial Development (1966), p. 22 and Appendix III.

[5] Cf. Mouly (1965).

(b) Estimates of total employment in the target year for the whole economy and for sectors and industries; these estimates are to be derived from the output expectations, using some target or forecast of future productivity.

(c) Specification of the employment estimates according to occupational groups which, at a later stage, can serve as the basis of estimating training requirements and setting targets for meeting them. For present purposes this third step is of major interest.

Although developed for long-term forecasting, the Mediterranean Regional Project of the Organisation for Economic Co-operation and Development (OECD) is the best illustration of this approach. Its detailed method has been lucidly described, and its results have been penetratingly analysed (Parnes 1962 and Hollister 1966). Extensive reports are also available for each of the countries that participated in the project: Greece, Italy, Portugal, Spain, Turkey and Yugoslavia. Table 2 indicates the degree of detail used in the country studies (except for Portugal, where no sub-division by sector was made).

Table 2

DETAIL USED IN COUNTRY STUDIES OF OECD MEDITERRANEAN REGIONAL PROJECT

Country	*Number of occupational groups*	*Number of sectors and industries*
Spain	9	9
Greece	61	8
Italy	6	10
Turkey	4	5
Yugoslavia	8	15

In France similar methods have been used for medium-term planning; 105 occupational groups and 41 economic sectors were distinguished. (For details see *Revue française du travail*, January-March 1966, p. 98.) In selecting and defining occupational groups, the main criterion for present purposes is the structure of the education and training system for the development and adaptation of which targets are to be set and decisions taken. Thus, as the Mediterranean Project was designed to help in long-term educational planning, its architect, Professor Parnes, divided the entire ISCO into four classes, each corresponding to an educational level. In France, in connexion with medium-term planning, five levels of skill formation were distinguished for each of five fields, thus giving 25 different classes.

Once the units of the targets or forecasts have been thus defined, the estimation of actual numbers can begin. As in the case of long-term estimates, the two basic methods are extrapolation of past national experience and international comparison. While generally some blend of both approaches is used, extrapolation has been relied upon more heavily in France and in the Mediterranean countries except Spain. International comparison was used primarily (and mostly for long-term purposes) in Puerto Rico, Spain, Thailand and the United Arab Republic.

The theory underlying both international comparison and extrapolation is that a given level of productivity in a particular activity is associated with (and possibly determines) a specific occupational composition of the labour force. If a country expects to attain a certain level of productivity in a certain industry, it is assumed it will need a labour force whose occupational composition resembles that of industries in other countries where that level of productivity has been reached. In actual practice productivity (in the sense of value added per man-year) does not really seem to have been a specific target for the development of individual industries. Yet it might be useful to include such targets in development plans; in any case a notion of the productivity other countries have achieved with their particular labour force will be of interest to public policy-makers concerned with vocational guidance.

This assumption of a systematic relationship between productivity and occupational composition of the labour force was verified in the British study already cited. It was also closely examined in a more detailed study undertaken at Northeastern University in the United States (Horowitz, Zymelman and Herrnstadt 1966). This study is especially pertinent to medium-term problems because of the detailed calculations made for industry (21 individual manufacturing industries in addition to manufacturing as a whole). Its analytical results can be summed up by saying that "variations in the proportion of professional and technical workers are a major determinant of productivity in almost every industry; and that the importance of other groups varies from industry to industry, and depends on the type of curve that is used to fit the data. The only occupational group whose variations seem to exert no influence on productivity is that of clerical workers" (Horowitz *et al.* 1966, p. 33).

But this study is particularly valuable for its extensive manpower statistics. Data were collected from 19 countries and for seven of these statistics were available at different dates so that 26 sets of figures are presented. While the majority of countries covered are highly industrialized, the sample also includes Argentina, Chile, Israel and Japan (both 1950 and 1960), Puerto Rico and Yugoslavia. Data are given for 225 occupational groups of the ISCO and for 58 industries or industrial

groups based on the United Nations *International Standard Industrial Classification of Economic Activities*.

The experiments of the OECD, the London School of Economics and Northeastern University referred to above have all pointed to the lack of occupational data that could throw light on skill requirements and other qualifications needed for industrial occupations. Thus, occupational data provided by population censuses (the most important source of information on composition of the labour force) are usually based on ISCO. But in its present form, this classification does not distinguish clearly between different types and levels of skill requirements among and within occupations. This means that the conclusions derived from occupational data as to the educational and training requirements or attainments involved are limited. ISCO was not designed for such purposes; its main functions are to help to identify the contents of specific occupations in a national context (e.g. for vocational guidance and employment placement), to assist Governments wishing to develop or revise national classifications of occupations (e.g. in connexion with population censuses or labour force surveys) and to facilitate international comparisons of occupational statistics. To obtain classification by nature and level of occupational qualifications, further criteria are needed—of the kind used in French planning (for which "qualification/education profiles" of occupational groups have been developed) and in the United States (where a full classification by "workers' traits" is now available). There seems to be a need for developing some such classification at the international level.

For present purposes the main difference between a short-term and a medium or long-term target is twofold. First, expectations about the future are more specific—a typical short-term situation arises when plans and blueprints are being drawn up for the construction of a specific plant. Second, the scope for adjustment to expected needs is narrower in the short run—practically nothing can be done about general educational qualifications of the labour force, although something may be done with respect to vocational training and, of course, expatriate manpower may be hired.

When a plant is under construction detailed occupational requirements are implied in the plans. The designers can usually provide fairly specific job descriptions and indicate the skill requirements they think are needed, the ways of acquiring these and the time needed for this. For a structural steel plant for example, it could be established that a template-maker "makes full-size wood, cardboard, or sheet-metal templates from blueprints or models for use in laying out rivet holes, cuts and bends on structural steel: locates holes, cuts and bends, using his knowledge of trigonometry, orthographic projections and radial projections, and marks their locations, using such layout tools as squares, dividers and scales". It might further be determined that in general such a worker, in addition to a certain general educational attainment, needs no less than two and no more than four years of training and basic experience, which he might acquire in another plant (in the same country or abroad) or in a school or training centre (United States Department of Labor, Bureau of Employment Security 1957, p. 114). Information of this kind can be gathered only in industry itself, where it is primarily needed. Central public concern in the case of such short-term skill requirements would seem to be limited to two aspects: to ensure that manpower problems receive timely attention when plans are being established so as to minimize losses arising from unforeseen lack of skills once expensive buildings and machines have been installed; and to ensure that a wide range of information on different possibilities for using manpower is drawn upon so as to avoid making unrealistically high or unduly low skill demands, employing expatriate manpower when local staff can be trained, or installing machines in a developing country where the same work could be more appropriately performed by human labour.

Information on the manpower requirements of specific production processes should be much more widely available than is the case at present. This would enable developing countries, working out short-term plans, to choose from various possibilities those best suited to their own conditions. Important sources of data for such purposes are engineers' "blueprints" project feasibility studies and technical assistance reports drawn up by consulting firms for new plants and the actual staffing of existing enterprises. Much of this information is of a private and often confidential nature, but some is freely available and has been published at the international level by the United Nations.[6] It tends to be in terms of occupational requirements rather than skill requirements, and the occupational categories distinguished are not always clearly defined or necessarily identical with those of other studies. Yet data of this kind can provide a very useful basis for determining short-term skill requirements.

Manpower requirements of specific industries

The United States has a unique, even though still imperfect, system of classifying the skill requirements of the labour force into well over 100 indus-

[6] See, for instance, ECOSOC (1965), and United Nations (1966).

trial sectors. This is done by the census (Eckaus 1964, pp. 191 ff.; Ross and Eckaus 1966, pp. 103 ff.). The measure of skill requirements used is years of schooling as far as requirements of general education are concerned and length of training (whether vocational education in schools, apprenticeships, on-the-job training or acquisition of essential experience) as regards specific vocational preparation. Estimates of these required periods were based on what was needed "for a worker to acquire the knowledge and abilities necessary for average performance in a particular job-worker situation" in a large number of jobs, according to experienced labour placement specialists in the United States during the early 1950s (United States Department of Labor, Bureau of Employment Security 1957, p. 110). This information was applied to employment data, by occupation and industry, provided by the United States Population Censuses of 1940 and 1950. In this way a survey could be made of the distribution of the labour force in individual industries, among seven periods of required general education and eight periods of specific vocational preparation.

Table 3 is based on data from the 1950 census. It ranks a few industries in the order of increasing average learning time requirements (general education and specific vocational preparation combined) for the labour force of each industry as a whole. The table further shows for each industry weighted average education and training times needed as a percentage of those in textiles. The absolute figures for textiles in the original source are 9.93 years of general education and 0.94 years of specific vocational preparation.) Although it cannot be assumed that developing countries "need" the same length of training time per man in their industries as did the United States in the early 1950s, the data from the United States do give some indication as to whether the training period for the labour force in a specific industry in a developing country will be long or short.

The above figures suggest that among the industries listed "logging, etc.", is least, and "construction" most exacting in terms of training time per man. The second most demanding industry is non-electrical machinery, and the second least demanding is glass-making.

While the figures may be helpful in indicating relative training time and cost per worker in different industries, they do not indicate relative cost of training per unit of production (e.g. one million dollars of annual steel output). For that purpose account must be taken of the numbers of workers needed or, alternatively, of output per worker.

Thus, for example, value added per man-year in the United States is nearly twice as high in the pulp and paper industries as it is in the textiles

Table 3

EDUCATION AND TRAINING REQUIREMENTS IN SELECTED KEY INDUSTRIES

Industry	*General Educational Development*	*Specific Vocational Preparation*
Logging and wood products, except furniture	91	76
Glass and glass products	90	94
Cement	97	112
Pulp and paper	100	87
Apparel	102	76
Textiles	100	100
Blast furnaces, rolling mills, etc.	101	131
Fabricated steel	106	134
Chemicals	107	153
Electrical machinery	109	147
Non-electrical machinery	110	188
Construction	107	247

industry (United States Bureau of the Census 1958). Therefore, although general educational development and specific vocational preparation per man in these industries are about the same, per unit of output value they are, in pulp and paper, only 53 and 54 per cent, respectively, of the requirements in textiles. For chemicals, the contrast is even greater, though requirements per man in that

Table 4

SPECIFIC VOCATIONAL TRAINING REQUIREMENTS FOR THE UNITED STATES LABOUR FORCE IN 1940 AND 1950

(Per cent)

Specific vocational preparation range	*Labour force*	
	1940	*1950*
Short demonstration only	1.44	0.47
Anything beyond short demonstration up to and including 30 days	16.70	20.95
Over 30 days up to and including 3 months	13.23	7.71
Over 3 months up to and including 6 months	22.90	23.71
Over 6 months up to and including 1 year	4.33	5.06
Over 1 year up to and including 2 years	17.54	14.37
Over 2 years up to and including 4 years	20.53	23.52
Over 4 years	3.33	4.21
Total	100.00	100.00
Average years of training required	1.26	1.35

Source: R. S. Eckaus, "Economic Criteria for Education and Training", *Review of Economics and Statistics*, Vol. 46, No. 2 (May), 1964, p. 186.

industry are much greater than in textiles: per unit of output required general education is only 35 per cent and required specific vocational preparation only 50 per cent of those in textiles.

Three further points of general interest may be noted in connexion with the United States data. First, comparison between successive occupational surveys of the training time requirements of the labour force reveals certain trends that can help in making projections as a basis of planning. Table 4 illustrates this point for shifts in the composition of the United States labour force as a whole between the 1940 and 1950 censuses according to the eight categories of specific vocational preparation.

Second, the increase in training requirements between 1940 and 1950 was due entirely to increases in the number of occupations requiring relatively longer training. It does not reflect increases in training requirements of the occupations themselves; the same "catalogue" of skill requirements was applied to the labour force data of both 1940 and 1950.

Third, the United States study suggests the existence of some discrepancy between general educational attainments of the labour force and general educational needs according to this particular application of the manpower approach to education. Thus in 1940, 31.2 per cent of the labour force had actually had full high-school education but only 28.5 per cent required it for their work; by 1950 these figures had risen to 39.0 and 32.4 per cent respectively. As regards college education (four years or more), in 1940 only 5.9 per cent of the labour force had had such education, while 7.1 per cent would have needed it for their work; by 1950 needs and actual attainments had balanced at 7.4 per cent each.

A key industry for which a good notion of available technology exists is cement. Theoretical manpower requirements are calculated below, using as templates summaries of staffing needs in two large-scale plants (in which unit capital costs are relatively low) described in United Nations, *Studies in the Economics of Industry No. 1; Cement* (ST/ECA/75, p. 21). These plants are of 335,000 and 400,000 tons capacity; in the former the so-called wet process is used; in the other a dry process.

Asian demand is expected (and output here assumed) to grow by 44.5 million tons from 1964 to 1970; African output, by 2.9 million tons from 1964 to 1975. Should these output levels be reached by either of the two plants cited, estimated additional manpower needs for six occupational groups would be as shown in table 5.

Although plants I and II have very similar fixed investment costs per ton of capacity (US$33.4 versus US$34.8), their manpower inputs are substantially different. A small increase in fixed investment expenditures from plant I to plant II implies much larger reductions in the input of skilled, and especially, technical personnel. The choice between these two types of plant should depend on which of the scarce resources (capital or highly trained labour) provides the binding constraint, or which could be better employed elsewhere. A further consideration is that developing countries that establish new cement industries will find the wet process (plant I) preferable to the dry process, since the former is simpler to operate, has lower fuel costs, and uniform quality can be maintained more easily.

Table 5

ADDITIONAL MANPOWER REQUIREMENTS IN THE CEMENT INDUSTRY

Estimates for 1965–1975

Occupational Group	*Asia*		*Africa*	
	Plant I Wet Process	*Plant II Dry Process*	*Plant I Wet Process*	*Plant II Dry Process*
Quarry workers	4,400	3,700	200	200
Production workers	57,800	48,200	2,300	1,900
Laboratory workers	5,200	4,400	200	200
Technical workers	3,000	2,200	100	100
Administrative workers	6,700	5,200	300	200
Guards and Miscellaneous	8,900	13,300	300	500
Total	86,000	77,000	3,400	3,100

Following the general method described above for the cement industry, very rough estimates have been made by the ILO of occupational requirements in the iron and steel, textiles and pulp and paper industries. Table 6 summarizes these estimates. It shows for each region the total calculated manpower requirements of the industries concerned and their division between professional and tech-

Table 6

OCCUPATIONAL REQUIREMENTS BY INDUSTRY AND REGION
ROUNDED ESTIMATES FOR 1965—1975

(In thousands)

Region	*Industry*	*Total*	*Professionals, Technicians, Engineers*	*Skilled workers*[a]
Africa	Fertilizer	26.5	2.5	4.7
	Cement[b]	3.1—3.4	0.5—0.6	2.1—2.5
	Iron and steel[c]	10.9—63.3	1.8—13.1	6.6—24.0
	Textiles	214.3	14.6	178.3
	Pulp and paper[d]	41.8	7.4	30.3
	Total	300—350	27—39	222—240
Asia	Fertilizer	n.a.[g]	n.a.	n.a.
	Cement[b]	77.0—86.0	11.8—14.9	51.9—62.2
	Iron and steel[c]	14.9—87.4	2.4—18.0	9.1—33.2
	Textiles[e]	314.0—474.0	21.6—32.6	261.2—394.1
	Pulp and paper	463.0	140.4	322.6
	Total	850—1,100	175—200	650—800
Latin America	Fertilizer[f]	10.2—21.7	1.0—2.0	1.8—3.9
	Cement	n.a.	n.a.	n.a.
	Iron and steel[c]	54.1—314.3	8.9—64.8	32.7—119.4
	Textiles	548.6	37.9	456.0
	Pulp and paper	n.a.	n.a.	n.a.
	Total	600—900	50—100	500—580

[a] Including semi-skilled workers in textiles and iron and steel.

[b] Wet process (high projection) and dry process (low projection).

[c] Highest and lowest estimates from among five different occupational patterns.

[d] Excluding North Africa.

[e] The ranges are due to two assumptions as to likely consumption (3,700 and 5,600 million square yards).

[f] High and low assumptions as to likely output.

[g] Not available.

nical manpower on the one hand, and workers (in some cases skilled workers only) on the other.

The figures are subject to a number of limitations, including the following:

(a) Where manpower requirements had to be based on demand projections, it was assumed that demand will be entirely satisfied by production in the region concerned.

(b) The definition of output in global projections is not the same as the definition of output at the plant level. Projection of final demand relates to an economic sector or a branch of industry (iron and steel, cement, etc.), whereas output mix of a plant forms only a part of total sector or industry output mix. With the exception of cement, the final products are too heterogeneous to warrant projection on the basis of occupational coefficients for one or a few plants.

(c) The occupational coefficients do not reflect the considerable variation depending on size of plant (except for cement).

(d) The occupational classifications in the data used for making the projections are neither uniform nor consistent. This is one explanation for the sometimes tremendous variations in the projections.

In spite of these and other shortcomings, at least two conclusions may perhaps be drawn from this very limited table. First, it is quite evident that the total employment-creating capacity of the industries concerned is but a minute fraction of the expected increases in the total labour force of the regions concerned.

Recently, estimates were made by the ILO of future increases in the world industrial labour force (Ypsilantis 1966). In table 7 these estimates are compared for the period 1965—1975, with the maximum estimates of total new employment calculated for the key industries considered above.

Increases in manufacturing output give rise indirectly to greater output and employment in related activities (transport, sales, raw materials, etc.). In any case, many industries will grow in-

Table 7

ESTIMATED INCREASE OF LABOURERS 1965—1975

(In thousands)

Regions	*Total labour force*	*Employment in key industries*
Africa	28,100	350
Asia	150,600	1,110
Latin America	25,100	880
Total	203,800	2,340
Per cent	100	1.15

dependently of the expansion in the key industries considered in the present paper. Furthermore, not all countries are included in the regional production and employment estimates for key industries given in table 6. But it is clear that if the estimates of employment in the key industries were multiplied by, say, five or ten, only a small proportion of the increase in the total labour force would be absorbed.

The second conclusion to be drawn from the figures in table 6 is that the indicated requirements for skilled manpower do not seem forbiddingly high. Evidence for judging this question is almost non-existent; in particular, it is not possible to compare the figures with indicators of what is obviously the most relevant factor, the current and probable future capacity of the region to train personnel of the various categories involved. Some estimates exist, however, of future total skilled manpower requirements in the developing regions. It may be of interest to compare these with the very partial estimates of table 6 to see whether the latter are at all compatible with the former.

The first of these estimates can be found in an ILO study submitted to the 1966 United Nations Seminar on Long-Term Projections (Scoville 1966, Part (b), pp. 39—40). In that study projections were made of future demand for labour in each of the ISCO major occupational groups, assuming reasonable rates of economic growth. The projections were based on statistical analyses of employment in these groups on the one hand and on the level of economic development, rates of growth and size of countries on the other. If the projected increase in employment during 1965—1975 for the major group professional, technical and related workers is taken as the indicator of growth in total demand for high-level personnel, and if the increase for the major group craftsmen, production process workers and labourers not elsewhere classified is taken as the indicator for skilled workers, then table 8 can be drawn up.

A second estimate of future high-level manpower needs appears in a report submitted in 1964 to the Economic and Social Council (ECOSOC 1965, pp. 24—25). Here, increased numbers of engineers,

Table 8

ESTIMATED INCREASES 1965—1975 IN EMPLOYMENT DEMANDS

(In thousands)

	High-level personnel		*Skilled workers*	
	Total	*Key industries*	*Total*	*Key industries*
Africa	1,500	40	6,100	240
Asia	6,700	210	35,600	810
Latin America	1,800	105	9,000	580

scientists and technicians required for industrialization in general were estimated for the period 1960—1975. For the period 1965—1975 these estimates may be assumed to be somewhat larger than two thirds of those for the 15-year period. This would mean increased numbers in the three occupations mentioned of approximately 70,000 in Africa, 400,000 in Asia and 250,000 in Latin America.

These figures suggest that the high-level manpower requirements of the key industries considered in this paper would not be excessive compared with global estimates of future manpower requirements in the developing regions. Indeed, in some cases the key industries would seem to require relatively small fractions of the total estimates; global estimates themselves might be wildly unrealistic.

Skill requirements of industrial occupations

To establish occupational requirements of industrialization is a first step in target-setting for the development of human resources. The second step is to determine the skills required so that measures can be taken to provide them. But for various reasons, this second step is more difficult to take than the first. Skills have been, and perhaps can only be, defined and classified in much less precise terms than occupations. Furthermore, many skills can be acquired in several ways.

Thus, the possibility of planning on the basis of international comparison is more limited as regards skill requirements than it is in assessing occupational requirements. Also, other factors limit the scope for international comparison even further. Few countries collect systematic information on training in employment; and while many collect data about formal education of their labour force, they use very different criteria that may be impossible to compare.[7] Although it should not be impossible to reach a measure of international agreement and

[7] For a clear discussion of the problems involved see Layard and Saigal (1966) and Horowitz *et al.*, Vol. 1, p. 20 and Vol. 2, pp. 158ff., where occupational data are classified according to years of schooling.

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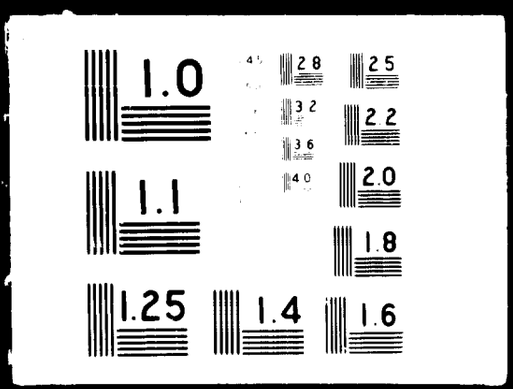

comparability on this particular point, further difficulties arise from wide international differences in the organization, methods and effectiveness of training and education. Hence, even if all countries provided comparable data on years of general education and training in employment, for example, this would by no means imply that a comparable measure of skill had been provided. And even when educational attainment among given occupational groups in different countries can be compared, the results are likely to indicate primarily the levels of general education countries can afford rather than the minimum education needed for effective, normal or efficient performance of jobs.

Although the present scope for international comparison in determining skill requirements of given occupational patterns is quite limited, it would seem desirable to take international action to increase it. If each of the above-mentioned difficulties were carefully examined at the international level, not only could ways to overcome them be found but, once comparable data existed, many ways to improve national practices in education and training could also be discovered.

Meanwhile, countries have to rely largely on their own experience and judgement in determining skill requirements by occupation. Relatively little systematic work has been done in this field, but two interesting examples may be mentioned here. The first is the Survey of Educational and Training Content of Occupations made in July 1966 by the National Manpower Board at Lagos, Nigeria. This was an inquiry among employers in a sample of 124 private and public enterprises employing ten or more workers each, excluding agricultural and services sectors, mostly in Lagos. The occupations examined included senior positions (engineers and other professionals, administrators), two groups of medium-level positions (junior administrative supervisory foremen, and technicians), occupations at the skilled, semi-skilled, and unskilled levels. The data concern 126 ISCO occupations (in which 65,000 workers were engaged in the enterprises covered) five-digit occupations at the senior level, three or four-digit occupations at the other levels. Employers were asked what educational qualifications they would require when recruiting new employees, what special training in employment (apprenticeship, on-the-job or in-service training), and what experience they considered necessary for efficient performance in the jobs concerned. (In the study, training in employment is called "employer training".) In addition, they were asked what qualifications their labour force actually possessed, what difficulties existed in recruiting personnel with the desired qualifications, and what wages and salaries were paid.

It is impossible to summarize here the detailed method and rich contents of this Survey, which should be of great interest to every developing country. But a few salient points may illustrate the results obtained:

(*a*) Seven out of ten jobs above the unskilled level, three out of four at the medium level, and greater than one in two at the senior level called for training in employment, in addition to formal education; of jobs requiring secondary technical education more than three quarters also required training in employment.

(*b*) In the senior group, engineering jobs required the most advanced formal studies, but 60 per cent also needed training in employment; for the senior group as a whole, and in mining, manufacturing, construction and utilities, 30 per cent or more of these positions called for more than two years' training, mostly on the job.

(*c*) Senior administrative positions called for experience, typically of more than three or even five years; indeed, for this group employers were willing to accept experience in lieu of some of the educational and/or training qualifications.

(*d*) The highest proportion of jobs requiring training in employment occurred at the medium-level, 76.1 per cent, but this proportion was higher for the junior administrative supervisory foreman category than for the technicians; in manufacturing the required training was estimated at two or more years for 30 per cent of the positions in medium-size enterprises and at three or more years for about the same proportion in large enterprises.

(*e*) In almost half of the skilled/semi-skilled level jobs no post-primary education was needed, but in nearly 70 per cent training in employment was required; clerical and sales jobs required least training; production jobs and occupations in transport and communications required most training.

(*f*) Salary levels rose clearly with educational level required, so that employers could reduce wage and salary costs by providing their own specialized training when this replaced specialized pre-employment training.

The second example of determination of skill requirements for given occupations is taken from the United States. In that country jobs have been classified according to demands on workers and on worker traits (aptitudes, interests, temperament). The classification is based on elaborate data collected by employment service specialists from business organizations, trade associations, professional societies and government agencies. Worker traits are

specified for 22 broad areas including clerical work, crafts, education and training, engineering, machine work, managerial and supervisory work, but also art, writing and other non-industrial activities (United States Department of Labor, Bureau of Employment Security 1965, Vol. 2, pp. 214–530). Within these areas a total of 114 more detailed workers' trait groups are distinguished. For example, the area of machine work contains the following groups: set-up and/or all-round machine operating, set-up and adjustment, operating-control, driving-operating and tending. The specific worker traits required within each group of occupations are stated in a Qualifications Profile. In the case of the group "set-up and machine operating" this profile indicates under skill requirements a general education level 4 and a range of specific vocational preparation levels 6 to 8. The profiles also give indicators of aptitudes and other traits required, and of common channels of entry into the group of occupations concerned (through on-the-job training and/or various types of schools).

Each worker trait group lists a number of specific occupations: thus, the group "set-up etc." includes a number of jobs in the nature of toolmaking and related work. Unlike the analysis of 4,000 jobs mentioned earlier (where the toolmaker is marked as needing level 8 of specific vocational preparation—more than 4 years), the individual jobs within worker trait groups are not separately assigned figures concerning training and other requirements. Nevertheless, this classification provides a relatively detailed specification of skill requirements. This classification of jobs by worker traits may indicate a way out of the difficulties that have been encountered in the use of ISCO, namely, that no definition can be made according to levels of difficulty and skill within many occupations.

Some conclusions and recommendations

The following major points seem to arise from the foregoing analysis:

(*a*) The target-setting approach to human resources planning is an important means for ensuring that the industrialization efforts of developing countries become a vehicle for progress rather than a further burden on already poor communities.

(*b*) While the specific skill requirements of industrial development should be studied in considerable detail, targets for meeting them should be set with due regard to the manpower problems of other sectors.

(*c*) Where over-all plans for industrial development exist, manpower planning should be made part of them; where no over-all development plan exists, manpower planning should nevertheless be undertaken on the basis of other indicators of probable future economic development.

(*d*) In studying industrial skill requirements and setting targets for meeting them, major, though not exclusive, emphasis should be given to training in employment.

(*e*) Targets should influence not only the provision of facilities for skill formation but also the utilization of such facilities (vocational guidance, wage and salary policy).

(*f*) Targets should be separately for the short, medium and long term.

(*g*) International comparison is an important aid in determining manpower requirements and in setting targets for meeting them. Countries should adopt a common approach and common definitions regarding types and levels of industrial skills as related to occupational categories. At the international level industrial manpower information, including information on staffing patterns of model plants, should be collected systematically and disseminated. Arrangements should be made for keeping such information up to date.

(*h*) In determining skill requirements, account should be taken of occupations in the field of industrial research and development in addition to occupations in production, transport and trade.

Five tools of manpower planning for industry

Developing countries should forge certain tools of manpower analysis that have proved feasible and useful elsewhere. Of course, these tools should be adapted to the specific needs and practical possibilities of the developing countries. Five such tools might be considered:

(*a*) An occupational breakdown of the population census or (where resources do not permit this) a sample inquiry showing numbers by individual industries. This information provides the basis of occupational projections in the country concerned. It also contributes to the international pool of knowledge about manpower problems other countries may learn from it as well.

(*b*) A sample survey of the actual educational and vocational qualifications of workers in selected occupations in individual industries. This information would supplement that mentioned in (*a*) and would be of great help in connexion with the three following suggestions.

(*c*) A system of vocational training statistics, covering both formal courses and on-the-job

training, to show what is being done in this field and, if possible, at what costs. It is typical of the traditional neglect of study of human resources as compared with trade, physical capital, etc., that such statistics are virtually non-existent even in advanced countries. Thus, in a recent impressive study of *Some Factors in Economic Growth in Europe during the* 1950's (1964, p. V 22) the United Nations Economic Commission for Europe could not include examination of vocational training as a factor in growth, finding it "statistically intractable". The British Industry Training Boards to which reference is made later can require firms to keep records and to give information. This power could, presumably, be used to build statistics at least on a sample basis.

(*d*) A statement revised from time to time of general skill requirements (and possibly other worker traits) in selected areas of industry that are expected to grow in the countries concerned. The criterion for what was required might be found in the average performance of workers in industries capable of competing with the manufacturing industries of advanced countries. A statement of this kind would provide some broad objectives (according to the manpower approach) regarding the nature and level of general education for those who were expected to find employment in various branches of industry. It would also aid vocational guidance, and it could provide clues as to where public support (financial or otherwise) might be most needed.

(*e*) A catalogue of specific skill requirements, and possibly other worker traits, for perhaps from 100 to 150 key occupations in a limited number of key industries. Such a catalogue would be useful for the same purposes as those stated in (*d*) above, but as it would be more detailed and precise it would also provide the basis for making specific training arrangements for the really crucial occupations in industry. About half of the catalogue might consist of such occupations as the roughly 800 that are listed under ISCO Major Group 7/8 (Craftsmen, etc.), but many of these are unskilled or are of limited importance to key industries. The other half might include selected industrial occupations from major groups 0 (Professional/Technical), 1 (Administrative, Executive and Managerial), 2 (Clerical) and 6 (Transport and Communications). The Survey by the Nigerian National Manpower Board effectively demonstrates how the necessary data could be collected.

There appears to be considerable scope for international action in the field of manpower analysis. There has already been a great deal of international co-operation in preparing the 1970 censuses—a major opportunity for obtaining, improving and updating information mentioned under the first of the five tools described above. But international action in preparing the four other tools suggested would also be useful. Some of the work involved would be difficult and expensive; pooling knowledge and experience would reduce the costs and improve the quality of the results. Further, as international comparison has proved to be of great help in forecasting and judging manpower requirements, it is important that the data to be collected from different countries and the standards (of skill requirements) to be set are truly comparable.

At the same time it would seem unwise to organize such work on a world, or even on a continental basis. For practical purposes the data and standards should be correlated to the level and general nature of industrial and educational development, and possibly to some other characteristics of the countries concerned. Sufficient similarity on these points, enabling a common pattern of skill requirement to be set for key occupations, can probably be found among relatively small groups of countries within the same geographical region.

International organizations could contribute to such work in the following ways:

(*a*) Convene experts from groupings of countries for which it seems possible *a priori* to establish more or less common catalogues of occupational skill requirements. These experts would include persons concerned with education, training, and manpower planning as well as employers and workers with practical knowledge and insight.

(*b*) Arrange for experience gained in the definition of areas of work and in the establishment of catalogues (the United States worker trait groups) to be shared with developing countries.

(*c*) As an especially difficult and important part of the previous step assist in the translation of required types and levels of ability into terms of specific educational attainment through the school systems of the developing countries concerned.[8]

(*d*) In general, promote the adoption of uniform, or at least internationally comparable, definitions of occupations according to type and level of qualifications required (for technician, skilled worker etc.).

[8] This problem proved particularly difficult also in the United States. Eckaus (1964), p. 185, n. 12 reports having received "conflicting advice" on the matter and having found his own translation "controversial".

As noted earlier, manpower requirements must be considered not in terms of industry or any other individual sector but for a country as a whole. Otherwise, targets set and attained for industry might eventually prove inadequate (or excessive) of people trained for industry moved in large numbers to sectors for which no adequate targets had been attained (or *vice versa*). There should, therefore, be some central government agency to determine a country's over-all skill requirements and to set targets for meeting them. Such an agency should be well informed about the demands made upon each of the major sources providing skills and about the practical means and possibilities of meeting these demands. This could be achieved by including among the agency's membership or consultants representatives of government bodies responsible for over-all economic and social development, industry, educational authorities, and any authority that may exist with major responsibilities for the organization and functioning of the labour market (an employment service).

The nature of the agency itself should depend on the system and organization of national government in the country concerned. For instance, it may be a committee of a National Planning Board, where such a body exists, or the agency might be attached to some suitable ministry or ministries (e.g. labour, manpower, or education).

How can a country best set targets for meeting skill requirements in the industrial sector ? As noted earlier, industry itself is best able to specify its detailed requirements and to meet these through training in employment. Therefore, some body or bodies should be set up through which industry could perform these functions. But there is considerable public interest in ensuring that industry adequately discharges its functions regarding skill formation. Training in general and basic skills tends to be inadequately provided by employers because of the risk that employees might leave the enterprises that trained them. Employers, facing the expense and difficulties of setting up training schemes, may underrate the value of training to their own enterprises. On the other hand, organizations of skilled and professional workers may insist on unduly slow and expensive training schemes. It would, therefore, seem necessary for any bodies concerned with training in industry also to include representatives of the public interest.

In view of these considerations, great interest attaches to the Industrial Training Boards set up under the British Industrial Training Act of 1964, which would seem to meet the requirements suggested above. The threefold objective of the Act is to ensure that within an industry:

(*a*) The quantity of training provided is adequate to meet its assessed training needs;

(*b*) The quality of this training reaches at least the minimum standards set;

(*c*) The cost of training to the employers is fairly shared among employers.

The composition and procedures of the boards are rather similar to those of the wage councils that under varying names have existed for many years in the United Kingdom and several other countries (including developing countries, such as Ceylon, India, Uruguay) to fix statutory minimum wages. Thus the boards are appointed (one for each industry or appropriate group of industries) by the Minister of Labour, after consultations with employers' and employees' representatives in the industries concerned. Furthermore, the boards may propose that the Minister impose a levy on employers in the industry concerned. The board's membership includes equal numbers of employers' and employees' representatives in addition to educational representatives and a chairman who must have industrial or commercial experience. Representatives of the Ministry of Labour and of the Department of Education and Science attend meetings of the board, but without the right to vote.

Furthermore, a Central Training Council has been set up to advise the Minister of Labour on the administration of the Act and on industrial training matters generally. This council is also tripartite and includes a number of chairmen of training boards. It reviews the performance of the boards and considers matters of general interest to them (training methods, training of instructors, use of proficiency tests, training of clerical and commercial staff).

The boards are intended to play a role in assessing manpower needs for all categories of employees – management and supervisory personnel, technologists and technicians, as well as skilled, semi-skilled and unskilled workers in both individual firms and in industries. Assessment of training needs are to be made on the basis of job analysis in terms of the skills and knowledge required for a competent, continuous and confident performance and the compilation of a syllabus for training for each job.

In conclusion, it is suggested that industrializing countries may find a system along the lines described above to be of the greatest use in setting targets for skill formation in industry, for developing the five tools of manpower planning proposed above and, of course, for the actual organization and improvement of training schemes.

It may be rational for industrializing countries to continue relying to some extent for the immediate future on expatriate manpower, especially teachers and instructors. In this case some planning at the international level would be essential to ensure that

the countries expected to provide the necessary manpower could indeed do so. This would mean an international application of the target-setting approach, at least for certain occupational groups important for industrialization. It would require a forward look at probable needs in the industrializing countries and possible availabilities in advanced countries. Some beginnings have in fact been made in adopting this approach. Some advanced countries have included in their assessments of future skill requirements some provision for assistance to other countries e.g. France as regards secondary school teachers and instructors for accelerated vocational training, and the Federal Republic of Germany and Sweden as regards vocational training instructors. International organizations could usefully develop further the assessment of future needs and supplies with a view to setting concrete targets for technical co-operation. Such work would seem to fit eminently into the framework of the United Nations Development Decade—both the present decade, and the next.

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Policies and Programmes for the Development of Small-scale Industry

THE ROLE OF SMALL-SCALE INDUSTRY IN THE INDUSTRIALIZATION OF DEVELOPING COUNTRIES

SMALL-SCALE INDUSTRIES play an important role in any economy, advanced or developing. They account for a large proportion of the manufacturing enterprises and of industrial employment and the gross domestic industrial product. In any economy, they pose distinct problems of development because special measures of promotion and assistance are needed to offset or remedy the structural weaknesses which arise from small size and scale of operation. Such weaknesses include shortage of financial resources and difficulty in obtaining credit, insufficient technological and managerial knowledge, inadequate labour skills, antiquated and sometimes primitive equipment, unsatisfactory premises and working conditions, poor raw materials and lack of information on markets. These are particularly serious in small enterprises in the developing countries, where industries in general are held back by limited resources in capital and skilled labour, by narrow markets and other obstacles. At the same time, small-scale industries have special advantages — again particularly marked in developing countries — which give them a distinct role in industrial development and justify special policy measures for their support.

While it is unquestionable that small industrial enterprises are often ill-equipped and poorly managed, and suffer from low productivity and unsatisfactory product quality, inefficiency is not a necessary corollary of smallness. There are, throughout the world, innumerable examples of small industries which are modern in every respect. These industries use up-to-date equipment, apply scientific methods of processing and management and produce high quality goods, whether complex or simple. Modern standards must be the objective of any programme for the promotion of small-scale industry, whether through the establishment of efficient new enterprises or the modernization of those already existing.

Because modern small-scale industries can contribute to strengthening and diversifying the industrial structure, and to the acceleration of industrialization, Governments in nearly all developing countries provide for their promotion in their development policies and programmes. There is general agreement that many articles can be produced economically on a small scale and that some articles can be produced more economically on a small scale than on a large one. In such cases, smallness is not a handicap and may even afford competitive advantages. Efficient small-scale industries can co-exist and compete successfully with large undertakings and in some cases the two can be linked in complementary relationship, small-scale subcontractors producing for the large industries various parts and components or carrying out certain processing or finishing operations.

In many instances, smallness is only a stage in growth. An industry may start on a small scale and grow in terms of employment, in size of plant and equipment and in volume and range of output.

Many small industries lend themselves to the use of labour-intensive methods of production characterized by a low capital-labour ratio, an important consideration in countries with scarce capital and abundant labour. In most establishments, some of these methods may be used, side by side with highly mechanized processes, the over-all efficiency of the undertaking remaining satisfactory. Even when a small enterprise uses predominantly advanced technology and its capital-labour ratio is high, the absolute amount of capital required is modest and can be raised from private domestic resources, without recourse to foreign investment or to Government equity participation. Thus, the promotion of small-scale industries offers an effective way of mobilizing private savings and initiative.

Production on a small scale is often the only means of meeting demand when the size of the market for any given item is limited. This is particularly true in the case of relatively isolated local markets such as those of small towns and rural areas. Thus, small industries may play a useful role in programmes for industrial decentralization. They may also contribute to the export of manufactures, the promotion of which is a foremost need of industrializing countries requiring increasing amounts of foreign exchange to finance their imports of capital and other goods.

Whether in relatively developed or undeveloped areas, small-scale industries make it possible to tap resources that would otherwise remain unused, including entrepreneurship, capital, labour and raw materials. With proper orientation and support, small industries may attract people who, because of lack of knowledge of technology and management and ignorance of prospects offered by industry, would either remain in their present occupations or engage in competing and presumably less risky activities, such as commerce and building. Small-scale industry may mobilize family and other savings which might otherwise remain idle, be spent on luxuries or be directed towards non-productive activities. They may utilize low-grade materials or by-products or materials available in small concentrations.

Small industries are a training ground for management and labour. Skilled technicians, foremen and workers are induced, and are often able, to set up their own industrial enterprises. More generally, and more importantly, such industries offer the most promising means of promoting entrepreneurship, that is, of inducing persons from various walks of life, with limited financial resources and scant technical and management experience, to participate in the industrialization of their country. As stressed below, this can only be achieved if guidance, assistance, training and support are given to these people at all stages of the planning, establishment and operation of their enterprises. This role of small-scale industry is of decisive importance in those countries (principally the newly-independent ones) where the industrial structure consists on the one hand of a few large-scale and medium-size industries, usually foreign or Government-owned or jointly-owned; and on the other of large numbers of traditional industrial undertakings — artisans, handicrafts and cottage industries. The lack of a middle group of modern small-scale industries not only causes imbalance in the industrial structure, but induces stagnation in the economy as a whole. Neither the Government nor foreign investors are interested in owning and operating small establishments. To promote small-scale industry is essentially to promote domestic private enterprise. Thus, especially in the countries where few small industries exist, the promotion of this sector is not only a means of strengthening and diversifying the economy and raising living standards, but also, through the creation of a new class of indigenous industrialists, of achieving major social and political objectives.

The relative position of small-scale and large-scale industry in the industrial structure and therefore the extent of the resources to be allocated to each must be determined by the planning authority of the country. The scope for the development of industries of different types and sizes varies according to the natural and human resources of the country; the capital, foreign and national, available for investment; the market prospects at home and abroad; and other considerations, both economic and social. In every country, the basic policy should be to develop small industries side by side with larger industrial projects, within the framework of an over-all industrial development plan or programme, and not instead of, or in preference to, large-scale or medium-sized industry.

Development policies

Since small-scale industries are unable to formulate and carry out self-help programmes, their promotion should be the responsibility of the Government. The Government's action tends essentially to assist small industries to overcome the disadvantages of being small or to make better use of the advantages of smallness and to achieve higher levels of efficiency. As a first step, industries which have potential for development and which are in need of assistance must be clearly identified and distinguished from others. For this purpose, among others, it is important to have a definition of small-scale industry based on precise and tangible criteria.

Smallness is a relative notion; it is not possible to find a generally acceptable statistical definition. Definitions of small-scale industry vary considerably from country to country, but sometimes differ even within the same country. Such variations are justified since various formulations may be needed to meet different objectives and conditions. Where a measure of uniformity and agreement may be introduced is in the very concept of small-scale industry, that is, in the choice of components of the definition, and the differentiation of industry from other productive activities characterized by a small scale of operation.

In this respect, the components of employment and investment in fixed capital are the most commonly used, either individually or in combination. The employment factor has obvious advantages

since data are widely available and a definition in terms of a ceiling on the number of workers per enterprise is simple and without ambiguity. But a definition based solely on the employment factor may not reveal the real size and scale of operation of an establishment. Some industries require high capital investment but only a small number of workers, and it may not be correct to classify such industries as small-scale merely on the basis of low employment figures. The opposite also applies to some extent.

The criterion of capital investment is more complex. In some countries, capital includes fixed assets and working capital. In most countries, it is limited to investment in fixed capital. The main reason for excluding working capital is that a proper assessment of the size and scale of operation of a firm will not be possible if factors such as the cost of raw materials, direct labour, manufacturing and administrative overheads are taken into account. Several industries require only small fixed capital investment, but very high working capital; if working capital is included along with fixed capital, they may fall outside the definition of small industry even though they are typical small industries. Again, the costs of the elements constituting working capital may vary considerably from firm to firm, depending upon the structure and efficiency of management, turn-over arrangements and other factors which may be unrelated to the size of the industries. Fixed capital provides a more satisfactory criterion for determining the size of the establishment. For purposes of definition, fixed capital should include the cost of buildings and machinery but not that of land which may vary widely from one location to another.

In some countries, the definition of small-scale industry is based only on fixed capital, the employment factor being excluded on the grounds that, since one of the roles of small-scale industry is to promote employment, a ceiling on this factor might inhibit entrepreneurs from hiring additional labour in order not to lose the benefits of Government assistance to small industry. This dilemma may be avoided if the ceiling on employment is set at a sufficiently high level. The ceiling on fixed capital should also be at a level that will not discourage small entrepreneurs from acquiring modern machinery and equipment. As a rule, whether the two criteria are used in combination or separately, the respective maximum values should be high enough to encourage on the one hand the increase of employment and on the other hand the use of modern productive machinery. In some cases, both objectives may be simultaneously pursued in the same enterprise; in other cases, small units may use predominantly either labour-intensive or capital-intensive techniques. Whatever the technologies adopted, these enterprises would remain in need of guidance and assistance and should be distinguished from larger ones which could forego such help.

The distinction between small industries and other productive activities characterized by small-scale operation, such as handicrafts, artisan undertakings and cottage industries, is based on the types of organization, equipment and techniques and also the types of products involved. In traditional occupations, which are usually limited to a few branches such as carpentry, blacksmithing, pottery, weaving etc., there is little or no division of labour and a minimum of machinery is used, hand-crafting being a predominant method of processing. In the case of handicrafts, artistic skills and the artistic and ornamental value of the products are distinguishing characteristics. The promotion of the traditional sector calls for programmes and measures of assistance different from those devised for the development of modern small-scale industry. For that reason, the definition of the small-scale industry should distinguish it from the traditional sector. Besides the qualitative features mentioned above, maximum limits on fixed capital and if need be on employment in traditional undertakings will also be necessary; these will be appreciably lower than the limits set for small-scale industry. When separate definitions are adopted for the modern and the traditional sectors, the definition for the modern sector, especially if based on fixed capital, may include both a ceiling and a lower limit. The lower limit, or a slightly higher figure (overlapping would be of no serious consequence), may be the ceiling of the definition of traditional industries.

In all developing countries, the future of the traditional industrial sector is, or should be, an important policy consideration. In some countries, there is a confusion between the traditional and the modern sectors so that development policies focus on upgrading handicrafts and artisan enterprises rather than on promotion of modern manufacturing establishments. More often, modern industry is being developed but little attention is paid to the role and place of the traditional sector in a modernizing economy. Sometimes, it is believed that the whole traditional sector can be transformed into modern manufacturing.

There are, no doubt, many traditional craft enterprises which have become obsolete and wasteful through the emergence of modern technology, changes in social structure and rising income levels. Factories are steadily replacing artisan workshops in the supply of such products as textiles, shoes, furniture and agricultural tools. It is a paradox of industrialization in developing countries that the very group of people who have background and experience in industrial activities

become its first victims. There are certain fields in which the artisan workshop can co-exist with the factory and even function in complementarity with it; there is, in particular, increasing scope in any economy for artistic handicraft production, the demand for which seems to grow with the increase in the affluence of the society, the expansion of tourism and other factors. Such skills and crafts should be identified and assisted so that they may develop further. The obsolete and declining trades are a particularly difficult problem; though inefficient, these trades may be a source of income for large segments of the population and, in certain countries, they are the predominant element in the industrial structure. Some traditional activities, probably fewer than is commonly believed, can be transformed into small-scale industrial undertakings in the same line of business. Many others do not lend themselves to such transformation, but should be steered towards small-scale manufacturing in different lines of business, service and construction industries and other promising activities. In either case, programmes of conversion, retraining, technical assistance and special incentives are called for.

Artisans are only one of the sources of entrepreneurship in small-scale industry. Prospective entrepreneurs may also be found among educated young men, merchants, foremen and skilled workers from large enterprises, Government officials and others who should be directed towards industrial occupations which offer good development prospects and are in the priority areas of the over-all industrialization programme. Promotion of small-scale industries and this applies also to artisan enterprises- should therefore be selective, taking into account their viability, their competitive strength and their growth potential. Government policies should not be aimed at starting, or artificially maintaining weak, vulnerable and inefficient industries. The identification of the types of industries which are economic on a small scale, which can sustain the competition of larger firms, or which can be linked with these by complementary relationships, and which have prospects of expansion and diversification, has a decisive bearing on the coverage, scope and orientation of promotion programmes. Hence the importance of surveys of the prospects of development of small-scale industries in various regions or localities of a developing country, and of measures of assistance to small industrialists at the pre-investment stage. These aspects are considered in the next section "Outline of an Integrated Development Programme".

Selection of the location of small industries should be as important as the selection of the types of manufacturing activities. As indicated above, small-scale industries may, on account of their locational flexibility, play a substantial role in decentralization programmes. In most developing countries, however, the choice of location of industry is limited by the lack or inadequacy of infrastructure in vast regions, and except in a few "islands" which have the basic conditions for industrial development, it is often impracticable to set up even small establishments. These need a minimum of infrastructure facilities, skilled labour, raw materials, and market outlets. Such resources or the lack of them must be surveyed before a decentralization or regional planning programme can be formulated. Most small-scale industries have the advantage that they can be operated where the supply of basic facilities is limited and where larger firms could not be set up economically. In a general way, the development of small-scale industry should be closely co-ordinated with programmes for the construction of power plants or for power distribution, road building, water supply and other infrastructure facilities.

The industrial estate may *inter alia* facilitate the establishment of industries in less developed or backward areas, since it provides economic justification for the development of basic facilities and services, e.g. power, water, transport, factory buildings, extension services and training. Yet even the location of an industrial estate presumes the existence of minimum basic resources and facilities and of favourable prospects for industrial development; this should be decided on the basis of thorough surveys.

Since small-scale industries need help in all aspects of their planning, establishment and operation, therefore, the various measures of promotion and assistance for small-scale industries – financial, technical and managerial – should be part of an integrated development programme. Individual measures will be ineffective unless supported by complementary action. For example, credit funds may remain unused, standard factories on industrial estates may remain unoccupied unless steps are taken to stimulate entrepreneurship. Equipment may not be modernized if financing is not provided. Vocational training alone will not improve productivity if industrial extension services are not available to managers. Guidance, advice and support will be needed at every step, in each operation, and over a relatively long period of time. Such integrated and sustained assistance can only be provided by the Government through appropriate institutions, often with the help of foreign experts. The main purpose of such assistance is to support small industrialists through the initial stages and to lead them towards effective, self-reliant management; high-quality, low-cost production; and self-sustained growth.

While it is the function of the Government to

draw up general development policies and programmes and the Government itself must provide through public institutions many, and sometimes most, of the measures of promotion and assistance, there is usually scope for some co-operation from semi-public and private agencies. Such co-operation should be facilitated and co-ordinated by the Government. As a rule, private agencies will not come forward to provide free of charge, or even at cost, such services as technical counselling, technical facilities and training for workers and managers. Services supplied by common-facility workshops are in the nature of operating costs and should be charged for. Counselling services and training are forms of education which, in most countries are considered to be a Government responsibility, and are provided free.

In view of the shortage of industrial extension personnel, Governments of developing countries may consider using the services of chambers of commerce and industry, industrial associations or private consultant firms, and pay the costs of such services in whole or in part. The Government need not give direct credit assistance to small entrepreneurs if commercial banks can be induced (through guarantee or insurance schemes, interest rate subsidy and similar supporting measures) to advance loans to small industries under liberal conditions. Quite often the Government need only play the role of "pump priming", directing its efforts to encouraging private agencies or groups of small entrepreneurs to take promotional action. For example, certain common service facilities on an industrial estate, and even the estate itself, may eventually be turned over to private ownership and management. The first industrial estates should nearly always be set up by the Government since private initiative is not forthcoming in the early stages. One of the purposes of the industrial estate, however, is to demonstrate what can be done through Government assistance to induce local bodies, private groups and co-operatives to follow suit and to set up their own industrial estates with some public support. Public authorities have a major responsibility to facilitate self-help programmes by private groups, usually in the form of co-operative associations. In all cases, it is the duty of the Government to ensure that small entrepreneurs get integrated measures of support, whether these are provided by public institutions, by private agencies or by voluntary efforts of the entrepreneurs themselves.

The measures referred to so far tend to strengthen and support small-scale industries by inducing them to benefit from economies of agglomeration: this is the case when they are located on industrial estates with standard factories, common service facilities and industrial extension services, and when co-operative and complementary arrangements among them enable them to undertake programmes of self-help. Another means of strengthening small-scale industries is to encourage the establishment of subcontracting relationships with large firms. Promotion and support of small industry should be institutionalized through the creation of permanent public agencies such as small-industry service institutes, industrial extension centres, management development centres or special departments of industrial development banks and through the co-operation of semi-public and private agencies.

There is still another type of action which is necessarily the responsibility of the Government the adoption of legislation to facilitate the growth of small establishments as part of the over-all industrialization effort, and of certain preferential schemes and special measures of protection. In most developing countries, tax and tariff concessions are used as an incentive to industrial development. Sometimes, industries benefit from these advantages only if their investment and/or employment exceeds a given minimum which may be set at a relatively high level, thus encouraging large-scale industry. In other cases, incentives are provided only to industries whose investment and employment do not exceed a relatively low level; these are incentives to artisans or to very small industrial establishments. In either case small-scale industry suffers a disadvantage. Thus the revision of existing laws or the enactment of special incentive laws for small-scale industry is often called for. Preferential schemes include programmes for procurement of small-industry products by public authorities, priority procurement of scarce raw materials, concessional rates on freight and utilities and others.

The role of the Government in the promotion of small-scale industries as outlined in the preceding paragraphs has sometimes been criticized as too protective. In this view, small-scale industries are seen as a "spoon-fed" group which cannot survive without Government support, and the Government is criticized for interfering unduly with private initiative. But these criticisms are based on an incorrect understanding of the nature of the Government's role. As stated earlier, one of the principal objectives of small-industry development is to promote the emergence of a healthy group of private entrepreneurs. The Government's role is limited to the extent and time needed to help such entrepreneurs to stand on their own. While Government measures of assistance may continue over a long period and for this reason should be institutionalized, assistance to the individual industry is given only for such time as it is needed. Experience shows that most small industries very quickly outgrow the stage of needing Government assistance. New entrepreneurs will in turn need such

assistance, and so the Government's role of providing assistance continues. The promotional role of the Government will be progressively reduced as the country advances and as private agencies and institutions come forward to provide the services and facilities needed by industries including the small ones.

Smallness does not confer special privileges or advantages in development programmes, but it is the duty of the Government to ensure that smallness is not a perpetual handicap.

Outline of an integrated development programme

The following paragraphs present an outline of a "maximum" programme of promotion of and assistance to small-scale industry. The development of this sector covers in a different context and in different perspective all the major problems encountered in the establishment and growth of industry in general. Much has to be done to promote small enterprises - more than for the larger industries because their need of support is greater. Some measures of promotion and assistance are required by all industries, irrespective of size: planning, surveys and feasibility studies, financing, provision of sites and infrastructure, training of manpower, technological research, marketing and export promotion, fiscal and other incentives; but the requirements of small industries in these areas should be especially adapted to their needs. Other measures are needed only for the promotion of small-scale industry, as in the case of industrial estates, common service facilities, co-operatives, hire-purchase and other supervised credit schemes, Government store procurement programmes etc. In general, technical and managerial counselling are needed only by small industries. Depending upon the needs, prospects and targets of the development of small-scale industry in a given country, most and sometimes all of these measures should be provided. The programmes may be implemented by one or several agencies - a department of a ministry, small-industry development institutes, extension centres, industrial estate authorities or other agencies.

Appreciable resources of expert personnel and finance are needed to carry out comprehensive programmes of this type. The scarcity of specialists in small industry development - industrial economists, engineers in various fields of specialization, management development experts, industrial estate planners, market researchers, and so on is a major obstacle; it is frequently necessary to call in foreign experts and to make the training of national counterparts one of their main duties.[1] Certain projects involve large investments. The establishment of industrial estates calls for land, infrastructure development, factory construction, equipment of common facilities and provision of other services and facilities. Large investments are also required for industrial extension centres, and training institutes which must have workshops and laboratories with equipment, class-rooms, libraries, and so on. Though some of this investment may be recovered, as, for example, when installations on industrial estates are turned over to the occupants, the over-all costs of an integrated small-industry development programme may be high. Nevertheless, there is abundant evidence that many developing countries consider that the economic, social and political worth of such a programme fully justifies the allocation of scarce resources to build permanent development machinery.

An integrated small-scale industry development programme includes measures under the following three main headings: *(a)* promotion and assistance; *(b)* industrial estates; and *(c)* financing, training and special incentives. Under the first two headings the programme should be the responsibility of a special governmental agency or a department of a ministry, and implemented either by the agency or by specialized institutions, which would also contribute to the formulation of the programmes under the third heading and play a role in their implementation and co-ordination. However, the responsibility for carrying out the third part of the programme would usually be borne by other institutions or government departments.

Promotion and assistance

Stimulation of entrepreneurship

In order to stimulate entrepreneurship and attract prospective entrepreneurs to industrial activities offering good prospects and consonant with the objectives, priorities and requirements of the over-all development plan, technical and economic studies should be made of the types of industries which can be set up in various parts of the country. Such surveys would indicate, in the light of the availability of raw materials, power, water, transportation and other utilities, capital, labour, markets and so on, the prospects for manufacturing industries which would use to the greatest possible extent local materials and create substitutes for imports. Such surveys would necessarily be broad and would not only describe the prospects of small-industry development but would also indicate possibilities for industrial decentralization.

[1] Technical assistance is beyond the scope of the present report. For a detailed description of the types of assistance which may be provided by the United Nations, see *Technical Co-operation for the Development of Small-scale Industries* (United Nations publication, Sales No.: 67.II.B 2).

Once the feasible and desirable types of small industries have been determined, "model schemes" or "industry fact sheets" should be prepared for each of the industries or at least for those with highest priority. The "model schemes" would describe in simple and clear terms requirements of capital, plant and equipment, employment, raw materials, processes, marketing prospects, and would estimate turnover and profitability.

The promotion and assistance agency should not limit itself to giving consultations to persons approaching it. It should, as far as possible, seek out prospective entrepreneurs with a view to directing them to industrial occupations and providing them with all necessary information and advice. Intensive development campaigns, organized jointly by industrial extension and financial agencies, may be undertaken. Groups of technicians may go from place to place with mobile demonstration vans, convene meetings and discussion groups, and formulate projects for which technical, managerial and financial assistance will subsequently be provided.

Upon request from prospective or established entrepreneurs, the promotion and assistance agency would undertake feasibility studies, including marketing surveys, for new industrial projects, and would evaluate projects already prepared by the entrepreneurs.

It would assist prospective and existing entrepreneurs in formulating "bankable" projects for financing by commercial or public credit institutions. It would also assist entrepreneurs in all formalities relating to incorporation, licensing, acquisition of site or buildings, import licenses and foreign exchange authorizations and other prerequisites for setting up, modernizing or expanding an industrial enterprise.

The promotion and assistance agency would coordinate the activities of institutions for training, management and labour, industrial research centres and other bodies such as chambers of commerce and industry, professional associations, cooperatives etc. which contribute to the stimulation of entrepreneurship, the spread of industrial skills and the dissemination of technical information.

Technical and managerial assistance

The promotion and assistance agency would provide assistance to small industrialists in every aspect of planning, constructing, operating and managing their enterprises.

Economic assistance in this context consists principally of counselling on an industry's feasibility and prospects; selection of location; determination of fixed and working capital requirements; collecting information on the availability and prices of raw materials, labour, factory space and production costs of units of different size; studying the competitive position of this industry in relation to others; and evaluating marketing and export opportunities.

Technical assistance consists of advice and guidance on the choice of materials, machinery and tools and their most efficient utilization in production. It includes advice on plant layout; installation, operation, maintenance and repair of machinery, techniques of production, testing, quality-control procedures, packaging, storing, selling and shipping goods; and classroom and on-the-job training of workers and supervisors.

Management development calls for advice, guidance and training in all aspects of the conduct of a business, including the raising of resources, organization, production planning and control, inventory control, cost accounting and marketing techniques. It includes advice on sources of credit, loan regulations, taxes, bookkeeping, advertising and publicity. It may also include promotion of subcontracting between large and small industries through the provision of information on opportunities in this field and the facilitation of negotiation of contracts. The promotion of co-operative arrangements, including co-operative associations among small undertakings, is a related activity.

Product improvement is concerned with design and quality. Existing design may be improved or a new design substituted for an old one so as to enhance performance, quality and appearance. Advice on standardization is also provided.

Training is necessarily involved in these activities, whether it is provided in an industrial extension centre, in a special institution or on the job. As an industrial extension activity, the training provided to managers, supervisory personnel and workers of existing enterprises is, as a rule, in the nature of upgrading of existing skills and is more specialized than that given in business administration courses or through technical and vocational training to students who have not yet entered industrial employment.

Industrial research is an essential supporting activity for technical and managerial assistance. Technological adaptation or innovation in respect of processes, equipment and products is often of special benefit to small-scale industries. Some processes result in reductions in input of capital and materials. Some types of equipment make it possible to produce economically at relatively small capacity or lend themselves to multiple use. Some products may be based on local materials or by-products or may meet special demands in narrow markets. An industrial extension service should make use of the results of such research.

Information and research

The promotion and assistance agency would disseminate economic, technical and legal informa-

tion relating to the development of small-scale industries and would undertake research in these areas.

Industrial estates

The planning and construction of industrial estates should be one of the fundamental components of a programme for the development of small-scale industry.[2] The estate is one of the most effective instruments of promotion. The availability of standard factories for rent or hire-purchase is, for people with small financial means, a major inducement to engage in industrial operations. The existence of facilities providing technical and managerial assistance is another important inducement to entrepreneurship. When an extension centre is part of an industrial estate, the small industrialists may receive sustained assistance in all aspects of their work. Common service facilities, such as a tool-room, a maintenance and repair shop, or a testing and quality control laboratory, which may vary in type with the composition of industries on the estate, contribute to improving productivity and product quality and to reducing costs. The grouping of small industries on a common site makes it economical to set up other facilities, such as a training institution or an information centre, as part of the estate. Thus, the industrial estate is an effective tool for integrating the various measures of support to small-scale industries.

Financing, training and special incentives

To be fully effective, the measures described above should be supported by complementary programmes. Because of relatively high risks, high costs of lending and small banking profits, small industries have difficulties in obtaining credit, and therefore require special measures for financial assistance. The principal feature of financing small-scale industries is the linking of technical to financial assistance. As industrial extension services help to increase productivity, the risks of small entrepreneurs are reduced and their creditworthiness increased. Credit is facilitated through assistance in preparing loan applications and "credit supervision" for small-scale industries is essentially a form of technical assistance aimed at ensuring a proper use of loans through technical and managerial guidance.

Supervised credit operations may be jointly managed by financial and industrial extension agencies. Certain forms of supervised credit, for example hire-purchase systems for the provision of machinery, may be more effectively operated by a special agency. Because of the high cost of credit supervision, special financial institutions often have to be created, through which foreign as well as domestic funds can be channelled. Where small industries have achieved a measure of development, financing by commercial banks may be obtained through Government guarantee and insurance schemes.

The importance of vocational training is evident and need not be elaborated. One of the advantages of establishing training centres in or near industrial estates is that courses may be designed specifically to meet the needs of the industrialists. Another advantage is that apprenticeship and in-plant training may be facilitated.

Other measures in a maximum programme of development include special tax and customs benefits for small-scale industries, priority allocation of scarce raw materials, preferential purchase of small-industry products by Government agencies, reductions in transportation and utility rates, and special export promotion measures.

The place of small-scale industry in the industrial framework

This section is adapted from parts of a statistical analysis of the role of small-scale industry in industrial and industrializing countries, prepared by Mr. G. K. Boon, a UNIDO consultant. The full study is expected to be published by UNIDO in 1969.

There are two main obstacles to assessing the place of small-scale industry in the over-all industrial framework: the lack of uniformity of definitions of small-scale industry as found in publications, industrial censuses and other statistical material in various countries; and the small number of countries for which detailed data are available.

A definition of small-scale industry should identify the modern small manufacturing sector, excluding handicraft and artisan undertakings and cottage industry. In many countries, the definition is based on employment only, with ceilings set at different levels. It happens frequently that enterprises with little or no machinery and employing relatively large numbers of workers are classified as small-scale or medium-sized industries, though their activities may be of an essentially artisan or cottage-industry type.

A comprehensive definition should take into account investment in fixed capital, with or without the criterion of the number of employees, the ceilings varying from one country to another. The criterion of investment in fixed capital is, however, seldom found in statistical literature. For this reason, the present study uses a definition of small-

[2] See "Policies and Programmes for the Establishment of Industrial Estates" (ID/CONF.1/29).

scale industry based on employment only, setting a ceiling of 100 workers or less per enterprise.

For the purposes of the analysis, industry is grouped into three broad categories: light industry, the metal products industry, and heavy industry; the components of each of these categories are shown in table 1 below.

Table 1

CLASSIFICATION OF INDUSTRY

ISIC[a] *No.*	*Industry group*
	Light industry
20–22	Food, beverages and tobacco
23	Textiles
24	Footwear, clothing
25	Wood and cork
26	Furniture
28	Printing and publishing
29	Leather and leather products
30	Rubber products
39	Miscellaneous manufacturing
	Metal products industry
35	Metal products
36	Machinery except electrical
37	Electrical machinery
38	Transport equipment
	Heavy industry
27	Paper and paper products
31	Chemicals and chemical products
32	Petroleum and coal products
34	Basic metal industries

[a] International Standard Industrial Classification.

Heavy industries are capital-intensive and, in general, use equipment characterized by relatively large indivisibilities. For this reason, they benefit from economies of scale. The other industrial activities are, however, not necessarily labour-intensive. It is a characteristic of many light and metal-products industries that choices exist between alternative techniques, ranging from more to less labour-intensive, or from less to more capital-intensive.

A sample of fourteen countries has been taken as the basis for an assessment of the place of small-scale industry in each of the three categories: six developed countries: Canada, Finland, Japan, the Netherlands, the United Kingdom and the United States; eight developing countries: Argentina, Brazil, Chile, China (Taiwan), Colombia, Mexico, Pakistan and Peru.

In both the developed and the developing countries in the sample, the highest number of establishments is in the light industry group. In the developed countries and in Brazil and Mexico, the average size of establishments in terms of value added per establishment is the smallest in the light industry group. In the other developing countries, it is in the metal products industry group.

In all the countries under consideration, with the exception of Argentina and Peru, the smallest number of establishments is in the heavy industry group; in Argentina and Peru, it is in the metal products category.

The largest average size of establishment, expressed in value added per enterprise, is in the heavy industry group in all countries except Brazil, where the average added value per establishment is significantly greater in metal products than in heavy industry.

The average number of persons employed per establishment is smallest in the light industry group in the developed countries and in Brazil, Chile and Mexico. In the other developing countries of the sample, the metal products industry has the lowest average employment per establishment.

The average size of establishment expressed in number of persons employed is, in most countries, largest in the heavy industry group, with the exception of Brazil, where it is in the metal products group, and Pakistan, where it is in the light industry group.

Another indicator of the relative importance of industry is the value added per employee, which measures the average labour productivity. The value added per employee is positively correlated with the wage rate and the capital-labour ratio.

The value added per employee is the lowest in the light industry group in all the developed countries except Finland, and in Brazil and Mexico. In the other countries the lowest labour productivity is found in the metal products industry.

The highest labour productivity figures are found in the heavy industry group in all countries except China (Taiwan), where the highest figure is found in the light industry group. Because of the positive correlation between the value added per employee and the capital-labour ratio, what has been said of the average labour productivity holds indirectly for the capital-labour ratio. The highest capital-labour ratio is found in the heavy industry group while the lowest ratio is found either in the light industry group (mainly in the developed countries) or in the metal products group (mainly in the developing countries).

A final characteristic is the average level of wage per person employed. As might be expected, the lowest average wages are paid in light industry (with the minor exception of Colombia where the wages in the metal products industry are slightly lower). The highest wages are paid in the heavy industry group, in all countries of the sample, except in the United States, where the average wages in the metal products category are somewhat higher, and in Brazil, where they are significantly higher.

The statistical analysis suggests that the following pattern observed in the industrially mature countries is the normal one for these countries:

The highest number of establishments is found in the light industry category followed by the metal products industry category and the heavy industry category.

The average value added per establishment is smallest in the light industry category, as are also the average number of persons employed per establishment, the value added per employee (and consequently the capital-labour ratio) and the average wage paid per person. The highest level in all these ratios is in the heavy industry category; intermediate values are found in the metal products group.

The pattern is different in the developing countries which go through various phases before reaching the industrial structure typical of the advanced countries. In the industrializing countries, the position of light industry and metal products industry appears to be the reverse of that in the industrial countries. An explanation of this deviation is that the process of industrialization often starts with an emphasis on light industry and is followed by the development of the metal products industry. For this reason, the light industry group may be relatively mature, while the metal products industry may be still at an infant stage. It is also for this reason that light industry may be expected to decline in importance in relation to metal products and to heavy industry. This conclusion is strengthened by the analysis of the distribution of value added in industry for the period 1938–1961 given in table 2 below.

Table 2 shows that, in the industrializing countries, the share of heavy industry is comparable to the proportion in the industrial countries. This, however, is entirely due to the relatively low contribution of the metal products industry; yet this contribution is rising very rapidly. The share of light industry declines but remains quite high. In 1961, light industry contributed more than three times as much to total value added in manufacturing as did the metal products industry.

In the industrial countries, the share of the metal products industry is higher than that of heavy industry. The decline in the share of light industry is more rapid in these countries than in the developing ones.

It may be expected that, in all economies, the share of light industry will decline in relation to that of the metal products industry. In the developing countries, it is probable that the contribution of small-scale industries to the light industry sector will decline but that it will increase in the metal products group since small enterprises are very efficient in many branches of the latter group, either as independent producers or as subcontractors to large undertakings. On the whole, therefore, the relative position of small-scale industry may not necessarily decline in the future; it may remain unchanged or may even increase. In absolute terms, the number of small-scale industries will definitely increase as industrialization proceeds.

Another approach to ascertaining the role of small-scale industry in manufacturing industry as a whole is to determine its percentage share in total employment and the total value added in manufacturing. This has been done for 35 countries for which data are available; the results are presented in table 3.

Table 2

DISTRIBUTION OF VALUE ADDED IN INDUSTRY, 1938–1961

(At 1958 prices)

Area	*Industry groups*	*Per cent of value added*			
		1938	*1948*	*1953*	*1961*
World (excluding USSR and Eastern Europe)	Light industry	52.4	44.3	39.3	37.8
	Metal products industry	24.1	30.1	35.2	34.7
	Heavy industry	23.5	25.6	25.5	27.5
Industrial countries	Light industry	50.8	42.2	37.5	35.9
	Metal products industry	25.5	31.9	35.0	36.6
	Heavy industry	23.7	25.9	25.5	27.5
Industrializing countries	Light industry	68.9	67.2	63.1	55.7
	Metal products industry	9.7	10.7	11.9	16.3
	Heavy industry	21.4	22.1	25.0	28.0

Source: Table 24, *The Growth of World Industry, 1938–1961*, United Nations publication, Sales No. 63.XVII.5.

[a] The light industry group includes ISIC 20–26, 28–30, 39; the metal products industry group ISIC 35–38; the heavy industry group ISIC 27, 31–34.

Table 3

RELATIVE POSITION OF SMALL-SCALE INDUSTRY IN SELECTED COUNTRIES

The percentage share of small-scale industry in total manufacturing for employment and value added

Country	Year	Definition of small-scale industry according to numbers of employees	Per cent of employment		Per cent of value added	
			Small-scale	Larger scale	Small-scale	Larger scale
1. Cyprus	1962	1–99	78.1	21.9	65.6	34.4
2. Greece	1961	10–99	65.6	34.4	58.2	41.8
3. Venezuela	1961	5–99	62.7	37.4	41.3	58.7
4. Surinam	1961	1–100	61.0	39.0	—	—
5. Israel	1963–64	1–99	59.7	40.3	—	—
6. Rep. of Korea	1963	5–99	56.7	43.3	42.4	57.6
7. Costa Rica 8. El Salvador 9. Guatemala 10. Honduras 11. Nicaragua	1962	5–99	52.9	37.1	51.7	48.3
12. New Zealand	1962–63	6–100	52.1	47.9	47.4	52.6
13. Tanganyika	1962	1–100	48.4	51.6	—	—
14. Japan	1961	4–99	46.2	53.8	47.4	52.6
15. Colombia	1962	5–99	45.9	54.1	29.2	70.8
16. Australia	1961–62	5–100	43.4	56.6	—	—
17. Chile	1957	5–99	42.8	57.2	25.4	74.6
18. Philippines	1960	5–99	42.1	57.9	23.6	76.4
19. Brazil	1960	5–99	38.9	61.1	32.2	67.8
20. Sweden	1960	1–100	38.4	61.6	—	—
21. Uganda	1963	1–99	37.7	63.3	—	—
22. India	1962	1–100	35.8	64.2	29.7	70.3
23. Malta	1963	1–100	34.6	65.4	25.6	74.4
24. Canada	1961	1–99	34.5	65.5	27.7	72.3
25. Iraq	1963	10–99	31.7	68.3	14.0	86.0
26. Kenya	1963	5–99	31.0	69.0	29.0	71.0
27. Malaya	1959	1–99	27.3	72.7	—	—
28. United States	1958	1–99	27.0	73.0	23.0	77.0
29. Pakistan	1958	1–99	22.2	77.8	24.8	75.2
30. Great Britain	1958	1–99	15.8	84.2	13.6	86.4
31. Ghana	1959	6–100	8.4	91.6	6.5	93.5
32. Northern Ireland	1958	1–24	8.0	92.0	—	—
33. Yugoslavia	1961	1–125	6.2	93.8	5.3	94.7
34. Hungary	1963	1–100	0.9	99.1	1.0	99.0
35. Romania	1963	1–100	0.5	99.5	—	—

Extreme values, that is, employment ratios of more than 50 per cent for small-scale industry, are found in the Central American countries, in Cyprus, Greece, Israel, New Zealand, the Republic of Korea, Surinam and Venezuela; all of these are relatively small industrializing countries. Employment in small-scale industry of less than 20 per cent of the total is found in Ghana, Hungary, Northern Ireland, Romania and Yugoslavia, all of which are also developing countries, three of them with centrally planned economies. In highly industrialized countries Sweden, the United Kingdom and the United States employment in small-scale industry is, respectively, 38, 16 and 27 per cent of the total. Thus, it appears that the relative role of small-scale industry does not depend on the level of economic development.

The share of value added in small-scale industry is lower than that of employment in small industry in all countries listed in table 3 except Japan and Pakistan. This indicates a lower labour productivity in small industries as compared with large enterprises, a finding which confirms earlier ones.

Selected Country Data

More detailed data on a number of characteristics of small-scale industry are given in the following paragraphs for India, Japan, Pakistan, the United Kingdom and the United States.

India

Analysis of Indian data shows that the larger the number of establishments in a given industry sector, the smaller the average firm size and the

lower the average labour productivity. In 57 out of 62 industries, the largest number of establishments is in the small-scale class (less than 100 workers). The distribution of industry among the light and heavy sectors is shown in the following table:

Table 4

PROPORTION OF LIGHT AND HEAVY INDUSTRY IN INDIA, 1948–1961

	Light industry	*Heavy industry*
	(Per cent of total industry)	
1948	79.7	20.3
1953	74.5	25.5
1958	68.3	31.7
1961	64.3	35.7

Source: United Nations, *The Growth of World Industry, 1938–1961*, table 13 (Sales No. 63.XVII.5).

A special aspect of the subject has been studied for India: the requirements of professional workers. The analysis shows a positive correlation between the above-mentioned ratios and number of professional and technical workers as a per cent of total employment. Smaller firm size and lower labour productivity are positively correlated with lower professional and technical labour requirements. In the light of non-durable consumer goods industries, the highest percentage of professional and technical workers is in the small-industry class; in the metal products and heavy industry groups, the highest percentage of these workers is in the large-industry class. As in all generalizations, there are some exceptions.

Data on the contribution of small-scale industry to manufacturing industry in India for a more recent date (1962) show that small industry plays a substantial role in Indian manufacturing. Small industries, defined as establishments with fixed capital assets not exceeding Rs. 500,000 and employing up to 100 workers, account for 91 per cent of the total number of establishments, 36 per cent of the total employment and 30 per cent of the total manufacturing gross output in manufacturing.

Japan

Data on industry in Japan have been analysed by a ranking procedure. A broad sample of 19 industry sectors was grouped in nine size classes in terms of the number of employees per enterprise, the smallest size class including 1–9 employees, the largest 1,000–1,999 employees. Because of incompleteness of data in larger size classes, establishments with an employment above 2,000 persons were disregarded. The results of the statistical analysis are summarized below.

The correlation between the number of establishments and the size class is almost perfect; in almost all of the 19 sectors, the smaller the number of employees, the larger the number of firms. The correlation between labour productivity and the size of the industry is also very close: the smaller firms have almost invariably a lower labour productivity in terms of output per employee. The capital-labour ratio (fixed capital assets per employee) is very strongly correlated with firm size, the smaller the firm, the smaller the average investment per worker.

The correlation between size class and capital-output ratio is not strong, the coefficient of concordance being relatively low. It still appears that the larger the average firm size, the higher the capital-output ratio. This relationship is weaker at both ends of the size breakdown: in the large enterprises, economies of scale reduce the ratio, while in the smallest size class, owing to under-utilization of equipment, the capital-output ratio is higher than in the next two larger size classes.

There is an almost perfect correlation between wage-rate level and size class, i.e. the larger the firm the higher the average wage; the smaller the firm, the lower the wage rate. The ratio of capital income to labour income yields a lower coefficient of concordance than the capital-labour ratio.

Pakistan

The data for Pakistan, based on the 1958 census of the manufacturing industry, show that small-scale industry provides employment to 22.2 per cent of the workforce in manufacturing industry and contributes 24.8 per cent to the value added.

In several industrial groups, labour productivity is higher in small-scale industry than in manufacturing as a whole. This is the case in the printing, chemicals, machinery and miscellaneous industries. In the case of non-metallic mineral products, the basic metal industry and the metal products industry, labour productivity is only slightly below that of the average for all industries in these sectors. The impression is gained that the average labour productivity is higher for small-scale industry than for the manufacturing industry as a whole, which would be a rather striking fact. Because of the scarcity of mineral and other raw materials, industrialization may have advanced more rapidly in light industries than in heavy industry. In more recent years, advances took place in heavy industry, as may be seen in the following table.

Small-scale industry is rather important in the United Kingdom, where in 1958 it accounted for 15.8 per cent of all employment in manufacturing and 13.6 per cent of the net output. There is a strong positive relationship between the average firm size and the average labour productivity,

Table 5

ADVANCES IN HEAVY INDUSTRY IN PAKISTAN, 1948–1961

	Light industry	*Heavy industry*
	(Per cent of total industry)	
1948	79.2	20.8
1953	79.2	20.8
1958	74.4	25.6
1961	70.2	29.8

Source: United Nations, *The Growth of World Industry, 1938–1961*, table 13 United Kingdom (Sales No. 63.XVII. 5).

capital-labour ratio and wage per employee. (The coefficient of concordance is 0.762.)

In sectors in which the average firm size is small (in terms of net output per establishment), labour productivity (net output per employee) is in general lower than in sectors with a higher average firm size. The capital-labour ratio (fixed capital per employee) and wages per employee are lower in sectors with a small average firm size.

Data on the number of establishments, employment and total sales relating to small firms (employing up to 100 persons) on the one hand, and to larger firms (employing over 100 persons) on the other hand, show that the industrial sectors in which more than 80 per cent of the establishments are small are: food, beverages and tobacco, engineering and electrical goods, metal goods, leather goods and furs, clothing and footwear, bricks, pottery and glass, timber, furniture, paper and publishing and other manufacturing industries.

The highest figures for all three criteria are in the leather goods industry number of establishments (93.4 per cent, employment 57.7 per cent and sales 55.2 per cent) followed by the timber, furniture, clothing and footwear industries. The lowest figures are in the vehicles industry (number of establishments 69.5 per cent, employment 4.7 per cent and total sales 4.0 per cent).

United States

Employment in small-scale industry in the United States in 1958 (in establishments employing from 10 to 100 persons) represented 23.4 per cent of total employment in industry and contributed 19.7 per cent to value added.

The capital-labour ratio is lower in light industry and the metal products industry than in manufacturing as a whole, while it is higher and in some cases considerably higher in the heavy industry group. This corroborates an earlier statement that heavy industry is largely capital-intensive. Small-scale enterprises contribute less to heavy industry than to the two other groups.

Heavy industry has the lowest output-capital ratio (<2), while the metal products has a fairly high ratio (between 3.2 and 4.6). The ratio for light industry varies from 2 to 9.3, five out of ten light industries having an output-capital ratio higher than 4. Labour productivity does not show clear trends in light industry, two out of ten industries having a ratio close to the average for manufacturing as a whole. In the metal products industry, two out of four of these ratios are above the average. In heavy industry, excepting the non-metallic mineral products industry, labour productivity is above the average figure for all manufacturing.

TYPES OF PRODUCTION SUITABLE FOR SMALL-SCALE INDUSTRIES

A broad variety of products may be manufactured economically by small-scale industries. In a recent survey,[3] five principal types of opportunities are identified:

1. Dispersed processing of weight-losing or perishable raw materials. Opportunities depend on the resources, geography, transport network and land ownership patterns of the country or area. Examples of such industries are rice milling, rice bran oil, saw mills, wood drying kilns, vegetable oil extraction, cheese, butter, leather tanning, fruit and vegetable canning, hardboard and strawboard.
2. Bulky, weight-gaining and hence market-oriented products, principally in the field of construction, agricultural and household goods. Examples are agricultural implements, sheet metal products, containers, mixed fertilizers, bricks, concrete products, structural metal products, plastic pipe and conduit, bread, soft drinks, ice cream, furniture and truck and bus bodies.
3. Simple assembly, mixing or finishing operations. Productions require low investment, have moderate economies of scale, are labour-intensive and have low transfer costs. Examples are; food products, clothing, footwear, leather goods, pharmaceuticals, paints and varnishes, sports goods, plastic products and toys. These are particularly suitable for establishment in urban centres enjoying external economies.
4. Service industries lending themselves to quality job work and specialized tasks. Examples are: tool and die making, electroplating, printing, electrical servicing, auto servicing, foundries and machine shops.

[3] E. Staley and R. Morse, *Modern Small Industry for Developing Countries*, Chapter VI, McGraw Hill, New York (1965).

5. Separable manufacturing operations in the metal-working industries. These offer potentially the greatest scope for small enterprises. The versatility of machine tool operations, the endless number of products and components to be made, and the interchangeability of standard parts offer great opportunities for craftsmen and engineers to adapt and innovate constantly in response to changing cost and production possibilities.

The authors of the survey state that the dynamic element in the metal-working industries is well suited for the technically oriented entrepreneur and accounts for the significant role of the small propriety and partnership firms in tool and die making, designing and precision job work, even in developed countries. Specialization in certain operations makes scale economies possible; versatility and precision working yield high value added in the products manufactured. The possibilities of subcontracting between small and large industries are particularly great in the metal-working sector.

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A. Development of small-scale industry

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   The article outlines in some detail certain proposals of the Secretary-General of the United Nations in the field of industrial development during the Development Decade (*The United Nations Development Decade — Proposals for Action*, Sales No.: 62.II.B.2). It refers, *inter alia*, to the role of small-scale industries and industrial estates and to the role of the United Nations in this connexion.
2. *Technical Co-operation for the Development of Small-scale Industries*, 42 pp. (Sales No.: 67.II.B.3).
   A description of the organization of technical co-operation and the procedures for obtaining assistance from the United Nations. An outline of the types of projects and the types of assistance which may be made available for the development of small-scale industry. Annexes contain typical job descriptions for expert missions and outlines of requests for assistance from the United Nations Development Programme (Special Fund).
3. *Promotion of Small-scale Industry in the Developing Countries.* To be published in 1969.
   A collection of studies on the definition of small-scale industry, the role of small-scale industries, pre-investment surveys and measures for the stimulation of entrepreneurship, industrial extension services, industrial estates etc.
4. *The Place of Small-scale Industry in the Industrial Framework: A Statistical Analysis*, by G. K. Boon. To be published in 1969.
   A statistical analysis of small-scale industries (number of establishments, value added per establishment, number of persons per establishment, value added per employee, wages per employee) and comparisons with larger manufacturing establishments in a number of developed and developing countries.
5. *Small-scale Industry in Latin America.* To be published in 1969.
   The publication will contain the report of the Seminar on Small-scale Industry in Latin America held in Quito, Ecuador, in November-December 1966 and some of the papers prepared for the seminar.
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   The publication will contain the report of the Expert Group on the Development of Small-scale Industries in Arab Countries of the Middle East held in Beirut, Lebanon, in November 1968, a paper on Situation, Problems and Prospects of Small-scale Industries in Selected Countries of the Middle East by E. Asfour, and a paper on the Future of the Traditional Sector in an Industrializing Economy, prepared by UNIDO.

B. Technical services and facilities for small-scale industry

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A discussion of national measures to promote exports of small industry products which may be taken by governments, producers and exporters of the exporting countries, and of international action in this field, especially by GATT and the United Nations. A discussion of industrialization policies in respect of import substitution and export promotion, with special reference to the role of small-scale industries, is presented in an annex.

4. *Technical Services for Small-scale Industries*. To be published in 1969.
The publication will contain the report of the Interregional Symposium on Technical Services and Facilities for Small-scale Industries, held in Vedbaek, Denmark, June-July 1967 and some of the papers prepared for the symposium.
5. "Promotion of Small-scale Industries through Government Purchasing", by Kennard Weddell, *Industrialization and Productivity Bulletin No. 12*, (Sales No.: E.68.II.B.3).
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6. *Common Service Facilities for Small-scale Industries: No. 1 Tool Room*. To be published in 1969.
A study of the tool room as common service facility for small-scale industries. Description of the functions, policies, procedures, methods, equipment and staff of these facilities, including economic and engineering data.

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A study of location, planning, layout and building requirements for industrial estates in the developing countries.
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Fertilizer Industry – Sectoral Study

General review

Role of the fertilizer industry

The fertilizer industry is a branch of the chemical industry, but it is an atypical branch in that it has only one customer, namely, agriculture. The fertilizer industry is, therefore, a part of manufacturing industry and at the same time an integral part of agriculture.

Fertilizer is one of the five principal agricultural inputs necessary for increasing agricultural productivity: fertilizer, improved seed varieties, water, pesticides and farm machinery. All these inputs are necessary to raise agricultural yields, but fertilizer is probably the most important. Some countries, such as the United States and Japan, have estimated that approximately half of the increases in agricultural yields attained may be attributed to greater use of fertilizers. Thus the fertilizer industry might be considered as the most urgently needed industry in many of the developing countries, particularly those with present or impending food shortages.

Although agriculture is its only major customer, the fertilizer industry has links with many other industries. The oil and natural gas industries supply it with hydrocarbon raw materials. The mining industry supplies phosphate rock, potash minerals and sulphur. Ammonia produced by the fertilizer industry has many industrial applications. Ammonium nitrate is used as an industrial explosive, particularly in coal mining. Urea is used in making urea-formaldehyde plastics. Phosphoric acid has many industrial uses. Ammonium phosphate is used as a fireproofing chemical. Ammonium chloride is used in the manufacture of electric dry cells. Ammonium chloride and soda ash are made as joint products in a process used in several Asian countries. And the fertilizer industry is an important buyer of catalysts.

Trends in the world fertilizer industry

World production and consumption of chemical fertilizers have increased tremendously throughout this century, as illustrated by table 1.

These data exclude mainland China, North Korea and North Viet-Nam. They refer to consumption, but production would be about the same, except for losses and changes in stocks. They do not include organic materials, except those processed

Table 1

FERTILIZER CONSUMPTION

(Thousand metric tons)

	Nitrogen (N)	*Phosphates (P_2O_5)*	*Potash (K_2O)*	*Total*
1905/1906[a]	366	1,047	515	1,928
1913/1914	702	2,137	1,022	3,861
Decline during First World War				
1919/1920	757	1,729	1,070	3,556
1938/1939	2,670	3,637	2,904	9,211
Decline during Second World War				
1946/1947	2,568	4,368	2,677	9,613
1960/1961	10,200	9,845	8,465	28,510
1965/1966	17,390	14,525	12,120	44,035
1966/1967	19,820	15,500	12,940	48,260

[a] The "fertilizer year" begins on 1 July and ends on 30 June of the following calendar year.

in factories and incorporated in commercial fertilizers. Organic materials were a substantial part of the totals in the early years of the century, but today they are only a small fraction of 1 per cent of total commercial fertilizers.

The growth in production and consumption of fertilizers has been much more rapid since the Second World War than it was between 1919 and 1939, and the rate of growth for nitrogen and phosphorus has been even higher since 1962. These facts are summarized in table 2.

Table 2

GROWTH OF FERTILIZER PRODUCTION AND CONSUMPTION

(Percentages)

Average annual rate of growth	*N*	P_2O_5	K_2O	*Total*
1919/1920 to 1938/1939 (19 years)	6.9	4.0	5.4	5.1
1946/1947 to 1965/1966 (19 years)	10.6	6.5	8.3	8.4
1960/1961 to 1966/1967 (6 years)	11.2	8.0	7.5	9.1

In view of the large-scale construction of new fertilizer plants around the world, it seems very likely that a high rate of growth will continue for the next few years at least.

Table 3 compares the growth rates of fertilizer production and consumption in the developed and developing areas. The developing areas are increasing production of all nutrients much more rapidly than the developed areas. For instance, in the developing areas nitrogen production rose 20.4 per cent per year during the first five years of the 1960's, whereas in the developed areas it rose only 11 per cent per year. However, the total production in the developed areas is still much larger than in the developing areas.

Table 3

COMPARISON OF GROWTH RATES OF PRODUCTION AND CONSUMPTION OF FERTILIZERS IN DEVELOPED AND DEVELOPING AREAS, 1960/1961 TO 1965/1966

(Percentages)

	N	P_2O_5	K_2O	*Total*
		Production		
Developed areas	11.0	7.7	8.6	9.3
Developing areas	20.4	10.7	23.5	16.8
Asia[a]	23.8	14.9	26.7	23.2
Africa	21.2	9.5	–	13.6
Latin America	13.8	6.9	0.0	11.9
		Consumption		
Developed areas	11.5	7.6	7.1	8.9
Developing areas	7.0	13.4	12.8	11.4
Asia[a]	7.0	18.0	17.1	12.7
Africa	9.3	6.7	14.9	9.9
Latin America	5.2	14.9	8.0	10.4

[a] Other than Japan, mainland China, North Korea and North Viet-Nam.

In terms of consumption, the developing areas have outstripped the growth rate of the developed areas since 1960 in the case of phosphate and potash fertilizers, but not in the case of nitrogen fertilizers.

The boom in fertilizers

A world-wide boom in the construction of fertilizer plants is now in progress, including nitrogen, phosphate and potash. At least 100 large-capacity fertilizer plants are under construction all over the world, but especially in Canada, the United States of America, Western Europe, Eastern Europe, the Union of Soviet Socialist Republics and Japan. This boom has been sparked first, by the rapidly increasing demand for fertilizers, second, by the advent of improved technologies for the production of ammonia, urea, nitric acid, ammonium phosphates, granulated mixed fertilizers and other fertilizer materials, and third, by the discovery of important new sources of natural gas, phosphate rock and potash minerals.

The basic cause of this great upsurge in the demand for fertilizers is the rapidly increasing population of the world. Up to 1950 the world's population had never increased by more than 25 million per year, but now it is increasing by more than 70 million per year—and the rate still growing. The demand for agricultural products and fertilizer is still further stimulated by the rising expectations of the peoples of Asia, Africa and Latin America. The rising standards of living of Western Europe, Japan and the Soviet Union are also a contributing factor. Unfortunately, the boom in fertilizer plant construction is largely bypassing the developing countries, with a few exceptions, such as Mexico, the Republic of China (Taiwan), South Korea and South Africa.

Production and consumption of fertilizer up to 1975/1976

Table 4 and figure 1 give detailed data on world consumption of fertilizers from 1930/1931 to 1966/1967. Also shown are some projections for 1970/1971 and 1975/1976. Again, production may be equated approximately to consumption. Figure 1 shows the growing importance of nitrogen. As recently as 1954/1955, nitrogen was the lowest of the three nutrients, whereas in 1965/1966 it was clearly forging far ahead of phosphorus and potash. The projections in figure 1 indicate that this trend will probably continue.

Table 4

WORLD CONSUMPTION OF FERTILIZERS

(Thousand metric tons)

	N	P_2O_5	K_2O	*Total*
1930/1931	1,499	2,986	1,959	6,444
1931/1932	1,237	2,403	1,508	5,148
1932/1933	1,205	2,467	1,549	5,221
1933/1934	1,267	2,780	1,956	6,003
1934/1935	1,592	2,974	2,281	6,847
1935/1936	1,969	3,104	2,432	7,505
1936/1937	2,147	3,399	2,707	8,253
1937/1938	2,485	3,678	2,960	9,123
1938/1939	2,670	3,637	2,904	9,211
1945/1946	2,025	3,375	2,100	7,500
1946/1947	2,568	4,368	2,677	9,613
1947/1948	3,109	5,017	3,104	11,230
1948/1949	3,330	5,497	3,540	12,367
1949/1950	3,639	5,864	3,994	13,497
1950/1951	4,191	6,208	4,514	14,913
1951/1952	4,534	6,273	5,006	15,813
1952/1953	5,218	6,639	5,392	17,249
1953/1954	5,805	7,192	6,053	19,050
1954/1955	6,510	7,540	6,260	20,310
1955/1956	6,795	7,980	6,780	21,555
1956/1957	7,285	8,280	7,170	22,735
1957/1958	7,870	8,530	7,420	23,820
1958/1959	8,775	9,050	7,915	25,740
1959/1960	9,150	9,630	8,225	27,005
1960/1961	10,200	9,845	8,465	28,510
1961/1962	11,030	10,435	8,635	30,100
1962/1963	12,415	11,155	9,285	32,855
1963/1964	13,920	12,250	10,050	36,220
1964/1965	15,165	13,695	11,000	39,860
1965/1966	17,390	14,525	12,145	44,060
1966/1967	19,820	15,500	12,940	48,260
1970/1971	28,200	20,300	17,000	65,500
1975/1976	44,000	27,600	23,500	95,100

Source: Food and Agriculture Organization, *Monthly Bulletin of Agricultural Economics and Statistics*, February 1962, for years 1930/1931 to 1953/1954.

FAO *Production Yearbook*, for years 1954/1955 to 1966/1967. Projections for 1970/1971 and 1975/1976 obtained by summation of separate graphical projections for Canada and the United States, Western Europe, Eastern Europe, Soviet Union, Japan, Oceania, India, Asia (other than Japan, mainland China, North Korea and North Viet-Nam), Africa, Latin America.

Note: Data do not include mainland China, North Korea or North Viet-Nam.

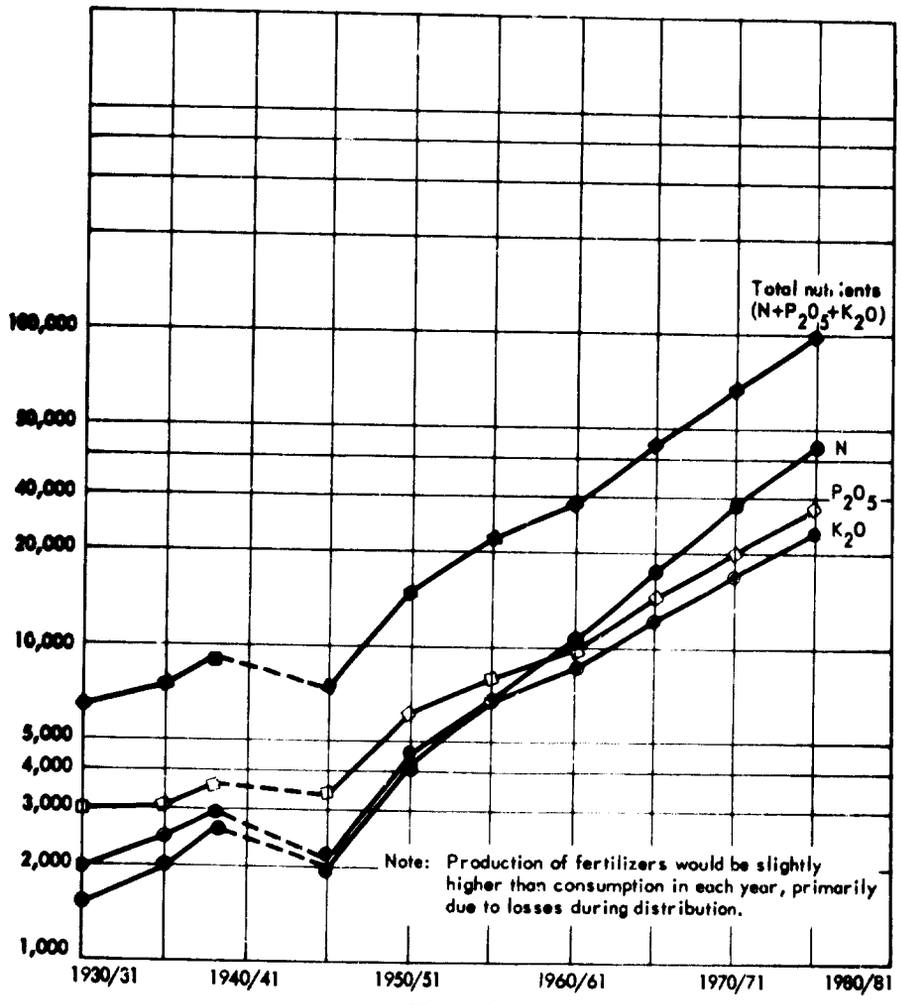


Figure 1

World consumption of fertilizers 1930/1931 to 1975/1976 (thousand metric tons of N, P_2O_5, K_2O)

Table 5

PRODUCTION AND CONSUMPTION OF FERTILIZERS, 1965/1966, 1970/1971, 1975/1976

(Thousand metric tons)

	Production			*Consumption*			*Surplus (deficit)*		
	1965/66	*1970/71*	*1975/76*	*1965/66*	*1970/71*	*1975/76*	*1965/66*	*1970/71*	*1975/76*
				Nitrogen (N)					
Developed areas	17,425	27,000	40,000	14,675	23,000	35,000	2,750	4,000	5,000
Developing areas	1,430	3,400	6,600	2,715	5,200	9,000	(1,285)	(1,800)	(2,400)
Asia[a]	680	1,850	4,000	1,495	3,000	5,500	(815)	(1,150)	(1,500)
Africa	240	800	1,600	540	1,200	2,000	(300)	(400)	(400)
Latin America	510	750	1,000	680	1,000	1,500	(170)	(250)	(500)
World total	18,855	30,400	46,600	17,390	28,200	44,000	1,465	2,200	2,600
				Phosphate (P_2O_5)					
Developed areas	13,855	19,000	25,000	12,990	17,500	23,000	865	1,500	2,000
Developing areas	930	1,700	2,900	1,535	2,800	4,600	(605)	(1,100)	(1,700)
Asia[a]	230	600	1,200	595	1,250	2,200	(365)	(650)	(1,000)
Africa	440	600	800	400	500	600	40	100	200
Latin America	260	500	900	540	1,050	1,800	(280)	(550)	(900)
World total	14,785	20,700	27,900	14,525	20,300	27,600	260	440	300
				Potash (K_2O)					
Developed areas	13,110	17,300	23,500	11,225	15,500	21,000	1,885	1,800	2,500
Developing areas	330	700	1,200	920	1,500	2,550	(590)	(800)	(1,350)
Asia[a]	310	500	600	375	650	1,150	(65)	(150)	(550)
Africa		170	570	200	350	600	(200)	(180)	(30)
Latin America	20	30	30	345	500	800	(235)	(470)	(770)
World total	13,140	18,000	24,700	12,145	17,000	23,550	1,295	1,000	1,150

[a] Other than Japan, mainland China, North Korea and North Viet-Nam. In all cases except in the production of potash fertilizers, India represents approximately 50 per cent of the amounts given for Asia.

Note: "Developed areas" includes United States, Canada, Western Europe, Eastern Europe, Soviet Union, Japan and Oceania. "Developing areas" includes Asia (except Japan, mainland China, North Korea and North Viet-Nam), Africa, Latin America (South America plus all of North America except the United States and Canada).

Table 5 and figures 2, 3 and 4 give projections of production and consumption of fertilizers in 1970/1971 and 1975/1976. The projections shown in table 5 and the three graphs represent the summation of separate graphical projections for Canada and the United States, Western Europe, Eastern Europe, the Soviet Union, Japan, India, other Asian countries (excluding mainland China, North Korea and North Viet-Nam), Oceania, Africa and Latin America.

The higher growth rate of the developing areas compared with the developed areas is clearly revealed in figures 2, 3 and 4. However, even in 1975/1976, production in the developing areas will still represent only 14 per cent of total world production of nitrogen, 10 per cent of world production of phosphate, and 5 per cent of world production of potash. In 1975/1976, the developed areas will still be surplus producers of all three nutrients, whereas the developing areas will have larger deficits of all three than they have now.

These conclusions are the result of a straightforward graphical analysis of past trends of production and consumption. There should be ample capacity to produce the quantities of plant nutrients shown in table 5. The well known report of the United States of America, Tennessee Valley Authority (TVA), *Estimated World Fertilizer Production Capacity as Related to Future Needs*, February 1966, gives capacities for 1970 as shown in table 6.

Table 6

FERTILIZER PRODUCTION CAPACITY

(Thousand metric tons)

	Estimated fertilizer production in 1970/1971 (from table 5)	*TVA estimate of capacity, excluding non-fertilizer capacity and also excluding mainland China*
N	30,400	43,000
P_2O_5	20,700	28,000
K_2O	18,000	26,000
Total	69,100	97,000

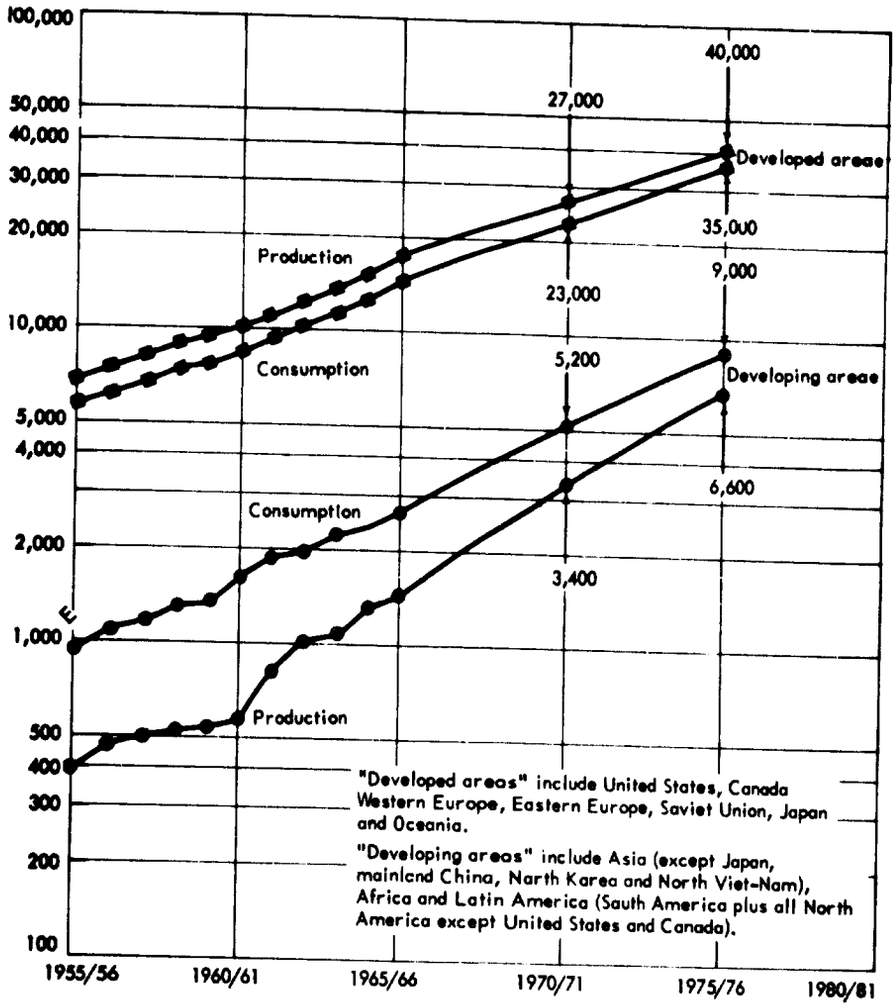


Figure 2

Production and consumption of nitrogen fertilizers in developed and developing areas (thousand metric tons of N)

The estimates of capacity reported by TVA represent only a statement of intentions for 1970 by Governments and industrial firms, so those capacities may or may not actually come into existence. If they should materialize, there would be considerable economic pressure to increase production and consumption to match capacity more nearly.

Raw materials for fertilizer production

The principal raw materials for fertilizer production are: hydrocarbons (as sources of hydrogen), including natural gas, petroleum and various petroleum fractions, and coal and lignite; phosphate rock; potash; and sulphur.

Hydrocarbons are widely distributed throughout the world. Most of the larger countries have one or more of them, although some areas are more richly endowed than others. The largest deposits of natural gas and/or petroleum in the developing countries are located in Algeria, Argentina, Bolivia, Brazil, Brunei, Burma, Chile, Colombia, Indonesia, Iran, Iraq, Kuwait, Libya, Mexico, Nigeria, Pakistan, Peru, Saudi Arabia, Trinidad, United Arab Republic and Venezuela. Coal and or lignite are located in many countries, although gaseous or liquid fuels are much to be preferred to solid fuels for ammonia production.

Phosphate minerals in substantial quantities are found in the following developing countries and territories: Algeria, Brazil, Israel, Jordan, Morocco, North Viet-Nam, Peru, Senegal, South Africa, Spanish Sahara, Togo, Tunisia, Uganda, and the United Arab Republic.

Potash deposits are much less common in the developing countries, being found in substantial amounts only in the Congo (Brazzaville), Ethiopia and Peru. In addition, Israel and Jordan have significant potash reserves in the form of lake brines.

Sulphur is available and utilizable in various forms, including elemental sulphur, pyrites, by-product sulphur dioxide from non-ferrous metal smelters, and gypsum anhydrite. The subject is too complex to be discussed here. However, it may be pointed out that, wherever electricity is cheap enough in relation to sulphur, it can replace sulphur in the production of fertilizers. Electrothermal phosphorus can replace sulphur entirely in the

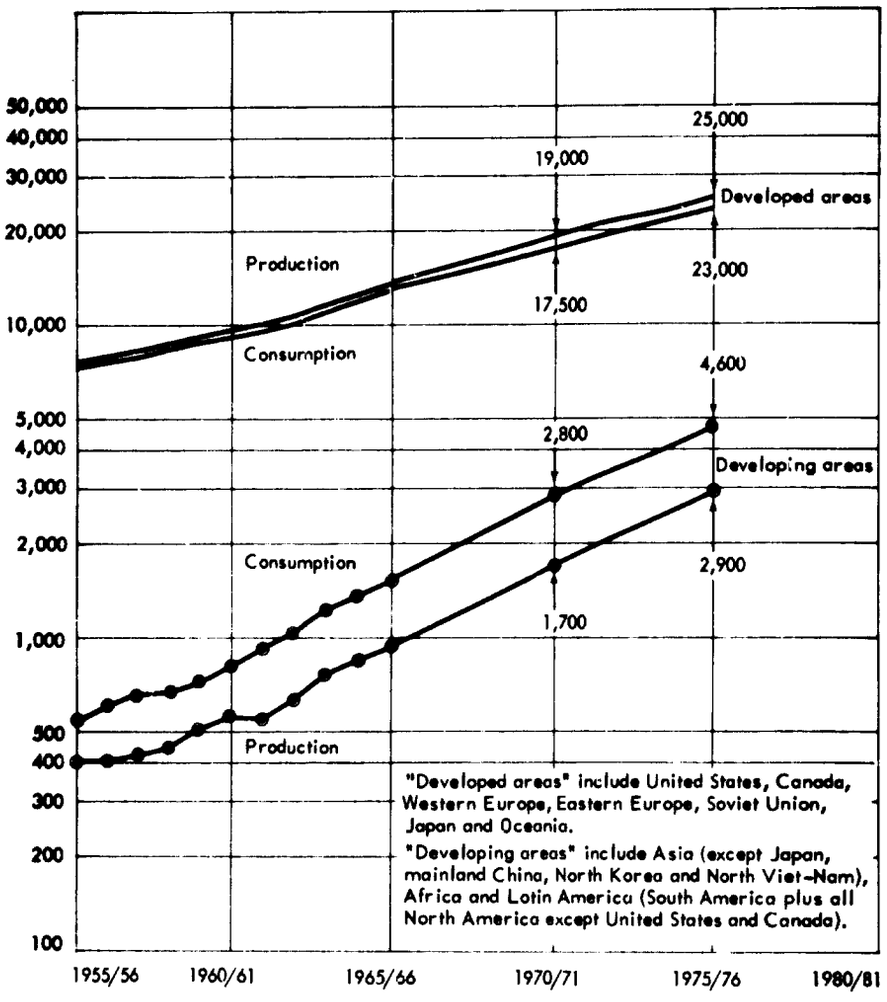


Figure 3

***Production** and consumption of phosphate fertilizers in developed and developing areas (thousand metric tons of P_2O_5)*

production of phosphoric acid and phosphate fertilizers. The use of ammonium sulphate as fertilizer is declining and in fact it could be dispensed with in view of all the other nitrogen fertilizers available. However, some sulphur will always be needed in fertilizers as a secondary plant nutrient.

There are good prospects for the development of nitrogen and phosphate fertilizer industries in many developing countries, but potash minerals are very scarce. Several of the developing countries, such as India, North Korea, Philippines, Republic of Viet-Nam, South Korea, Thailand, and Turkey, have none of the fertilizer raw materials in significant quantities. However, many of these countries have supplies of naphtha and/or refinery gas from their domestic oil-refining industries that can be substituted for natural gas in ammonia production.

Fertilizer targets for developing countries

Per capita consumption of fertilizers varies greatly among countries, as illustrated by table 7.

There are similar variations in fertilizer consumption per hectare. Figures 5 and 6 show the largest *per capita* consumption of nitrogen and phosphorus fertilizers in the developing countries.

Table 7

***Per capita* FERTILIZER CONSUMPTION IN 1965/1966**

(Kilograms)

	N	P_2O_5
Denmark	40	26
Netherlands	25	9
United States of America	24	17
United Kingdom	13	8
China (Taiwan)	11	2.9
Union of Soviet Socialist Republics	10	6.4
United Arab Republic	10	1.6
Japan	8	5.5
South Africa	5.5	6.6
China (mainland)	1.4	0.5
India	1.2	0.3
Brazil	0.7	1.2
Nigeria	0.03	0.02

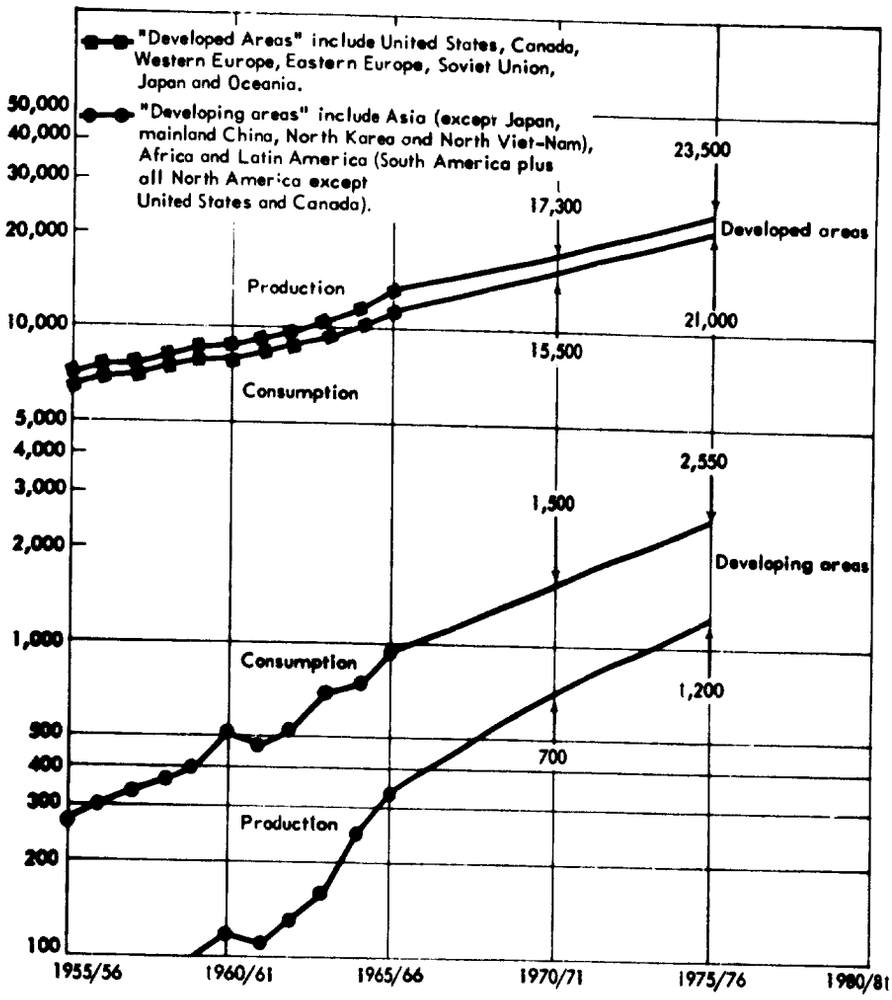


Figure 4

Production and consumption of potash fertilizers in developed and developing areas (thousand metric tons of K_2O)

From the standpoint of economic planning, *per capita* fertilizer consumption is more meaningful than fertilizer consumption per hectare, although the latter has agronomic significance. A given quantity of fertilizer will yield, within limits, a certain amount of additional food or other agricultural product more or less independently of the amount of land on which the fertilizer is used.

It is therefore suggested that all developing countries should begin to plan now for *per capita* fertilizer consumption in 1975 along these lines: 10 kg N, 5 kg P_2O_5. These are, of course, very rough minimum targets, and there would have to be considerable modifications for individual countries depending on types of crops, rainfall, soil analysis etc. Table 8 summarizes these suggested targets for all the developing countries with a population in 1975 over 13 million (except mainland China, North Korea and North Viet-Nam).

Nitrogen

Introduction

Adequate supplies of nitrogen in appropriate agricultural forms are essential to healthy plant life and hence to mankind. Nitrogen fertilizer manufacture, principally based on synthetic ammonia, has become a major world industry measured in tens of millions of metric tons annually; and a continued growth is foreseen to meet the needs of a world population that will increase from some 3,000 million to at least 6,000 million by the year 2000.

A principal characteristic of the industry is the rapid transition to large and costly plants that are often integrated with feed-stock sources, such as coal, steel, oil and gas industries, as well as with phosphate fertilizer and chemical plants. The advent of suitable bulk marine transportation is creating in some cases a locational trend towards sources of available, low-cost feed-stocks (especially natural gas), and this may become a future characteristic of nitrogen fertilizer manufacture.

Such trends present numerous problems to the industry in developed countries; and they create additional difficulties in many developing countries because of size; large capital requirements; shortages of skilled manpower, adequate transportation and marketing networks; and lack of consumer purchasing ability. Consequently, it is essential to

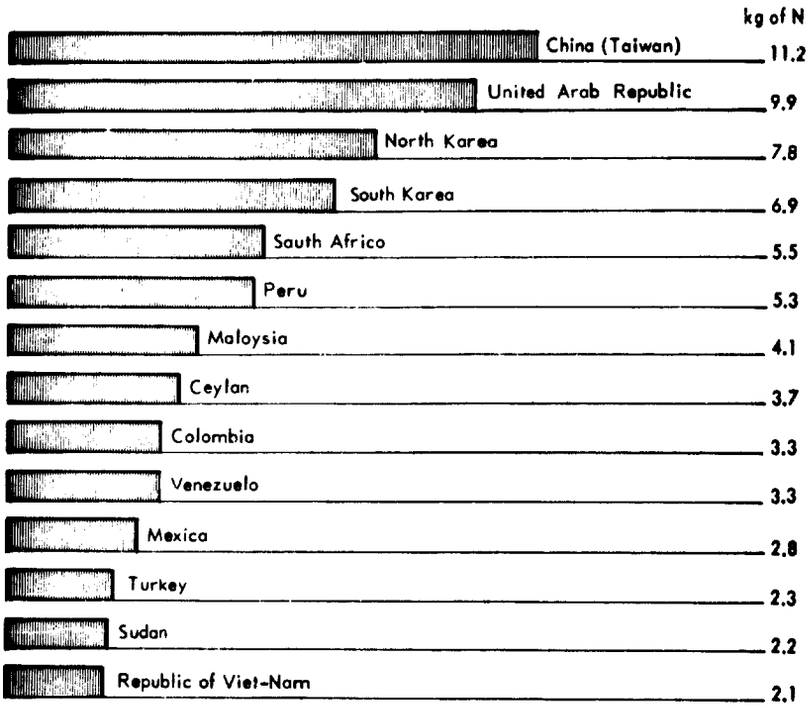


Figure 5

Per capita *consumption of nitrogen fertilizers in developing countries, 1965/1966*[a]

[a] Similar data for some other large developing countries are:

Philippines	1.7	Pakistan	1.1
China (mainland)	1.5	Iran	1.0
India	1.2	Nigeria	0.7
Argentina	1.1	Brazil	0.6
Indonesia	1.1	Thailand	0.6
	Burma	0.2	

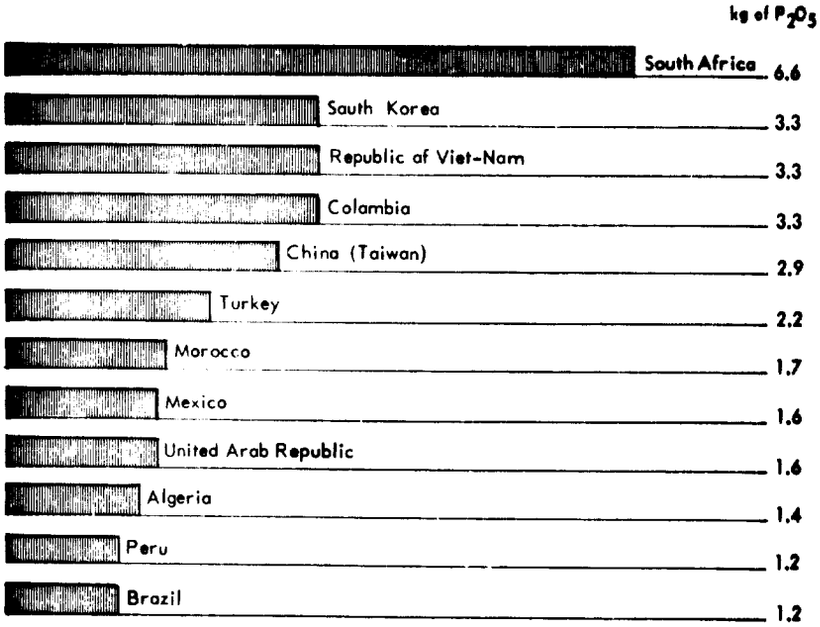


Figure 6

Per capita *consumption of phosphate fertilizers in developing countries, 1965/1966*[a]

[a] Similar data for some other large developing countries are:

Philippines	0.9	Thailand	0.3
Indonesia	0.8	Argentina	0.2
Iran	0.8	Pakistan	0.1
China (mainland)	0.5	Burma	0.04
India	0.3	Nigeria	0.02

Table 8

POPULATION AND FERTILIZER CONSUMPTION IN DEVELOPING COUNTRIES

	Probable population, 1975 (millions)	*Fertilizer consumption (metric tons)*			
		Suggested minimum targets for 1975		*In 1966/1967*	
		N[a]	P_2O_5[b]	N	P_2O_5
India	609	6,090,000	3,045,000	830,200	274,600
Pakistan	138	1,380,000	690,000	170,000	30,500
Indonesia	134	1,340,000	670,000	110,000	5,500
Brazil	113	1,130,000	565,000	71,200	91,600
Nigeria	81	810,000	405,000	4,600	1,800
Mexico	58	580,000	290,000	320,000	97,100
Philippines	46	460,000	230,000	65,000	41,200
Turkey	42	420,000	210,000	95,900	90,700
Thailand	42	420,000	210,000	36,000	17,800
United Arab Republic	40	400,000	200,000	250,000	55,000
South Korea	36	360,000	180,000	239,700	124,800
Burma	31	310,000	155,000	6,000	1,000
Iran	30	300,000	150,000	30,000	15,000
Argentina	27	270,000	135,000	30,000	12,000
Ethiopia	26	260,000	130,000	n.a.[c]	n.a.
Colombia	24	240,000	120,000	45,000	51,800
South Africa	24	240,000	120,000	108,000	215,000
Republic of Viet-Nam	22	220,000	110,000	45,200	24,700
Afghanistan	20	200,000	100,000	n.a.	n.a.
Congo (Dem. Rep. of)	19	190,000	95,000	1,300	400
Morocco	19	190,000	95,000	25,300	19,900
Algeria	17	170,000	85,000	20,300	15,900
Sudan	17	170,000	85,000	40,000	700
Ceylon	16	160,000	80,000	45,000	1,000
Peru	16	160,000	80,000	80,000	16,000
Malaysia	15	150,000	75,000	43,500	6,500
China (Taiwan)	15	150,000	75,000	155,300	36,800
Venezuela	13	130,000	65,000	31,000	10,000
United Republic of Tanzania	13	130,000	65,000	5,000	1,300

[a] Calculated on basis of 10 kg *per capita*.
[b] Calculated on basis of 5 kg *per capita*.
[c] Not available.

evaluate each potential project carefully and impartially to avoid wasting resources and scarce foreign exchange on premature or uneconomic units.

Evolution of the nitrogen fertilizer industry

General

Directly or indirectly, plants provide all the food required by mankind. In their turn, plants have their specific input needs, such as water and various minerals. At least sixteen elements have been identified as essential for plant growth, and three—nitrogen, phosphorus and potassium—are required in sufficiently large quantities to warrant their being called primary nutrients.

The effects of nitrogen on plants include accelerated growth and increased yields of leaf, fruit and seed. A deficiency is soon evident from a yellowing and shrivelling of leaves. The initial response to nitrogen fertilizer is usually so favourable that the possible need for other plant nutrients is sometimes masked. However, the ultimate benefit of any nutrient depends on an adequacy of all the other essential elements; therefore, a well-balanced fertilizer programme is imperative.

Although surface plants, with the exception of a few, such as legumes of the clover or alfalfa class, are surrounded by atmospheric nitrogen, they are unable to convert that gas into available compounds because of its extreme inertness. Consequently, nitrogen is mostly supplied through the soil in some soluble form. In a natural ecological cycle, plant and animal wastes are converted by bacteria into nitrogen salts, which are again taken up by

plant roots. This is a slow process and is upset by cropping. Hence, chemical compounds containing nitrogen and other necessary elements must be added to the soil to maintain the growth cycle.

Types of nitrogen fertilizers

Early nitrogen-containing fertilizers were of organic origin, for example, plant stalks, leaves, animal blood, carcasses, excreta. However, their low nutrient contents (0.5 per cent nitrogen for cow manure) and limited supplies meant that other sources had to be found. Fortunately, ammonium sulphate produced from coal-gas plants and sodium nitrate imported from Chile became available and met requirements until the First World War, when large military needs led Germany to produce synthetic ammonia.

Later, ammonia-synthesis plants were built on a world-wide basis, together with units for converting ammonia to derivatives such as ammonium nitrate, ammonium sulphate and urea. Thus, synthetic ammonia, containing 82 per cent nitrogen (made by combining atmospheric nitrogen with hydrogen produced mainly from natural gas or petroleum feed-stocks has become the key material in the nitrogen fertilizer industry of today. Organic nitrogen materials, by-product ammonium sulphate, calcium cyanamide and Chilean nitrate now represent only about 10 per cent of the total nitrogen fertilizer consumed; the balance is all derived from man-made ammonia.

World nitrogen fertilizer demand and supply

Historical growth

The world nitrogen fertilizer pattern has undergone major changes in the twentieth century, as indicated in table 9.

Table 9

WORLD NITROGEN (N) PRODUCTION

(Thousand metric tons of N)

Year	*As Chilean nitrate, coke oven ammonia, calcium cyanamide*	*As synthetic ammonia*	*As total N*
1913/1914	730	4	734
1938/1939	996	904	1,900
1963/1964	1,782	16,178	17,960

Future nitrogen needs

Based on calculations of the Food and Agriculture Organization (FAO), world nitrogen fertilizer requirements needed to maintain even minimum current dietary standards are shown below. Failure to meet these needs will result in hunger in those parts of the world where fertilizer supplies (or corresponding food availability) fall below the levels indicated in table 10.

Table 10

ESTIMATED MINIMUM WORLD NITROGEN NEEDS

(Million metric tons of N)

Region	*1965*	*1970*	*1975*	*1980*
Asia, Africa, Latin America ...	5.29	11.73	15.65	20.93
United States of America, Canada.	4.95	8.03	10.50	13.74
Rest of world	8.50	12.49	16.06	20.21
Total	18.74	32.25	42.21	54.88

Material mix

The material mix is also undergoing significant changes as high-analysis fertilizers such as urea and ammonium phosphate increase in popularity and as the use of liquid fertilizers continues to grow. Table 11 indicates possible trends in the nitrogen material mix pattern during the next few years.

Table 11

ESTIMATED WORLD NITROGEN MATERIAL MIX PATTERN

Material	*Percentage of total N*	
	1962	*1970*
Ammonium sulphate	24	14
Ammonium nitrate	28	25
Sodium nitrate	3	2
Calcium nitrate	4	3
Cyanamide	2	2
Urea (solid)	9	15
Other forms (solids)[a]	12	18
Other forms (solutions)	17	20
Organic materials	1	1
	100	100

[a] Including ammonium phosphates and nitrophosphates.

Feed-stock supplies

Since most nitrogen fertilizers are based on anhydrous ammonia made from natural gas and liquid hydrocarbons, raw material availability must be examined in terms of those feed-stocks. Calculations indicate that the projected nitrogen requirements to 1985, based on total world agricultural and industrial needs for ammonia, amount to some 125 million metric tons. On the assumption that half is made from natural gas and half from liquid hydrocarbons, this total corresponds to about 2 per cent of presently known natural gas reserves and a negligible proportion of proved world petroleum reserves. Thus no raw material shortages for nitrogen fertilizers are foreseen.

Nitrogen fertilizers and the developing countries

Production costs

When considering the production of nitrogen fertilizers, a developing country must determine whether the current or future domestic demand is big enough to justify an economical large-size ammonia (and derivatives) plant, or whether such products can be imported at lower cost; whether an economic source of feed-stock is available; whether an inter- or intra-regional export trading pattern can be developed to support a large plant; and whether the required capital (often in the $25 million to $50 million range) could be more advantageously spent on other projects.[a]

Plant size greatly influences production costs; with natural gas at $0.20 per million, ammonia made in a unit producing 200 metric tons per day may cost $30 to $35 per metric ton, whereas, if made in a plant producing 1,000 metric tons per day, the probable cost would be about $17 per metric ton. Similarly, the ammonia costs corresponding to natural gas costs of $0.10 and $0.50 would be about $26 and $42, respectively, based on an output of some 370 metric tons per day.

As a result of these economic factors, a trend is now taking place towards using low-cost sources of feed-stock, especially natural gas, and building very large ammonia plants in the 1,000 to 2,000 metric tons per day category near gas fields or seaports. Ammonia (and derivatives) made under these conditions can frequently be transported in special tankers and delivered to consumer points thousands of miles distant at prices competitive with, or lower than, nitrogen fertilizer made locally in a small or medium-size plant using relatively high-cost fuel. Therefore, any developing or developed country should carefully examine each possible means of making nitrogen fertilizers.

The switch to large ammonia plants (based on centrifugal compression and self-supporting steam energy) in the United States and Europe is so recent that only a limited number of plants are in operation, and several minor design or equipment problems in some of these are still in process of solution. One cause of delays and start-up difficulties has been an acute shortage of experienced, skilled labour and personnel. Consequently, any prospective builder of a large nitrogen fertilizer plant, whether in a developing or a developed country, should check the experience of prospective suppliers and sub-contractors. This is particularly important for developing areas, where plant modifications and limited availability of spare parts could create serious delays and additional costs.

[a] All costs in this article are stated in US dollars and cents. One cent equals $0.01 and one mill equals $0.001.

PHOSPHATES

Introduction

The importance of phosphorus in agricultural crop production and human nutrition is well known. However, there is a tendency in many developing countries to reduce the use of phosphorus (P_2O_5) relative to nitrogen (N). This may be harmless in phosphorus-rich soils; but in others the continued use of nitrogen without P_2O_5 will soon exhaust the supply of P_2O_5 in the soil, and disastrous crop failures may ensue. Initial response to nitrogen fertilizers is often more spectacular. The average world proportion of N to P_2O_5 to K_2O used in 1966/1967 is 1 : 0.8 : 0.7. The ratios in developed countries such as Japan and the United States for the same period are as follows:

United States of America	1 : 0.7 : 0.6
Japan	1 : 0.7 : 0.8

In developing countries such as India, the United Arab Republic and Mexico, on the other hand, the ratios are as follows:

India	1 : 0.3 : 0.16
United Arab Republic	1 : 0.2 : 0.004
Mexico	1 : 0.3 : 0.07

General trends

A survey made in 1965 by the United States Tennessee Valley Authority (TVA) of the actual (1965) and future (1970) capacity of the world phosphate industry has been updated and is shown in figure 7 and table 12.

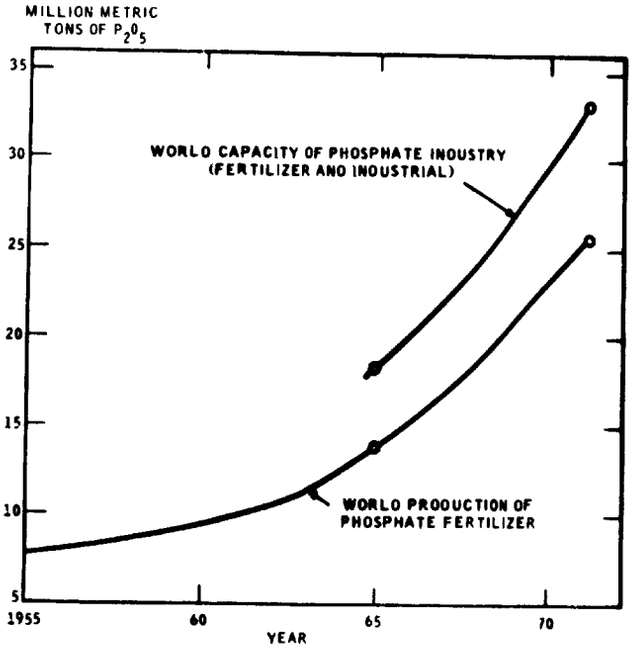


Figure 7

Phosphate industry capacity and fertilizer production (million metric tons of P_2O_5)

Table 12

PRODUCTION IN 1965 AND ESTIMATED CAPACITY IN 1971 OF THE WORLD PHOSPHATE INDUSTRY

(Million metric tons of P_2O_5 per year)

	Fertilizer production 1965[a]	*Estimated phosphate industry capacity, fertilizer and industrial 1971*
Europe		
Western	4.34	7.72
Eastern[b]	2.81	5.94
Asia	1.02	3.61
Africa	0.30	1.71
North America	4.02	10.29
Latin America	0.18	2.31
Oceania	1.13	1.91
Total	13.80	33.49
Possible fertilizer production, capacity $\times 0.90 \times 0.85$[c]		25.62

[a] Fertilizer year ended 30 June 1965.

[b] Including Soviet Union.

[c] Assuming 90 per cent production and 85 per cent of phosphate used for fertilizer.

The estimated capacity of the world phosphate industry is expected to increase to 33.5 million tons by 1971. The latter figure includes an assumed capacity of 3.6 million metric tons of P_2O_5 for the Soviet Union and an arbitrary allowance for mainland China. It does not include phosphate rock used directly on the soil after being finely ground but not chemically processed. In 1966/1967 the world consumption of ground phosphate rock used for direct application was equivalent to about 1.2 million tons of P_2O_5. The FAO figure for P_2O_5 consumption in 1966/1967 is 15.5 million metric tons compared to 13.6 million metric tons in 1964/1965, an increase of 6.6 per cent.

The growth rate of the world phosphate fertilizer industry in recent years has been about 12 per cent per year. If the 1971 projected production of 25.6 million metric tons is attained, the growth rate will be slightly over 10 per cent per year.

High-analysis products

There is a strong trend in the world towards high-analysis phosphate fertilizers. The developing countries should adopt this trend whenever possible because it reduces the bagging, transport and storage costs per unit of P_2O_5. In 1955, the low-analysis materials, normal (single) superphosphates and basic slag supplied about 81 per cent of the world's phosphate fertilizers. By 1965, these products constituted only 58 per cent of the total. Figure 8 shows that the increase in normal superphosphate was about 20 per cent, whereas concentrated superphosphate approximately doubled and "complex" or "multinutrient" fertilizers (mainly ammonium phosphate and nitrophosphate) quadrupled.

The most popular of the concentrated phosphate fertilizers are concentrated superphosphate and ammonium phosphate. Both require phosphoric acid for their manufacture, mainly wet-process acid, which in turn requires sulphur. Developing countries are already anxious about the world shortage of sulphur and its high price. In developing countries or regions where cheap electric power and phosphate rock are available, the electric-furnace method should be investigated. The capital cost for this method is quite high compared with that used in the wet-process phosphoric acid plant. Table 13 shows the distribution of phosphate fertilizer capacity among major types of products forecast for 1971 and table 14 typical plant nutrient contents.

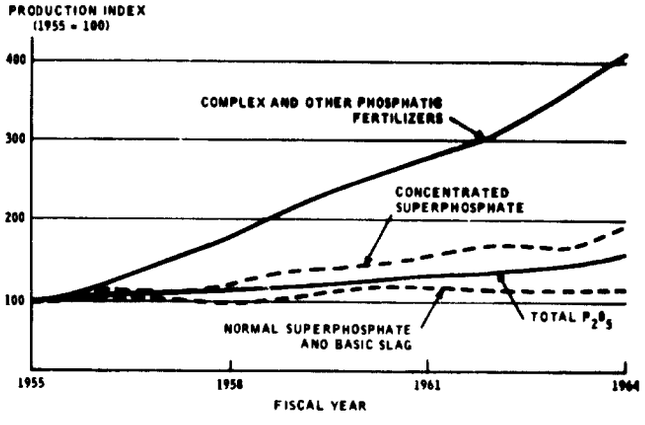


Figure 8

Relative growth in world production of phosphatic fertilizers

Table 13

DISTRIBUTION OF 1971 PHOSPHATE FERTILIZER CAPACITY AMONG MAJOR TYPES OF PRODUCTS

Product	*Percentage of world P_2O_5 capacity*[a] *in 1971*
Normal superphosphate	30.2
Concentrated superphosphate	18.9
Complex fertilizers[b]	30.0
Basic slag	5.7
Other and unspecified phosphate fertilizers[c]	15.2

[a] Excluding the Soviet Union and mainland China.

[b] Includes ammonium phosphate, 20 per cent; nitrophosphates, 6 per cent; and unspecified types of complex fertilizers, 4 per cent.

[c] Includes phosphoric acid, for which no specific use has been determined.

Table 14

TYPICAL PERCENTAGES OF PLANT NUTRIENT IN THE LEADING PHOSPHATE FERTILIZERS

Material	*Individual nutrient* N	P_2O_5	K_2O	*Total nutrient*
Normal (single) superphosphate (SSP)	0	18	0	18
Concentrated (triple) superphosphate (TSP)	0	45	0	45
Ammonium phosphate (AP)	18	46	0	64
Nitrophosphate (NP)	20	20	0	40

The trend towards high-analysis phosphate fertilizers is shown in figure 9.

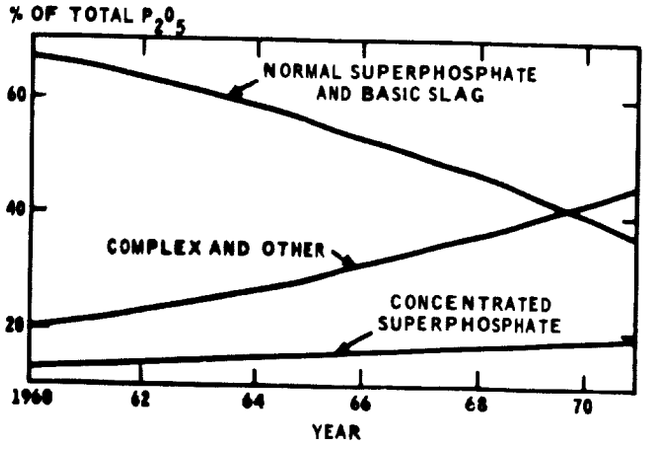


Figure 9

Trends in types of phosphate fertilizer

The trend towards integration of phosphate with nitrogen and production of "mixed", or multinutrient, fertilizers

Farmers in developed countries increasingly tend to use phosphate in the form of multinutrient fertilizers rather than as a single nutrient. In developing countries the farmer has to be educated to this approach. Some developing countries prescribe certain mixtures containing different N, P and K combinations, taking into account the analysis of soil and type of crops to be grown. Formerly mixtures were made using straight fertilizers, such as superphosphate, ammonium sulphate and potassium chloride. Often these ingredients were manufactured by different companies and shipped to a plant where they were mixed and sometimes granulated. Such mixing and granulation entail additional expense. The modern practice is to manufacture mixed fertilizers in integrated plants. As a result mixed fertilizers are not necessarily more expensive than straight fertilizers and may even be cheaper. Developing countries should adopt the integrated approach so that the farmer receives in a single bag all the nutrients needed for the particular crop under particular soil conditions. This also saves the farmer time and labour.

The trend towards large-scale production units

There is a general trend in the phosphate fertilizer industry towards large-scale production units, which has resulted in a substantial reduction in cost per unit of output. Whereas ten years ago a wet-process phosphoric acid plant producing 200 metric tons of P_2O_5 per day was regarded as a large plant, present plants are capable of producing 600 metric tons per day in a single train of reactors, filter and evaporation system. Nitrophosphate plants capable of producing 1,500 tons per day are part of a complex producing ammonia, nitric acid and straight nitrogen fertilizers. Electric-furnace phosphorus units of 70,000 kW capacity have been reported producing 140 tons of phosphorus per day, equivalent to 320 tons of P_2O_5.

Developing countries with large internal consumption should take advantage of the economy of scale in production. Where internal consumption is small, several countries in a region could co-operate to achieve such economy. Increasing the scale of operation should always be weighed against the cost of distribution of the product over wider market areas. There are also advantages in locating production facilities at the phosphate mine, since high-analysis phosphate fertilizers weigh less than the rock from which they are made.

Links with other sectors of industry

Phosphate rock

The only indispensable raw material for the production of phosphate fertilizer is phosphate rock. World consumption of phosphate rock in 1965 was about 63 million metric tons and is expected to reach 100 million by 1970.

Assuming that the 1971 production of phosphate fertilizer and industrial phosphate is 90 per cent of the estimated capacity and that the average recovery of P_2O_5 in processing is 90 per cent, about 33.5 million metric tons of P_2O_5 as phosphate rock will be required in 1971. To this must be added the phosphate rock used for direct application, which accounted for 1.8 million tons of P_2O_5 in 1965. Assuming no increase in rock for direct application, the 1971 rock requirement would be 35.3 tons of P_2O_5, which is equivalent to about 110 million tons of rock containing 32 per cent P_2O_5.

To meet the greatly increased demand for phosphate rock, steps are being taken to open new mines and to expand production of existing ones. In the United States of America, new mines have been opened in North Carolina and northern Florida, and other deposits are being explored. Phosphate rock production is being expanded in Jordan, Morocco, Senegal, South Africa, the Soviet Union, Togo, Tunisia, and the United Arab Republic. New deposits have been found in many coun-

tries and territories, including Brazil, India, Iran, Peru, Spanish Sahara, Turkey and Venezuela. Known reserves are ample for several hundred years. However, many countries lack such reserves.

Nearly half of the phosphate rock produced is traded internationally, with Europe (excluding the Soviet Union) the largest market. European imports totalled about 16 million tons in 1965. Australia, India and Japan are the largest importers outside Europe. The price of phosphate rock has remained steady, except for a 10 to 15 per cent rise recently for higher grades.

Sulphur and sulphuric acid

World consumption of sulphur (in all forms) was nearly 31 million metric tons in 1966, and of this total about 45 per cent was used for fertilizer production. About 70 per cent of the sulphur used for fertilizer production was used to make phosphate fertilizer. Thus, the quantity of sulphur used to make phosphate fertilizer was roughly 9.8 million metric tons (31 × 45 per cent × 70 per cent). Since world production of phosphate fertilizer in 1965/1966 was 15.1 million metric tons of P_2O_5, the ratio of sulphur to P_2O_5 was about 0.65.

On the above basis, the 1971 projected production of phosphate fertilizer (25.6 million metric tons of P_2O_5) will require 17.0 million tons of sulphur. If other sulphur uses grow at the current rate of 4 per cent per year, they will reach 26 million metric tons by 1971. The total sulphur demand will be 43.0 million metric tons, requiring an increased supply of nearly 13 million metric tons, or an average rate of growth of 2.6 million metric tons per year.

In 1966 (calendar year), the consumption of sulphur was 25.0 million metric tons (excluding the Soviet Union, Eastern Europe, and mainland China). Production was about 24.2 million metric tons. The difference was made up, on the above basis, by withdrawal from stockpile. The presumed distribution of the sulphur among phosphate and nitrogen fertilizers and other purposes was as follows:

	Million metric tons of sulphur
Phosphate fertilizers	7.5
Ammonium sulphate and sulphate nitrate	2.7
Potassium fertilizers	0.1
Other uses	14.7
	25.0

For 1971 the estimated sulphur demand is as follows:

	Million metric tons
Phosphate fertilizers	14.7
Ammonium sulphate and sulphate nitrate	4.3
Other uses (4 to 5 per cent growth per year)	16.0 to 16.9
	35.0 to 35.9

McCune and Harre (*Trends and Prospects of World Fertilizer Production Capacity, as Related to Future Needs*, TVA, December 1967) estimate that the 1971 sulphur-producing capacity of the world (excluding Eastern Europe, the Soviet Union and mainland China) will be 32.3 million metric tons. Assuming sulphur production at full capacity, there will be a deficit of 2.7 to 3.6 million metric tons in 1971.

About half of the world's supply of sulphur is in the form of elemental sulphur. In 1966, the sources of sulphur (excluding the Soviet Union, Eastern Europe and mainland China) were:

Source	*Million metric tons*	*Percentage of total*
Elemental sulphur (including recovered sulphur)	14.1	58
Pyrites	6.0	25
Other sources[a]	4.1	17
	24.2	100

[a] Includes gypsum, anhydrite, smelter gas, and miscellaneous sources.

The world prospect is that in the immediate future the supplies of elemental sulphur will continue to lag behind demand. The price of elemental sulphur is already reaching levels at which production of sulphuric acid from pyrites and other sources is becoming competitive. Economic pressures will favour increased use of pyrites and other forms of sulphur and increased use of fertilizer processes that do not require sulphur. However, the supply-demand balance is likely to improve shortly to a limited extent because of the expansion in sulphur production in Canada and the Middle East.

Technology and economics of the phosphate industry

The technology of producing the following phosphatic fertilizers is well known: normal (single) superphosphate; concentrated (triple) superphosphate.

There are two basic methods used in the commercial production of phosphoric acid – the wet process, using sulphuric acid, and the furnace process. The estimated world capacity for production of wet-process phosphoric acid will increase from 5.4 million metric tons of P_2O_5 in 1965 to

14.7 million metric tons in 1971. Furnace-acid capacity is expected to increase also, particularly because of the world-wide shortage of sulphur and its rising prices. Because of the higher purity of the furnace acid, it is used extensively for the production of phosphates for detergents and other high-value products. At the same time, only 19 per cent of the electric-furnace phosphorus produced in the United States, as compared with 93 per cent of the wet-process acid, was used in fertilizer production. Much of the wet-process acid is used for the manufacture of triple superphosphate and ammonium phosphate. However, in recent years, wet-process phosphoric acid has become more of an article of commerce. The quality of the acid has been improved so that its handling and shipment are less difficult.

The hydrochloric acid process for making phosphoric acid is attracting attention, and small projects based on it have been built where hydrochloric acid is in surplus. Hydrochloric acid is used to digest phosphate rock instead of sulphuric acid, and the phosphoric acid formed is separated from the calcium chloride by an organic solvent, which may be normal butyl or isoamyl alcohol. The solvent is separated from the acid and recycled to the process. This process was developed by the Israel Mining Industries. A similar process was developed by the Dow Chemical Company, using tributyl phosphate as the solvent. Whether this process is economic depends on the cost of hydrochloric acid. In the United States, where hydrochloric acid costs around $70 per metric ton and nearly 2 metric tons of chlorine are required per metric ton of P_2O_5 it is obviously uneconomic. But where cheap byproduct hydrochloric acid is available, the process has advantages.

Superphosphoric acid

Superphosphoric acid containing 76 per cent P_2O_5 is a liquid at room temperature and can be produced from elemental phosphorus at essentially the same cost per unit of P_2O_5 as the normal wet-process phosphoric acid (54 per cent P_2O_5).

Ammonium phosphates

These may be produced as mono-ammonium (11–48–0) or di-ammonium (18–46–0) salts or mixtures of the two. They may be combined with ammonium nitrate, ammonium sulphate or urea.

Ammonium phosphate sulphate

When both phosphoric and sulphuric acids are used, products with analyses of 13–39–0 or 16–20–0 can be made.

Ammonium phosphate nitrate

When phosphoric and nitric acids are used, products with analyses 30–10–0, 27–14–0 and 25–25–0 are possible.

Urea-ammonium phosphate

Urea may be mixed with ammonium phosphate to produce products such as 29–29–0, 25–35–0, 38–13–0, or with potash 20–20–20, 25–15–15 or 15–30–15.

Ammonium polyphosphate

Reactions of ammonia with superphosphoric acid yields a mixture of ammonium orthophosphate and polyphosphate, which is commonly called ammonium polyphosphate. Triammonium pyrophosphate [$(NH_4)_3HP_2O_7$], is the principal polyphosphate, although other pyrophosphates and tripolyphosphates are likely to be present.

At present the TVA operates the only known plant for the large-scale production of solid ammonium polyphosphate. The grade of the TVA product is 15–60–0. It is made by reaction of furnace superphosphoric acid with anhydrous ammonia under elevated pressure and temperature (3 atm and 210°C). The product is discharged from the reactor as a fluid melt and is granulated in a pug-mill. Since no moisture is present, drying is unnecessary. The pug-mill product is cooled and screened; the oversize is crushed, and fines are recycled.

Ammonium polyphosphate of 12–60–0 grade has been made experimentally from wet-process phosphoric acid. As in the case of ammonium orthophosphates, the polyphosphate may be combined with urea, ammonium nitrate, or ammonium sulphate, and potash salts may be added to make a variety of multinutrient fertilizers.

Ammonium polyphosphate solutions are produced by several firms in the United States and Europe by ammoniation of superphosphoric acid and concurrent addition of water. The usual grades of the solution are 11–37–0 and 10–34–0. The solutions are used in the preparation of liquid mixed fertilizers.

Nitrophosphate

If phosphate rock is acidulated with nitric acid, the product will contain calcium nitrate and monocalcium phosphate. The hygroscopicity of calcium nitrate precludes general acceptance of this product. Nitric acid serves two purposes: it makes the phosphate soluble and it provides nitrogen as a plant nutrient. In the Odda process, the calcium nitrate is removed by filtration. The calcium nitrate may be used as such or converted to ammonium nitrate. Other variations of this process are attracting world-wide attention because they do not require sulphur. Processes using sulphuric or phosphoric acid in conjunction with nitric acid and those using ammonium sulphate or carbon dioxide addition have also become attractive.

Four processes are shown schematically in the following flow diagram (figure 10), and their comparative economics are given in table 15.

(a) Odda Smeltwerke process - nitrophosphate 20-20-0;

(b) Mixed acid nitrophosphate with nitric and phosphoric acid 20-20-0;

(c) Ammonium phosphate nitrate 26-26-0;

(d) Urea ammonium phosphate 29-29-0.

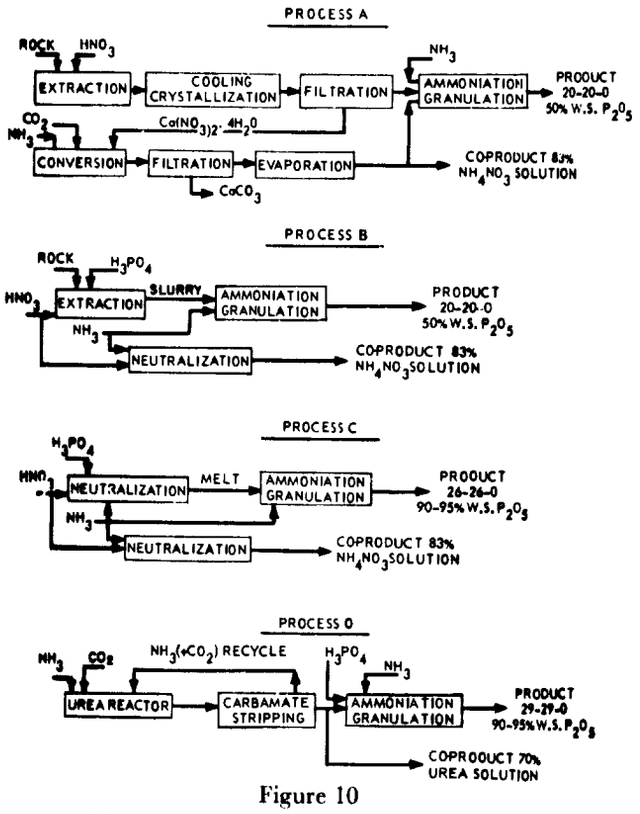


Figure 10

Schematic flow sheet for processes A, B, C, and D

Electric-furnace phosphoric acid

In view of the high cost of sulphur and the world shortage, the production of electric-furnace acid in situations where low-cost electricity is available has become important. Figure 11 shows the cost relation between furnace-process and wet-process acids. Tables 16, 17, 18 and 19 show capital costs and production costs of furnace-process and wet-process phosphoric acid at a hypothetical plant in Florida, United States of America. Similar cost data would apply to plants in Morocco, United Arab Republic or other countries having phosphate rock and low-cost electric power.

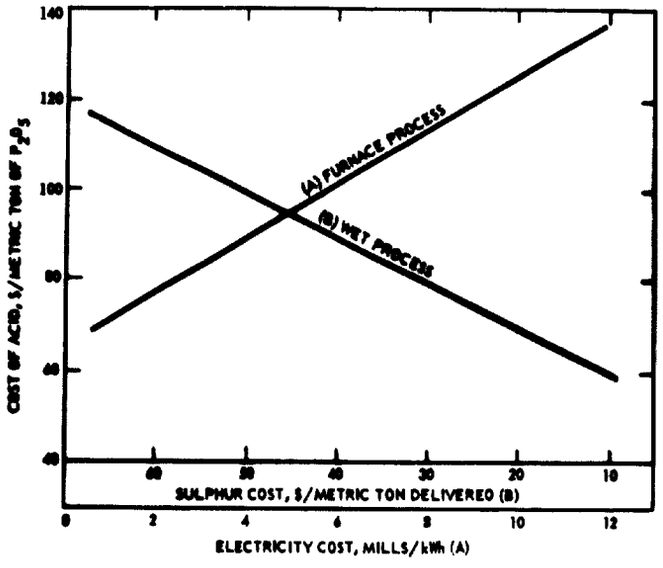


Figure 11

Cost relations between furnace-process and wet-process acids (does not include return on investment)

Table 15

COMPARATIVE ECONOMICS OF NITROPHOSPHATES, AMMONIUM PHOSPHATE NITRATE AND UREA-AMMONIUM PHOSPHATE PROCESSES[a]

	A *Nitrophosphate Odda-process (20-20-0)*		*B* *Nitrophosphate HNO_3-H_3PO_4 process (20-20-0)*		*C* *Ammonium phosphate nitrate (26-26-0)*		*D* *Urea-ammonium phosphate (29-29-0)*	
Plant capacity, metric tons/day	1,130		1,130		875		785	
Capital investment, million $	12.74		12.26		11.22		13.84	
	Cost, $/ton of							
	Product $N+P_2O_5$		*Product $N+P_2O_5$*		*Product $N+P_2O_5$*		*Product $N+P_2O_5$*	
Raw materials[b]								
Ammonia ($39.62/ton)[c]	8.72	21.80	8.52	21.30	12.77	24.56	23.19	39.98
Nitric acid (100%) ($21.09/ton)[c]	15.45	38.63	14.67	36.68	15.16	29.15	—	—
Phosphoric acid (100% P_2O_5) ($117–119/ton of P_2O_5)[c,d]	—	—	16.06[e]	40.15[e]	31.55[e]	60.67[e]	34.29[f]	59.01[f]

	A *Nitrophosphate Odda-process (20-20-0)*		*B* *Nitrophosphate HNO_3-H_3PO_4 process (20-20-0)*		*C* *Ammonium phosphate nitrate (26-26-0)*		*D* *Urea-ammonium phosphate (29-29-0)*	
Phosphate rock (72% BPL, $14.77/ton)	9.60	24.00	3.31	8.28	—	—	—	—
Conditioner ($55.66/ton)	1.11	2.78	1.11	2.78	1.11	2.13	1.11	1.91
Less (1% of production cost)	0.46	1.15	0.53	1.33	0.75	1.44	0.76	1.31
Sub-total	35.34	88.36	44.20	110.52	61.34	117.95	59.29	102.21
Operating costs[b]	10.73	26.83	9.68	24.20	11.65	22.40	16.86	29.07
Total production cost	46.07	115.18	53.88	134.72	72.99	140.35	76.15	131.28
Return on investment (20% pre-tax)	6.80	17.00	6.56	16.40	7.74	14.88	10.75	18.53
Nitrogen solution credit ($ 141/ton of N)	−16.93	−42.32	−16.93	−42.32	−22.02	−42.34	−24.70	−42.53
Sales expense	9.80	24.50	9.80	24.50	11.55	22.21	12.24	21.10
Wholesale price, f.o.b., bulk, $/metric ton								
Product	45.74		53.31		70.26		74.44	
$N + P_2O_5$		114.36		133.30		135.10		128.33

[a] 227 metric tons per day each of nitrogen and P_2O_5 as 1-1-0 and 136 metric tons per day of nitrogen as solution.

[b] Includes production of nitrogen solutions.

[c] Captive-use costs; includes return of investment.

[d] Sulphur at $36 per metric ton, delivered.

[e] 54 per cent P_2O_5 acid.

[f] 40 per cent P_2O_5 acid.

Table 16

CAPITAL COSTS OF WET-PROCESS ACID PLANT — PLANT CAPACITY 185,000 METRIC TONS OF P_2O_5 PER YEAR

(Thousands of dollars)

	Total	*Rock grinding*	*Sulphuric acid*	*Phosphoric acid*	
				(31%)	*(54%)*
Battery-limits plants	9,429	1,410	3,494	2,705	1,820
Land					
Soil analysis	10	3	3	3	1
Plant area	50	17	17	14	2
Cooling pond	330			110	220
Gypsum disposal	117			117	
Dikes					
Cooling pond	293			98	195
Gypsum pond	200			200	
Site improvements					
Paving, fencing, lighting, telephone entry, and clearing	72	24	24	21	3
Railroad tracks and scales	144	108	35	1	
Cooling water					
Pumps and lines	202			63	139
Neutralization facilities	250			83	167
Pipe racks between plants	23		2	10	11
Steam piping	85			22	63
Offices and service building	754	188	189	188	189
Wells and piping	240	5	208	25	2

	Total	Rock grinding	Sulphuric acid	Phosphoric acid (31%)	Phosphoric acid (54%)
Power distribution	200	75	25	75	25
Mobile equipment	130	16	16	66	32
Sub-total	12,529	1,846	4,013	3,801	2,869
Engineering	2,506	370	802	760	574
Sub-total	15,035	2,216	4,815	4,561	3,443
Contractor's fee and overhead	1,504	222	482	456	344
Total investment	16,539	2,438	5,297	5,017	3,787

Table 17

CAPITAL COSTS OF FURNACE-PROCESS ACID PLANT – PLANT CAPACITY 185,000 METRIC TONS OF P_2O_5 PER YEAR

(Thousands of dollars)

	Total	Feed preparation	Phosphorus	Phosphoric acid
Battery-limits plants	22,260	5,000	14,260	3,000
Land				
Soil analysis	10	4	4	2
Plant area	50	20	20	10
Cooling ponds	30		18	12
Neutralization (waste) pond	10		6	4
Dikes				
Cooling ponds	65		33	32
Neutralization (waste) pond	26		13	13
Site improvements				
Paving, fencing, lighting, telephone entry, and clearing	75	29	29	17
Railroad tracks and scales	127	82		45
Raw materials storage	1,411	1,411		
Product storage and shipping	482		100	382
Cooling water				
Pumps and lines	110		60	50
Neutralization facilities	150		75	75
Pipe racks between plants	20		10	10
Steam, water, and acid piping	300	50	200	50
Offices and service buildings	527	210	210	107
Wells and piping	100	10	50	40
Power distribution	700	50	600	50
Mobile equipment	150	25	100	25
Sub-total	26,603	6,891	15,788	3,924
Engineering	5,320	1,378	3,157	785
Sub-total	31,923	8,269	18,945	4,709
Contractor's fee and overhead	3,192	827	1,894	471
Total investment	35,115	9,096	20,839	5,180

Table 18

ESTIMATED PRODUCTION COSTS OF WET-PROCESS ACID

Plant capacity as acid: 544 metric tons of P_2O_5 per day (340 days/year); 184,960 metric tons of P_2O_5 annually

	Delivered unit cost, $	Quantity per ton of P_2O_5	Cost, $/ton of P_2O_5
Sulphuric acid section			
Sulphur (2.85 tons of H_2SO_4)	38.50/metric ton	0.96	37.04
Electricity	0.006/kWh	29.8	0.18
Cooling water	0.00528/m³	91.79	0.48

	Delivered unit cost, $	Quantity per ton of P_2O_5	Cost, $/ton of P_2O_5
Boiler feed-water	0.1057/m³	4.17	0.44
Filtered water	0.0264/m³	0.542	0.01
Salaries and wages	4.00/man-hour[a]	0.176	0.70
Supplies			0.12
Maintenance, 6%/year of investment			1.72
Depreciation, $5,297,000 over 15 years			1.91
Sub-total			42.60
Phosphoric acid section			
Phosphate rock	6.06/ton	3.58	21.69
Electricity	0.006/kWh	331	1.99
Water	0.00528/m³	20.86	0.11
Salaries and water	4.00/man-hour[a]	0.83	3.32
Laboratory analyses			0.26
Acid storage and distribution			1.32
Supplies and chemicals			1.76
Maintenance, 6%/year of investment			3.65
Depreciation, $11,242,000 over 15 years			4.05
Sub-total			38.15
Total (direct)			80.75
Overhead			4.96
Taxes and insurance (total, 2%/year on $16,539,000 investment)			1.79
Total			87.50

[a] Includes benefits.

Table 19

ESTIMATED PRODUCTION COSTS OF FURNACE-PROCESS ACID

	Delivered unit cost, $	Quantity per ton of P_2O_5	Cost, $/ton of P_2O_5
Raw materials section			
Rock	6.06/ton	2.25	13.64
Matrix	1.10/ton	2.62	2.88
Coke	18.74/ton	0.588	11.02
Electricity	0.003/kWh	71.7	0.22
Water	0.00528/m³	20.86	0.11
Salaries and wages	4.00/man-hour[a]	0.22	0.88
Mobile equipment			0.28
Supplies			0.06
Maintenance			1.33
Depreciation, $9,096,000 over 15 years			3.24
Sub-total			33.66
Furnace section			
Electricity	0.003/kWh	57.623	17.28
Carbon electrodes	0.309/kg	6.50	2.01
Water	0.00528/m³	25.03	0.13
Steam	1.10/ton	1.00	1.10
Salaries and wages	4.00/man-hour[a]	1.15	4.60
Air	0.71/thousand m³	0.078	0.05
Ammonia			0.07
Laboratory analyses			0.41
Mobile equipment			0.11
Supplies			0.54
Maintenance			5.53
Depreciation, $20,839,000 over 15 years			7.50
Sub-total			39.33

[a] Includes benefits.

	Delivered unit cost, $	*Quantity per ton of P_2O_5*	*Cost, $/ton of P_2O_5*
Acid section			
Electricity	0.003/kWh	44	0.13
Water	0.00528/m³	83.44	0.44
Air	0.71/thousand m³	0.041	0.03
Salaries and wages	4.00/man-hour[a]	0.18	0.72
Equipment operation			0.02
Acid storage and distribution			1.32
Supplies			0.07
Maintenance			1.10
Depreciation, $5,180,000 over 15 years			1.86
Sub-total			5.69
Total (direct)			78.68
Overhead			7.17
Taxes and insurance (total, 2%/year on $35,115,000 investment)			3.79
Credit for sale of by-products			−5.51
Total			84.13

[a] Includes benefits.

Shipment of phosphorus

A major advantage of the electric-furnace process is the high concentration of the intermediate product, elemental phosphorus. Phosphorus is readily shipped in mild steel tank cars, and water shipment by river barges or overseas vessels is feasible. Shipment of 1 ton of elemental phosphorus would supply the same amount of P_2O_5 as about 7.5 tons of phosphate rock plus 2.2 tons of sulphur for use in the wet process. One ton of elemental phosphorus is equivalent to the phosphorus content of 5 tons of triple superphosphate or diammonium phosphate derived from wet-process acid. Thus, when the market area is distant from the phosphate mine, a substantial saving in transportation costs can be made by shipping elemental phosphorus to the market area for conversion to fertilizer.

Although the present estimate assumes that all of the elemental phosphorus is converted to phosphoric acid at the Florida plant, it is much more likely that most or all of the phosphorus would be shipped from Florida to one or more conversion plants located in market areas. If the Florida plant produced elemental phosphorus only, the investment would be reduced to about $30 million, and the production costs would be about $178 per metric ton of phosphorus, which is equivalent to $78 per ton of P_2O_5.

When the distance of the market area from the phosphate mine is such that the transportation costs are $15 per ton, the shipment of elemental phosphorus would cost about $6.60 per ton of P_2O_5 as compared with $32.60 per ton of P_2O_5 for diammonium phosphate (18-46-0), a saving of $26 per ton of P_2O_5. Under these conditions the electric-furnace process would have a clear advantage when a 20 per cent return on investment is included, as shown in table 20.

Table 20

COMPARISON OF PHOSPHATIC FERTILIZER PRODUCTION COSTS USING THE ELECTRIC FURNACE AND WET PHOSPHORIC ACID PROCESS ROUTES

	$/metric ton of P_2O_5
Electric furnace	
Cost of elemental phosphorus (power at 3 mills per kWh)	78.00
Return on investment (20 per cent/year on $ 30 million)	32.40
Transportation of phosphorus	6.60
Conversion to fertilizer	10.00
Total	127.00
Wet process	
Cost of wet-process acid	87.50
Return on investment (20 per cent/year on $ 16.5 million)	17.84
Conversion to fertilizer	8.00
Transportation of fertilizer	32.60
Total	145.94

In the above comparison it is assumed that the fertilizer product is ammonium phosphate and that the cost of ammonia in the market area is the same as at the phosphate mine, so no credit for shipping the nitrogen content of ammonium phosphate has been allowed.

Another possibility is overseas transportation of elemental phosphorus to supply fertilizers to developing countries. Ocean transportation costs for shipment of fertilizer from the United States to India range from $12 to $15 per ton. Thus, shipment of triple superphosphate costs $26 to $33 per ton of P_2O_5. Ocean freight rates are not available for elemental phosphorus; at an assumed cost of $18 per ton, however, the freight per ton of P_2O_5 equivalent would be $8, and the saving over shipment of triple superphosphate would be $18 to $25 per ton of P_2O_5.

Comparison of the cost of shipping elemental phosphorus to India with the cost of shipping phosphate rock and sulphur is more difficult, as rock and sulphur are not commonly shipped there from the United States. However, recent prices of phosphate rock and sulphur delivered at ports in India were $23 and $60 per metric ton, respectively. Thus, the raw materials for making wet-process phosphoric acid in India would cost $133 per metric ton of P_2O_5. The cost, including allowance for a 20 per cent return on investment, of elemental phosphorus delivered in India from the hypothetical Florida plant with 3-mill power is calculated to be less.

Concentration of wet-process phosphoric acid to superphosphoric acid for shipment to India or other developing countries has been proposed. A rough comparison (table 21) gives elemental phosphorus a cost advantage over wet-process superphosphoric acid for shipment to India.

Table 21

COMPARISON OF PHOSPHATIC FERTILIZER PRODUCTION COSTS USING THE ELECTRIC FURNACE AND WET PHOSPHORIC ACID PROCESS ROUTES

(Transport to India)

	$/metric ton of P_2O_5
Electric furnace	
Cost of elemental phosphorus (power at 3 mills per kWh)	78.00
Return on investment (20 per cent/year on $30 million)	32.40
Freight to India (0.44 at $18)	7.92
Conversion to phosphoric acid in India	10.00
Total	128.32
Wet process	
Cost of wet-process acid ($38.50 sulphur)	87.50
Conversion to superphosphoric acid	8.00
Return on investment (20 per cent/year on $18 million)	19.40
Freight to India (1.39 tons at $15)	20.90
Total	135.80

Where electricity is available at or near three mills per kWh and sulphur costs are as high as $38.50 per ton, the electric-furnace method should be considered for phosphate fertilizer production. The usefulness of furnace acid for industrial phosphates weighs in its favour. Other favourable factors are the ability of the process to use low-grade rock, the suitability of the product for making unusually high-grade fertilizers, and transportation savings through shipment of elemental phosphorus.

The problems of developing countries

Developing countries often establish a nitrogen fertilizer industry first, then a phosphate fertilizer industry, and finally a mixed fertilizer industry. This procedure is likely to make the total job more expensive, and it makes it more difficult to give the farmer the balanced fertilizer he needs. It would be better to begin by providing the farmer with the grades of fertilizer he needs rather than setting up separate industries. In countries where farmers are well educated and where there are many well-trained agricultural advisers and ample facilities for soil analysis, the farmer can make wise use of straight fertilizers. Even so, farmers often prefer multinutrient fertilizers. In developing countries farmers are often illiterate, well-trained advisers are few, and laboratories for soil analysis may be lacking. In such cases it would seem best to provide farmers with mixed fertilizers compounded on the basis of the best information available for the crops and soils of the area and with due regard to cost.

If farmers are supplied with straight nitrogen fertilizers, results may be good for a few years, but the phosphorus content of the soil is soon likely to become a limiting factor. The farmers will then become disappointed in the results of fertilizer use.

When nitrogen and phosphate fertilizer facilities are planned separately, problems may arise that could be avoided by an integrated approach. For instance, if urea is chosen for nitrogen fertilizer and superphosphate for phosphate fertilizer, any attempt to mix these two materials will result in a wet, sticky, unusable mixture. Also, money may be wasted in granulating two materials in separate plants when the two could be combined and granulated in a single plant.

The first decision confronting developing countries in providing a fertilizer supply is whether to import finished fertilizer, fertilizer intermediates, or raw materials. The usual raw materials for phosphate fertilizer production are phosphate rock and sulphur. Few countries have both these materials, and many have neither. The experience of the developed countries has shown that it is best to import only the necessary raw materials, provided the demand is sufficient to support an economic scale of operation. Countries that have built up a

large phosphate industry based mainly or entirely on imported raw materials include Australia, Belgium, China (Taiwan), the Federal Republic of Germany, Japan, the Netherlands, New Zealand, and the United Kingdom. Many other countries import phosphate rock but use indigenous supplies of sulphur or pyrites. Several countries make extensive use of nitrophosphate processes requiring no sulphur.

The examples mentioned above indicate that lack of indigenous raw materials does not preclude the establishment of a flourishing phosphate industry. In fact, some of the above-named countries export a substantial amount of phosphate-containing fertilizer.

All countries, naturally, wish to use whatever indigenous raw materials they have. However, to use indigenous raw materials of unsuitable quality or excessive cost, such as low-grade, high-cost rock that cannot be beneficiated economically, is a poor policy. Such a policy leads to the excessive cost of phosphate fertilizer, and this will discourage its use and retard agricultural development. The result may damage the country's economy more than the importation of fertilizers or raw materials. Developing countries should search diligently for raw materials but should evaluate carefully the economics of using any that are found.

The possibility of importing intermediate materials for phosphate fertilizer production is a recent development. Phosphoric acid, superphosphoric acid and elemental phosphorus have been proposed as materials that could be shipped economically from locations where they can be produced at minimum cost. These possibilities may prove attractive in some cases and should be evaluated carefully.

Importation of fertilizers is usual during the first stages of agricultural development when the demand is not sufficient for economic indigenous production or when demand is increasing faster than production. Use of imported fertilizers to create a market is a necessary prelude to the establishment of an indigenous industry. The cost and suitability of imported fertilizers and their compatibility with future plans should be carefully considered. When a fertilizer industry is to be established, imported materials should be similar to those that will later be produced. Importation of mixed fertilizers or use of imported straight fertilizers in a mixing plant should be considered.

If the country already has a nitrogen industry, it may decide to import phosphoric acid to make ammonium phosphate fertilizers. Another possibility is to import bulk triple superphosphate (nongranular) for use in production of a mixed fertilizer by ammoniation-granulation techniques.

The establishment of a fertilizer industry is a complicated problem. Of primary importance is the cost of the finished fertilizers delivered to the farmer. The actual manufacturing costs often are no more than half of the final cost to the farmer. Handling, bagging, transportation, storage and distribution costs comprise a large percentage of the final cost. Hence, a thorough economic evaluation usually favours high-analysis products, although there are exceptions. When the nature of the crops and soils is such that sulphur is needed in fertilizer, some compromise must be reached between sulphur content and concentration of the primary nutrients.

Modern fertilizer plants should be capable of an output of at least 90 per cent of rated capacity, even allowing for all necessary maintenance and occasional major repairs. In fact, it is not unusual to achieve a sustained output above rated capacity. However, many developing countries operate their phosphate fertilizer facilities at only 50 to 60 per cent of capacity, even when higher output is urgently needed and fertilizer is imported to make up the deficit. The reasons for this poor record include shortages of raw materials, inadequate transportation and storage, lack of operating or maintenance skills, and difficulties in obtaining spare parts and other maintenance supplies. Most of these difficulties could be overcome if the Government of the country concerned would assign a high priority to maintain maximum production in existing facilities. In many of these countries fertilizer is so vital to the country's economy that top priority would be fully justified. There is a regrettable tendency to attach more importance to establishing new plants than to making the best use of existing ones.

The training of operating and maintenance personnel for a plant is a difficult problem. Most construction firms provide start-up services, but this is often inadequate for thorough training, since these firms lack the personnel and the know-how to train the plant operators sufficiently to ensure sustained, full-capacity operation. Good results have been achieved by employing a supervision team from an experienced operating firm for one or two years. An expenditure of this sort can yield far better returns than an investment in new plants.

Short-sighted policies limiting importation of raw materials, spare parts, or services of foreign technologists may be responsible for many of the poor operating records. Complicated, time-consuming procedures for obtaining approval for importation may be as damaging as outright prohibition. Heavy taxes on imports may be a handicap.

The effect of the failure of developing countries to operate fertilizer production facilities at a high percentage of rated capacity is to limit the amount

of fertilizer produced and to increase its cost. The economic success of modern fertilizer plants usually depends on sustained operation at or near capacity. Each plant has a "break-even" operating rate, below which the operation is uneconomic. The break-even rate may vary considerably from one plant to another, but 70 per cent may be a typical value. A country with a good record in making full use of the facilities it has will inspire confidence in investors when new plants are needed. Conversely, where previous financial aid or investment has been poorly utilized, there is little reason to suppose that more capital will be forthcoming.

Not all countries should expect to establish a full-fledged fertilizer industry. Many countries are too small or lack the agricultural potential to furnish a market for a fertilizer plant of an economic size. In such cases regional planning can be helpful. For instance, a country with low-cost natural gas could produce ammonia for itself and other countries of the region. Another country may have phosphate rock, a third may have sulphur or low-cost electric power, and a fourth may have potash. Careful planning is needed to determine where production facilities should be located and what products or raw materials should be shipped.

The advantages of regional planning and co-operation are not limited to small countries. Adjacent portions of large countries may benefit also. For instance, the north-western part of the United States and the south-western part of Canada constitute a region in which phosphate rock, potash and finished fertilizers move freely across the border, with substantial advantages to both countries.

Potash

Known potash ore deposits

In about 1843, a brine well in Germany was found to contain potassium salts, and shortly thereafter German scientists established that potassium was an important plant nutrient. However, potash was not used as a commercial fertilizer ingredient in major quantities until early in the twentieth century. Its primary use in the early period of the industry was in dyeing, tanning, glass, fireworks, explosives, soap and other similar chemical industries.

Germany controlled world production of potash from approximately 1860 until the early 1930s, when demand stimulated the development in the United States of America of the Carlsbad, New Mexico, deposit. This deposit was discovered in 1925, but mining was not started until 1931. Production capability increased in the Carlsbad district to meet demand during and after the Second World War. World demand has increased rapidly since the middle 1940s at a rate of 8 per cent per annum.

The recent expanding demand for potash in the world market has stimulated the development of the Saskatchewan, Canada, deposits. At the present time three companies there are producing potash, and five other companies are developing properties. Several other major companies are making feasibility studies of the properties they control.

Potash is being recovered in over 140 operations in the world, including both brine and mining operations. Currently, fourteen properties are under development. Today over 95 per cent of the world's production of potash is used as fertilizer.

Exploration

With few exceptions, the major potash deposits in the world have been found as a result of oil-drilling operations. The deposits in New Mexico and Saskatchewan are typical examples. The first report of potash in Saskatchewan was made during the Second World War when a wildcat oil well intersected a major salt horizon and some potash salts were identified in the remnants of the leached core. Development began in 1951, and exploration drilling for potash started near Saskatoon, Saskatchewan. More recently, oil exploration work in Brazil and West Africa has indicated the presence of potash in a salt horizon; development by shaft sinking and further drilling is now in progress.

Potash is derived principally from underground deposits of bedded potash and, to a less extent, from surface brines. The major production at present is from bedded deposits, which are interbedded with halite or common salt. Some of the ores are mined solely for KCl, while others are mined for potassium sulphate and mixtures of the two minerals.

Exploration for potash deposits is unlike exploration for most non-metallics in that potash deposits do not normally outcrop at the surface. Potash exploration is also unlike exploration for metallic deposits in that most geophysical methods are not applicable. Gravity surveys are of some use in locating potential exploration areas because salt masses are generally of a lower density than the surrounding rock. The presence and mineralogical identity of underground potash can be demonstrated only by taking core samples. Drilling for potash, therefore, generally begins earlier than it would for other mineral commodities. The cost of drilling may also be higher, since special techniques are required to preserve the soluble salts recovered from the core. It is also generally necessary to take a larger diameter core to sample potash deposits than is needed for other mineral commodities because potassium salts are often coarse and crystalline. Thus, exploration for potash deposits requires a different approach from that used for the exploration of most mineral deposits.

Physical characteristics

It is difficult for mineral properties containing kainite ($KCl \cdot MgSO_4 \cdot 2.75H_2O$) and carnallite ($KCl \cdot MgCl_2 \cdot 6H_2O$) ores to compete in the world market with mines producing sylvite or KCl. The sylvite deposits in Canada have only minor metallurgical problems; however, the mining horizon is over 3,000 feet below the surface, and at this depth the evaporites (salt horizon) that contain sylvite, carnallite, and sodium chloride are plastic. Conventional mining much below this depth is not economic because of the plasticity of the deposit. The sylvite deposits in New Mexico are more complex, in many cases containing a mixture of many potash salts. The only major operating kainite deposits in the world are in Sicily, where there are substantial reserves with average K_2O content of about 12 per cent. The processing is fairly complicated, and potassium sulphate is the usual end result; little or no potassium chloride is produced.

In some of the major potash deposits the horizon to be mined is extremely thin, and special mining equipment and methods must be used to extract the ore. The depth at which potash deposits are mined varies from a few hundred feet below the surface to as much as 5,000 feet by solution mining techniques. No underground workings are envisaged below 3,700 or 3,800 feet at present. In the United States, the potash deposits in New Mexico are from 500 to 2,500 feet below the surface, and the deposit in Utah is about 2,700 feet deep. In Canada, there are in effect two potash horizons, the upper bed being the important source for the mine in western Saskatchewan. The producing mines and those that are now being developed will be operating at depths of from 3,000 to 3,700 feet depending upon location in the province. Those in the western part will be the deeper mines.

In France, potash deposits are from 1,500 to 3,700 feet below the surface. There are two separate beds, the upper bed being thinner and richer and the lower bed, thicker and of a lower grade. Potash is currently being mined in the Federal Republic of Germany at a depth between 3,000 to 3,800 feet. In Spain, the depth varies from 900 to 1,600 feet.

In the Soviet Union, the deposits in eastern Galicia are from 300 to 2,000 feet deep. The Starobin deposits are from 1,200 to 3,000 feet deep and the Caspian deposits are reported to be 900 to 2,000 feet deep. The important mines in Upper Kama are being worked at depths of from 1,000 to 3,700 feet. The kainite deposits in Sicily are from 900 to 1,500 feet below the surface. Two horizons are known to occur in the Congo (Brazzaville) deposit, one approximately 1,000 and the other about 1,400 feet below the surface. The potash deposit in Yorkshire, England, is reported to be from 4,000 to 5,000 feet below the surface.

Saline deposits are composed of interbedded halite (NaCl), clays, gypsum and anhydrite. Occasionally the halite beds contain concentrations of potassium minerals of possible economic importance.

One other source of potash is natural brine, such as sea-water or water in contained areas such as the Dead Sea. Today the only major production from this source is the evaporating operation in the western portion of the Dead Sea carried on by an Israeli company. Minor amounts of potassium are produced from the nitrate fields of Chile. The product is potassium nitrate, a by-product of the sodium nitrate industry.

Each source of potash presents its own problems. Production of potash from the Dead Sea, for example, is limited by the cost of construction and maintenance of dikes, an important factor in operating costs. Several other brine sources have been considered, and feasibility studies are being made to see whether it is possible to produce potash salts from these brines economically.

The possibility of producing potassium salts from the Great Salt Lake in Utah is now being studied by several major chemical companies; the outcome of these studies is still unknown. The brine deposits in north-central Libya have been investigated, but to date no major effort has been made to develop this possible minor source of potash. A pilot plant is being operated in the Sechura Desert brine fields in northern Peru to ascertain the possibility of recovering potassium salts and other known elements of economic value.

Potash mining

The first of the three basic methods of extracting potash from underground deposits is the so-called conventional mining method, whereby ore is drilled and blasted, loaded by mechanical loaders, conveyed by cars or trucks to a conveyor belt and then transported to the shaft, where it is hoisted to the surface plant.

In the second method, mining machines—either the ripper or the boring variety—replace the blasting and loading operations. The ore is conveyed through the machine to a conveyor belt and thence to the mine shaft and hoisted. Machine mining is a new development, used commercially only since 1962. This is the method now in use in Saskatchewan mining of the flat-lying potash deposit.

The third method is also comparatively new from a commercial standpoint. It is the solution mining method, in use in only one operation in Saskatchewan where the potash deposit is more than 5,000 feet below the surface. Owing to this

great depth, conventional methods were not considered. In solution mining, a hot water solution is pumped down into the potash horizon and recovered through auxiliary wells. The potash salts contained in the returned solution are then treated in crystallizers and the potassium salts extracted. The main disadvantage of this method is its lack of selectivity. All soluble salts are dissolved in the horizon being worked.

The possibility of developing another deposit for solution mining is now being investigated. This deposit is near Whitby, Yorkshire, in north-east England. The potash occurs at a depth of about 4,000 feet, and there is an overlying stratum of about 1,000 feet, which is a strong aquifer. This overlying aquifer and the depth have discouraged the development of this deposit by conventional methods.

Mining by drilling and blasting methods or with continuous miners is difficult in faulted and steeply dipping deposits such as those found in certain parts of the Federal Republic of Germany. Here some of the deposits have been so distorted by movement that the beds are essentially vertical. These deposits are being mined by extracting from a certain vertical interval and then refilling the mined-out area with salt to support the walls of the deposit.

In a new mine in North America equipment and methods to extract potash from a steeply dipping and rolling bed are being developed. Wherever potash is found in nearly vertical beds the cost of mining will be much higher than it would be for flat-lying deposits, owing to the lack of mechanical equipment designed to operate under those unusual conditions. A not uncommon hazard encountered in the underground potash mines is the presence of brine, gas and even oil in the ore or in the adjacent horizons.

Processing methods

The physical and chemical characteristics of the deposit dictate the processing methods used to recover the potassium salts. In some areas the physical mixture of anhydrite with potassium salt in micron sizes makes it very difficult to produce a coarse product containing 60 per cent K_2O. To achieve the coarser sizes it is sometimes necessary to compact and resize the potassium salt concentrate. The mining and processing cost is increased where mixed salts occur, for example, kainite mixed with sylvite. The presence of keiserite and polyhalite is also extremely detrimental to the recovery of a saleable product. High sodium-ion content is undesirable in potassium salts to be used in saline soils. Potassium chloride is not acceptable as a source of potassium when the soil is high in sodium chloride. The additional chloride in the soils makes them unproductive after sustained use.

Currently, three natural brine deposits are being worked for potash. Two are in the United States; at the Searles Lake deposit in California potassium chloride is being obtained as a by-product, and potassium sulphate is also produced; the Wendover deposit in Utah is yielding potassium chloride. The Dead Sea near Sodom, Israel, is also yielding potassium chloride. Three other plants are in the planning stage one each in the Soviet Union, Jordan, and the United States (Great Salt Lake). The potassium chloride content of the Dead Sea brines is about 1 per cent and may reach 1.6 per cent. The Bonneville brines near Wendover contain 0.08 - 1.2 per cent KCl. There is considerable difficulty with the Searles Lake brine because it forms a complex salt having a composition of $Na_2SO_4 \cdot 3K_2SO_4$ or $K_3Na(SO_4)_2$. The Great Salt Lake is reported to contain 0.92 per cent KCl. Seawater normally contains about 0.05 per cent K_2O. Slimes consisting of insoluble material present a very serious problem in the brine operations, as extra filtration apparatus must be incorporated in the circuit.

The processing problems in New Mexico are more complex than those found in the Canadian deposit, but the mining conditions at 800 to 1,000 feet deep are considerably better. The complex ores found in the Federal Republic of Germany and France pose two kinds of problems. The depth in some areas is excessive and temperatures are high. The metallurgy is costly, as these ores contain high percentages of carnallite. Carnallite reacts unfavourably in deep deposits because of its water content, and it is extremely hygroscopic. It does not have the physical strength characteristics of sylvite or langbeinite. The deposits in Spain, although not deep, are folded and distorted. Their processing is complicated by the presence of carnallite in some deposits and brine in others.

World supply demand situation

The following eight factors, pointing to increasing use of fertilizers in the world, will have an effect on the future consumption of potash:

(a) One and a half thousand million more people in the world to feed in the next fifteen years;

(b) An increasing standard of living in developed and developing countries, which means more meat consumption and consequently more grain consumption to produce the meat;

(c) Greater agricultural education;

(d) More intensive agriculture and higher technology;

(e) Increasing profit to farmers from their investment in fertilizer;

(f) Higher government priorities for agriculture;

(g) Declining cost of fertilizer relative to machinery, land and labour;

(h) Acceleration of soil-depletion rates, with the day ever closer when man must stop taking more nutrients out of the soil than he puts in.

Currently, world potash production capacity is divided approximately as follows:

United States and Canada	29 per cent
The Soviet Union and Eastern Europe	30 per cent
Other developed nations	38 per cent
Developing nations.....	3 per cent

As to the world-wide demand, potash consumption in 1966 1967 was about 15.5 million tons. The capacity for 1966 1967 is placed at about 16.5 million tons. For 1969 1970, capacity is estimated at 22 million and demand at 19 million. After 1970 an average annual growth rate in demand of about 6.3 per cent is expected up to and including 1980.

Development of a potash complex

Manufacturing costs of potash are directly related to grade, depth and capacity. If those elements of costs that must be borne by the producer in developing countries are considered part of manufacturing costs, then manufacturing costs are also directly related to investments in distributing facilities (railroads, roads, port facilities), investment in housing, schools and hospitals, and investments in basic utilities (water, power, fuel).

Mining costs per ton of finished product are closely related to the ore content of the ore body. Obviously a high-grade ore containing little waste (salt) is much more productive per ton mined than one of low grade. For example, in Canada (Saskatchewan), the ore grade of the ore body runs 26 to 28 per cent K_2O: whereas some of the low-grade Carlsbad mines produce ore of 12 to 14 per cent K_2O. For a given tonnage, this means that a Canadian producer needs to mine less than half of the ore mined by a Carlsbad producer.

Refinery costs are also related to grade, although not nearly so much as mining costs, since the separation and disposal of waste occurs early in the circuit; and from then on costs are similar regardless of grade. Costs are directly related to recoveries, and high-grade ore always results in higher refinery recoveries than low-grade ore.

Costs rise as depth increases. A deeper shaft is a more costly investment, hoisting costs are proportional to distance lifted, and underground recovery (amount of ore removed per unit of advancement) is inversely proportional to depth. Shaft costs are also affected by the geological formations through which it is sunk. Depth alone is not the only factor affecting costs.

In Canada, a shaft is over 3,100 feet deep and costs (fully equipped) approximately $10 million. This is a ratio of about six and one half to one in comparison with Carlsbad costs and reflects not only the depth but the treacherous geological formations passed through in reaching the Canadian ore body.

Potash producers are no different from other large bulk producers. Volume directly influences costs. A high capacity operation invariably has lower unit costs than a low capacity plant. This is particularly true for operations with high fixed investment and operating costs. For instance, in Canada, a conventional mining operation will have invested $20 million in shafts alone. If to this is added underground equipment, a refinery, office and laboratories all built to withstand the severe Canadian winters, a producer will have over $50 per annual ton invested. In the refinery manpower is needed to attend to certain controls regardless of the volume processed. Thus, production unit costs are inversely proportional to capacity.

In developing countries, where labour is readily available at a very low cost, a producer will find it more advantageous to hire many men than to invest in complicated equipment, the operation of which may exceed the capabilities of the local labour force. In this case unit costs will not change significantly with volume.

Preparing for the development and operation of a potash complex is at best a tremendous undertaking, requiring engineering studies, core drilling, ore testing, economic evaluation and heavy capital investments, all within the framework of a certain element of risk. In developing countries the complications are multiplied and aggravated by lack of industrialization, transportation, capable work force, sufficient utilities, housing, foreign exchange and sometimes rigid government restrictions and regulations.

Unfortunately, most of the major producing deposits of the world are 200 to 1,000 miles from the ocean and are serviced by complex transportation systems.

Construction costs at the world's potash mines may vary from $30 per ton of annual capacity to as much as $60 to $70 per ton. Moreover, construction costs have been rising at 5 to 6 per cent per annum since 1962, with similar increases probably to be expected in the future.

Development of potash deposits from discovery to actual production has in some instances taken several decades owing to supply and demand conditions. Actual construction of mine and plant facilities has taken from three to six years, depending upon the particular deposit. To be economic, a potash operation should have adequate reserves to sustain operations for 25 to 50 years and must produce fairly high tonnage. This in turn demands an adequate power supply to operate the under-

ground equipment, refinery pumps, motors and other equipment; an adequate water supply for plant processing, brine make-up, dissolving and flotation; a source of natural gas or fuel oil for power plant, steam and drying; a reliable supplier of repair parts and supplies or the equivalent in plant inventory; and a labour force.

In developing countries the labour available is unskilled and inexperienced, and this means that extensive training programmes have to be undertaken. Even though Canada is an advanced country, the rural location of some of the potash mines has made highly organized programmes to train farmers to operate mining and refining equipment necessary.

An example of the difficulties developing countries face may be seen in Ethiopia, which has within its borders a very large deposit of potash. The results of early investigations were not sufficiently encouraging to attract potential producers, and to date the deposit is still not being exploited.

Among the factors that discouraged early investigators are:

(a) Remote location – extensive development of roads, port and energy sources is required;
(b) Climatic conditions – severe surface temperatures in excess of 130°F make operations difficult and expensive;
(c) Lack of water – a considerable quantity of water is required for processing potash to modern standards of quality;
(d) Lack of skilled labour – personnel must be imported and housing facilities built;
(e) Ore quality – although of high potash content, it contains impurities that make processing complex and expensive;
(f) Government – although the leaders are experienced, they are advancing in years; therefore, the future of government attitudes is uncertain.

In evaluating the Ethiopian project, geologists and mine engineers investigated water sources, mining conditions, native customs and religious differences, site locations, port requirements, transportation facilities, living conditions, equipment availability and other factors. The costs, including taxes, were estimated and government attitudes determined. Some day this deposit will undoubtedly be commercially mined. There is a natural market for this raw material, which is large enough to support such development in spite of high operating costs.

Distribution

The transportation of bulk products has received increasing consideration in recent years. It is necessary to know the physical distribution economies available in order to understand the market. Companies entering bulk markets, such as those for phosphate rock, potash, and sulphur, will find that considerable resources and efforts have been expended to develop the lowest possible distribution costs.

Success within national borders depends on the proper use of existing movement facilities, and technological innovation is the most important in distribution. Geography is no longer a critical factor where large volumes exist, if the "total movement concept" is employed. This concept refers to a distribution programme that exploits every opportunity from the time the product leaves the end of the production line to the time it reaches the ultimate user. The cheapest and most efficient method of transportation to the port of export must be established. Port facilities must be adequate to load the product aboard properly sized vessels at a speed ensuring the lowest loading costs consistent with ship requirements. Vessel selection, through negotiation or construction, should always reflect the specific requirements of the particular product and customer.

The port facilities at destination must also be carefully considered. Often the economically sized ship cannot be used owing to severe restrictions at the port of entry as a result of draught limitations, inadequate handling facilities, lack of storage, inability to provide sufficient transportation equipment for the inland haul, or labour difficulties. It is no longer possible in world markets to depend on placing the burden of delivery on the final customer, unless he is willing and able to provide distribution facilities of his own. Utilization of all distribution opportunities, as listed below, can preserve or develop world trade.

Movement to the port of export

Production plans must be geared to customer consumption, both domestic and foreign.

Strict control must prevail. Whatever proves to be the most economical and efficient delivery method must be used – whether rail, barge, motor truck or pipeline; any minor error could prove very costly.

Tonnage at port must be assembled quickly if storage is not provided. Any delay is expensive.

If possible, control should be exerted over the port facility to ensure quick turnover of the vessel. Many suppliers have developed their own terminal complexes in order to avoid delays at publicly owned ports.

Ocean movement to port of import

The most specialized vessel should be selected. Although huge ocean vessels create lower per ton costs than smaller ships for actual movement, they

may also create problems and costs that may not only destroy their hauling advantage but actually yield higher total distribution costs. Table 22 illustrates the operating cost comparisons of different sized ships based on experience. These costs include operating, management, fuel at sea, capital expense, repairs, maintenance and surveys of vessel.

Table 22

OPERATING COSTS OF SHIPS

Deadweight tonnage of vessel	*Cost per day* ($)	*Cost per deadweight ton per month* ($)
10,000	1,582	4.83
15,000	1,736	3.53
20,000	2,170	3.31
25,000	2,576	3.14
30,000	2,744	2.79
40,000	3,262	2.49

Discharging port and movement to final destination

Although there are obvious advantages to large bulk carriers, the benefits can vanish unless discharging facilities are modernized. In many developing countries purchasing major amounts of bulk commodities, inefficient handling and shallow draughts prevent them from enjoying the low costs available under the total movement concept. Table 23 compares discharging costs in terms of ship time in port expressed in dollars per long ton.

These discharge costs show the urgent need for modernization of port receiving facilities. Without improvement, vessel specialization is useless, and a key area for distribution economies is destroyed.

On key accounts it is also advisable to investigate the movement from discharging port to final destination. Reductions in costs are often possible if everyone involved is aware of the business available should distribution economies be maximized. The successful potash producer must examine every item of distribution expense. The competition in world trade demands such efficiency.

Table 23

DISCHARGE RATE PER RUNNING DAY

(Dollars per long ton)

Deadweight tonnage of vessel	*1,000 LT*	*2,000 LT*	*3,000 LT*	*4,000 LT*	*5,000 LT*
10,000	1.43	1.17	0.91	0.65	0.39
15,000	1.64	1.33	1.03	0.72	0.42
20,000	1.84	1.49	1.14	0.79	0.44
25,000	2.08	1.68	1.28	0.88	0.48
30,000	2.31	1.86	1.41	0.97	0.52
40,000	2.76	2.24	1.71	1.19	0.66

A cautionary note should be added: over-specialization of the vessel can result in a loss of pliability by eliminating the possibility of backhaul arrangements. A ship should be secured, or built, on the basis of customer requirements but not to the extent as to destroy flexibility. Although many long-term contracts are predicated on an empty ballast movement from destination to the loading port, efforts to work with other industrial concerns should be pursued in order to curtail backhaul costs.

Several years ago it was difficult to secure return movements on bulk vessels. This is no longer true. Shipments of dry solids have increased from about 300 million tons in 1950 to over 700 million tons in 1965. In recent years many ship owners have pooled their resources to form substantial bulk carrier groups to take advantage of this high volume.

The vessel should proceed to the discharge port at the swiftest and most economical speed. Through voyage data analysis, computers can contribute to running ships in the most economical fashion.

Conclusions with respect to the developing countries

For the developing country wishing either to establish its own fertilizer industry or to increase its food productivity through greater agricultural yields, potash is essential. Most of the developing countries lack potash deposits, and for them there is no alternative but to import potash; the only question is the source from which it should be obtained. Countries possessing potash deposits have to decide whether it is more practical to develop those reserves or to continue to import.

A basic consideration entering into their decision is the amount of foreign exchange available and its best use with respect to food production. The approach here must be a strictly economic one based on established priorities. For example, if the world market price of potash is $40 per ton, the decision might be to import it as the most economical way to develop a fertilizer industry. If potash

were $50 per ton, on the other hand, the country might well decide that it should exploit its own reserves.

To develop their potash reserves, most countries will find it necessary to attract outside capital and manpower, and here they must ask themselves if the physical resources and the economic environment are attractive. The investor, naturally, goes where the return is largest and safest. In some developing countries, development under the public sector, based on needs, will seem necessary.

The investor, as well as the governing body of the country with the potash reserves, must also consider the competition the potash will meet. If the reserve is exploited, will it move to a market within a country, within a region, or will it have to compete against other world sources for the nearest natural market? Is the country part of a regional economic grouping? The group's tariff schedule, the needs of its members for potash, and the likelihood of reduced trade barriers in the future must all be taken into account.

Four factors have to be studied before developing countries should undertake potash exploitation:

(a) Most countries have no known economically competitive deposits. Potash is less available than phosphate, which in turn is less available than hydrocarbons needed in the production of nitrogen, the third major plant nutrient. Extensive geographical surveys and exploration are necessary.

(b) Early development costs of a potash mining project are higher than for the other two plant nutrients.

(c) The cost per unit of K_2O is the least per unit of the three primary nutrients, and therefore its purchase is least depressing to a country's balance of payments.

(d) Potash and phosphate are used in soils only after nitrogen has been applied. Therefore, nitrogen has traditionally been developed first.

Export Marketing Organizations

Most of the developing countries find it difficult to meet the conditions required for successful promotion of exports of manufactures. Because of the small size of enterprises and the limited market, production costs in these countries are usually high and the prices of manufactures non-competitive in the world market. The undiversified structure of their industrial production and exports makes it difficult to adapt to the changing pattern of demand in the world market. Lack of experience in entrepreneurial, technical and managerial fields as well as in export marketing also adds to the difficulties of breaking into foreign markets. In general, all of these obstacles result from the low productivity of labour and inefficiency of production.

This situation has a twofold effect: not only is the development of an export trade in manufactures prevented, but in the absence of a larger market and the competitive pressures deriving from international trade, existing firms are unable to increase their efficiency and their size to the point where they will be able to produce at a competitive cost level.

The problems confronting the developing countries and the nature of the obstacles to development of their export trade in manufactures and semi-manufactures were described in a precise way at the first session of the United Nations Conference on Trade and Development (UNCTAD), held at Geneva in 1964. One of the secretariat papers prepared for the Conference stated:

> "The realization of an increasing flow of manufactures from the developing countries necessarily depends primarily on the ability of these countries to produce a rising volume of products suitable for export; and this is no easy task. It is not enough, however, that these countries seek to enlarge their industrial capacity. It is also necessary that they adapt their products to the specifications demanded in foreign markets, that they increase their industrial efficiency in order to bring their costs and prices more into line with those in developed countries, and that they establish effective commercial channels for their products in importing countries. For countries with only brief past experience in industrial production and in the external marketing of manufactures, these are formidable requirements. But even the most vigorous efforts on the part of the developing countries can be thwarted, or substantially impeded, if these countries do not enjoy access to the markets of developed countries on favourable terms. And there are, unfortunately, grounds for maintaining that the access which is currently granted to the exports of these countries fails to meet this stipulation" (UNCTAD, Vol. 4, p. 21).[1]

It has been the experience in some countries, e.g. in Scandinavia and Japan, that export marketing organizations set up by groups of manufacturers or supported by governmental or semi-governmental authorities can contribute to the removal of such bottlenecks. Such export organizations have been responsible not only for mobilizing whatever export capacity was potentially available but also for effecting considerable changes in the structure of production of existing firms. In particular, export organizations have brought about rationalization of production, improvement in quality and diversification of goods. In some cases they have resulted in increases in plant sizes to the point where economies of scale have made it possible to reduce costs and prices not only for the export market but also for the output to the domestic market.

The establishment of such organizations could be a useful instrument for the promotion of industrial exports from developing countries. Therefore the United Nations Industrial Development Organization (UNIDO) has initiated a number of country studies to analyse the experience gained in this area under different economic and social systems and at various levels of industrial development. Such studies have been received from Chile, Iran, Israel and Yugoslavia. On the basis of these studies and

[1] All references are listed at the end of this article.

other sources, a comparative analysis of this problem has been made, and some conclusions have been drawn in regard to the possibilities of United Nations technical assistance in this field.

THE NEED FOR EXPORT MARKETING ORGANIZATIONS

In recent years, great changes in production and market conditions have taken place in the world. The trend in production towards concentration in large units, specialization and co-operation in joint ventures is increasingly evident. Spectacular progress in electronics, automation of production, and the utilization of atomic energy have brought about a technical revolution in the world that has led to further internationalization of production and to the intensification of international scientific and technical relations.

As a consequence, profound changes in the structure of world industry, agriculture and trade, as well as in the pattern of international division of labour and the economic relations between developed and developing countries have occurred. The increase in labour productivity resulting from the introduction of new techniques and technology has made it possible to reduce unit costs in most industries. The new techniques, however, often require long runs in production, thus calling for large-scale investment in plant and equipment, employment of highly skilled personnel, training of labour force, and efficient organization of production. With the growth of productive forces the world over, the size of national markets is becoming an ever greater obstacle to development of production and trade. The trend towards faster rates of technical progress and the desire of the people for improved living standards require an expansion of markets on a world scale. Mass production and further diversification of goods and services are needed. As has been stated: "The production of higher-quality goods better suited to the manifold requirements of consumers, and production in quantity at the lowest possible price, are the imperatives dictated by present trends" (OECD 1964a, p. 11).

Advantages of large-scale production

There is no doubt that under conditions of stiff competition, large-scale production has considerable advantages over production on a small scale. Large-scale enterprises can reduce the investment layoffs per unit of output. They can apply modern production techniques and rational forms of organization, thereby increasing labour productivity and efficiency and reducing prime costs. The economic advantages of large-scale production are most evident in the electrical, metallurgical, chemical and other branches of heavy industry. In establishing the optimum scale of an enterprise two basic factors should be taken into account: its average production costs and the demand for its products.

The advantages of concentration of production in large-scale enterprises should not lead to the incorrect conclusion that with technical and commercial progress small and medium-size firms are doomed to disappear. It is true that in the present era, "there is no room for the weak"; but small-scale enterprises in some cases have advantages, especially in certain branches of the consumer goods industry. To cite an example of a successful export business in that category, a small United States firm with about 400 employees in the United States derived more than half of its sales and profits from overseas operations. The latter included a wholly owned manufacturing subsidiary in Western Europe, a joint manufacturing venture in Japan and a world-wide export business. (United States Small Business Administration 1966, p. 1).

Even small markets may be large enough to permit individual manufacturers to co-operate to an optimum degree. Also economies of scale are not determined solely by technological considerations. Although an optimum manufacturing unit may be small, economies of scale may be realized in marketing, research, development or management. The total number of industries needing a larger market to operate at low average costs is consequently higher than it would be if production technology alone determined the optimum scale (Israel Financial Research Institute 1966, p. 6).

Opportunities for small-scale exporters

These problems were discussed at the Conference on the Exploration of New Markets by Small and Medium-Sized Firms sponsored by the Organisation for Economic Co-operation and Development in Vienna in 1961. The participants agreed that, "although it is naturally unthinkable that small and medium-sized firms should be able to compete successfully in the production of raw materials and automobiles, it has been noted that in a number of specialized industries, such concerns can produce better-quality goods at a lower cost price than the larger firms" (OECD 1961a, p. 8). Other advantages over big firms (flexibility, specialization in production and services, personal relationships, etc.) were also noted.

The main conclusions of the conference may be summarized as follows:

(a) Small and medium-size firms can take advantage of their opportunities in export marketing if they make proper use of their business organizations and marketing consultants.

(b) With growing competition, product research and product design become more important in both the capital and the consumer goods fields.

(c) The cost of market research can be considerably reduced if it is carried out jointly by firms in the same sector of industry.

Characteristics of small-scale industries in developing countries

In most developing countries numerous small-scale industries and handicrafts produce goods for the local market. The small-scale sector, in terms of enterprises, is the largest group in manufacturing. In 1950, according to available data, 87 per cent of all industrial establishments in Japan were those employing eleven to 50 persons; the figures for Brazil and Argentina were 77 per cent and 76 per cent, respectively (ECLA, p. 5).

In some developing countries, modern plants installed along lines of production and organization similar to those in Europe and the United States exist. However, their optimum capacity is rather small compared with that of enterprises in highly industrialized countries. Furthermore, in developing countries, the difference in the productivity of large-scale and small-scale enterprises in a given branch is very great. For instance, in Chile, the ratio is 7 to 1 in the product per man in the cotton textile industry and 3.2 to 1 in the woollen textile industry. A greater discrepancy has been observed in Brazil's textile industry, particularly in cotton, where the ratio is 12 to 1 in spinning factories and 5 to 1 in webbing factories (United Nations 1966, p. 47).

According to Eugene Staley, the distinguishing features of small-scale industry in developing countries are:

(a) Very little specialization, or none, in management functions;

(b) Shortage of capital, and very limited access to institutional finance;

(c) Weak bargaining position in its markets;

(d) Close personal contact between management and workers, and often between the firm and its customers.

Associated with the foregoing may be:

(e) Employment of obsolete technological processes;

(f) Preference for production of traditional lines;

(g) Reluctance to introduce innovations (Staley 1958).

Limited market and high costs

The present markets in developing countries are too small to enable them to obtain the benefits of economies of scale. As stated in a United Nations document: "If a local factory is, in fact, established, the limited market is likely to restrict the size of the plant. The implications of this in terms of technique of production and unit costs obviously vary from industry to industry" (United Nations 1955, p. 14).

In consequence, the costs and prices of export goods manufactured in small-scale plants in developing countries are usually much higher and their quality is lower than products of the same kind produced in large-scale enterprises of developed countries. Where manufacturing facilities exist for such products in developing countries, their survival is due largely to government protection and subsidies.

In the absence of joint arrangements between small producers and specialized servicing institutions, such services as packaging, shipping and selling goods for export are usually carried out in a wasteful and uneconomic way by wholesalers, middlemen and export traders, who provide the material and finance, give some guidance on products and processes, and secure an outlet for output of the plants (UNCTAD, Vol. 4, p. 87).

SPECIFIC PROBLEMS OF EXPORT MARKETING OF MANUFACTURES

The specific problems of export marketing as against domestic marketing must be considered from the point of view of risk, competition, information and communication, scale and marketing costs.

Risk

Commercial, exchange rate and political risks affect international traders, especially exporters, more seriously than domestic traders. Commercial risks arise because it is usually more difficult to obtain reliable credit information about foreign customers and to collect debts from them if they should fail to pay for goods supplied. Similar considerations apply to exchange-rate risk – an element peculiar to international trade.

International trade, more than other types of trade, is subject to a host of government rules and regulations, which vary in detail and complexity from country to country and from time to time. These regulations may be changed at short notice, a distinct risk to foreign traders. Changes in an importing country's tariff rates, quota allocations or administrative procedures governing imports may profoundly affect exporters' profits. This type of risk is especially pronounced in international trade, an area in which governments exercise a large degree of control. (For further details on this question, see Israel Financial Research Institute 1966, pp. 1–3.)

Competition

The risk issue is closely interrelated with the problem of competition. When selling in world markets, as opposed to the domestic market, the risks on the demand side tend to be much greater. As Raymond Vernon puts it: "The conditions of competition in world markets are not so easily defined or predicted and certainly not so easily controlled as in the markets at home. When selling to export markets, one has no guarantee against the risk that a competitor may enter the market from any direction... The outcome, therefore, is much less predictable than in domestic marketing" (UNCTAD, Vol. 4, p. 203).

Domestic manufacturers are often protected against foreign competition by high transportation costs, tariffs or administrative regulations. Exporters have to overcome these barriers before they can even hope to begin to compete with domestic manufacturers. Even when they succeed in meeting domestic competition, exporters may still be excluded from the market by a new tariff or other regulation. Even when their competitive position remains unchallenged by domestic industry, exporters from other countries may deprive them of their market. Unlike domestic manufacturers, they have no recourse to government protection, and their market position is always an exposed one.

In addition, there is a difference between exports of raw materials and of manufactures. Prices of raw materials are more variable than those of manufactured goods. However, if the manufactured products are undifferentiated and come from many different sources, the fluctuations in prices are not much less than those of raw materials. A higher degree of price stability is likely when the manufactured products are well-differentiated and their sources are few.

However, the export manufacturer is confronted with still another risk. The exporter of manufactured goods, to the extent that he offers a differentiated product, tends to be committed to given markets and given distribution channels. Although he may have managed to insulate himself from competition in regard to price level, he probably will lose some of the averaging effects of selling to diversified markets. As a result of sharp changes in sales, much greater risks are involved in selling to a more constricted and specialized market.

In the view of Professor Vernon, it would be a mistake to assume too readily that there is some given rate of return that the entrepreneur would regard as sufficient to justify the risk involved in exporting manufactured goods: "Contrary to the easy assumption sometimes made in economic theory, entrepreneurs in fact are not necessarily willing to accept larger risk for the chance of greater gain" (UNCTAD, Vol. 4, p. 204).

The threat of competition in international trade is greater because trading is often carried on at prices that may cover less than the full costs. To maintain prices in their domestic markets, manufacturers often restrict supply and attempt to sell the surplus output abroad at lower prices. While a domestic manufacturer may induce his Government to protect his market position against such competition, an individual foreign supplier can hardly expect the Government to intervene on his behalf, thereby preventing its citizens from enjoying cheap goods provided by foreign suppliers.

Ignorance or lack of information

Ignorance or lack of relevant information constitutes a major handicap to the exporter *vis-à-vis* domestic competition. It has been stated: "Hawaii may, for example, offer a first-rate market for bathing costumes manufactured in Israel, but the existence of Hawaiian demand may remain unknown to the Israeli manufacturers, and the availability of a suitable source of supply in Israel may not be known to the Hawaiian market. Such investments in market research are very uncertain, since it is difficult to assess in advance the chances of the research paying off. Furthermore, market research in one country does not necessarily yield relevant information about the market potential in other countries" (Israel Financial Research Institute 1966, p. 1). This is especially the case with developing countries, which are in great need of statistical offices, economic research departments and agencies, and other information, intelligence and research facilities. Many manufacturers have neither the time nor the qualified staff to weave the data, obtained from various sources, relating to market intelligence into a clear-cut pattern that concerns their particular problems.

"The difficulties involved in basing potential export industries on foreign markets alone, constitute a serious challenge to developing countries whose domestic markets are often comparatively small", it is pointed out. "The range of these countries' export products is limited not only by their inability to compete on a cost or quality basis, but also because of their inability to overcome the information and communication barriers" (Israel Financial Research Institute 1966, p. 5). As a result, the entrepreneurs in developing countries prefer to sell first to the domestic market; and they could be expected to make this choice even if exports were a real possibility.

Marketing costs

The problem of marketing costs is also more serious for the exporter of manufactured products than for the domestic producer.

High transportation costs, customs duties and other government-imposed trade restrictions undoubtedly limit the scope of exports. As noted earlier, entrepreneurs justly regard exports as more of a gamble than domestic marketing; the cost of export financing generally exceeds that of financing domestic trade; and the problems of establishing channels of distribution and reliable information networks are far more complex in the case of exports. Also, the costs of export packaging, insurance and port charges must be mentioned.

The exporter, moreover, must often hold larger inventories than his domestic competitor and may also have to maintain expensive overseas offices. "If these differential marketing costs are so high as to prevent manufacturers from gaining access to foreign markets, their output will be restricted to the domestic market, and if the domestic market is comparatively small, manufacturers will be deprived of the benefits of economies of scale which are available to those of their foreign competitors whose domestic markets are large. Thus, a situation may arise where a potential low-cost producer may be unable to compete internationally and even in his own market with a high-cost producer, because export marketing costs exceed domestic marketing costs" (Israel Financial Research Institute 1966, p. 7).

EXPORT MARKETING ORGANIZATIONS – FUNCTIONS, ADVANTAGES, OBSTACLES

Role

Expansion of sales to foreign markets raises problems, especially for small and medium-size firms. These problems can be solved only if the size and structure of the firms give them enough flexibility to adapt their output to the requirements of demand in the foreign market.

The establishment of an export marketing organization requires large investments. The rising standards of consumers in regard to quality, packaging and grading of goods – a characteristic trend in the present world market—make it necessary for producers and exporters to resort to costly market research, product adaptation and export promotion. Such costs may be beyond the means of small-scale producers eager to export their manufactures. To quote from one study: "As small and medium-sized firms are rarely able to establish export sales on an individual basis, especially as their range of products is often too limited to bear the heavy export marketing costs, they are therefore forced to sell their products together with those of other exporters" (OECD 1964b, p. 10).

Export marketing groups or associations can play an important role in solving the specific problems of export marketing of manufactures – the problems of risk, lack of information and communications, and marketing costs. By bargaining as a group, small-scale exporters can improve their position regarding the price and quality of raw materials purchased for production purposes, as well as the sales prices of the exported manufactures. In general, co-operation among small-scale producers in developing countries can offset any possibility of monopolistic power on the part of foreign corporations or local big business and result in much better terms than if the products were sold independently. Specialization of the export marketing function as an activity apart from production, and concentration in larger organizational units, may afford opportunities for greater specialization of labour, management and other services involving human skill. Export marketing organizations can also be instrumental in promoting the general development of export-oriented industries. They stimulate entrepreneurship, help in modernizing plant and equipment, in raising productivity and lowering costs of production, in improving the design and quality of products, in improving management, etc.

Functions

Export marketing organizations should concentrate on providing major services to their constituents in seven areas: quality control, documentation, credit and insurance, freight-rate negotiations, market intelligence, capital supply and governmental and public relations.

Export organizations of a centralized type maintain continuous contacts with foreign markets and study the conditions in these markets, this being their regular and normal function. They relay the impulses emanating from foreign markets to domestic producers, thus assuming the role of importer of foreign technology and of a channel through which foreign demand is transmitted.

A large number of export organizations send their own experts or foreign experts to a domestic enterprise to advise on how to organize the production of a given article, or a given assortment of items, in order to satisfy the foreign customer. Another way of extending technical assistance is to place blueprints at the disposal of the producer and provide information on the technical specifications, outward appearance and properties of an article destined for export to a given market.

As specialists in the field, export organizations are able to organize sales promotion and advertising more economically and on a broader scale than individual producers could do for their own products. The organizations should be able to provide the necessary investment for their services—main-

tenance of an appropriate network, acquisition of equipment, teleprinters, etc. thus reducing the cost of investment per unit of turnover.

In raising the level of skills of the personnel employed in foreign trade enterprises, export organizations can be expected to build up a group of specialists possessing an adequate knowledge of foreign trade techniques, marketing, domestic and foreign trade regulations, foreign languages and other skills necessary for the conduct of foreign trade affairs.

Contact with producers

One of the main tasks of an export marketing organization is to help producers organize production for export. It can do so in such matters as reconstruction of plant, better utilization of existing capacity, modernization of production processes, and raising of productivity. All of this is the subject of a standard contract on business co-operation, which is typical of an arrangement between two partners. Under this, an export organization assumes the obligation to:

(a) Protect the interest of the producers and to behave as an orderly and conscientious businessman;

(b) Sell abroad at the highest possible prices and on the best terms;

(c) Make continuous, expert and systematic efforts to assure the proper marketing of products on the domestic and foreign markets;

(d) Inform the producer regularly, in writing, as to the conditions of marketing abroad;

(e) Safeguard for the duration of the contract the business secrets confided by the producers;

(f) Protect the interests of producers on the market against the competition of other producers in the same country, who may also have contractual relations with the export organization in question.

On the other hand, the producer is obligated to:

(a) Harmonize production, in accordance with the advice of the export organization and the requirements of the foreign market;

(b) Utilize the most suitable packaging which corresponds to the demand on the foreign market;

(c) Strictly observe the terms of delivery and other conditions of sale;

(d) Adjust the prices of his products to the level of prices of similar products on the foreign market; to achieve this end, the producer should enable the export organization to have an insight into the production processes.

If the export organization discovers possibilities for the sale of a product which has not yet been manufactured in the country, it takes steps to organize production of this item in the country, first contacting the existing large production units. Experience has shown, however, that new items are often introduced more efficiently when smaller enterprises are engaged for the production. In this case, the export organization may induce a group of enterprises to co-operate in such a way that each enterprise organizes a certain stage of production of the item in question. Alternatively, the production of the quantity to be sold abroad can be sub-divided among all the members of the group. Sometimes small enterprises, after establishing links with foreign markets through an export organization, have obtained good results in specializing in a given production. A characteristic example concerns the Yugoslav foreign trade enterprises Jugodrvo and Eksportdrvo, which persuaded a number of small enterprises to produce furniture for export. In another case, Jugometal took account of the demand for bauxite in Western Europe and opened a series of small bauxite mines. Starting at a rather modest level, these mines raised their total output and exports to more than one million tons of bauxite ore within five years (Rip 1965, pp. 32 - 33).

General and specific advantages

The general advantages of co-operation among small-scale producers for export through various types of export groups, associations or marketing organizations may be summarized as follows:

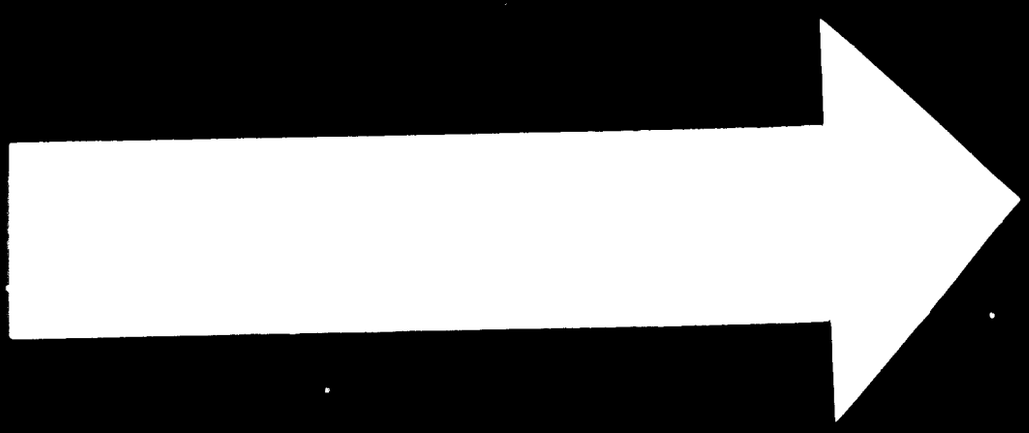
(a) Economies of scale inherent in large-scale operations can be obtained by enabling individual firms to reduce the number of products produced and to specialize in fewer items that can be manufactured in larger runs.

(b) By sharing costs, especially in research and development facilities, modern marketing comes within the reach of the small or medium-size enterprise.

(c) Small and medium-size firms can eventually become integrated within the structure of the national export policy, an integration which would be difficult, or impossible, to achieve on an individual basis because of ignorance, lack of time and a certain amount of apprehension (OECD 1964a, pp. 76 - 77).

Sharing of risks. Among the specific advantages is that the risks associated with exporting can be borne partly or wholly by the marketing organization.

In the opinion of the author of one study, it makes sense that certain risks should be shared when exports are marketed centrally, and that no individual producer should be responsible for the failure of the marketing organization to realize a better price for his output. But does it make sense that the marketing organization should bear no



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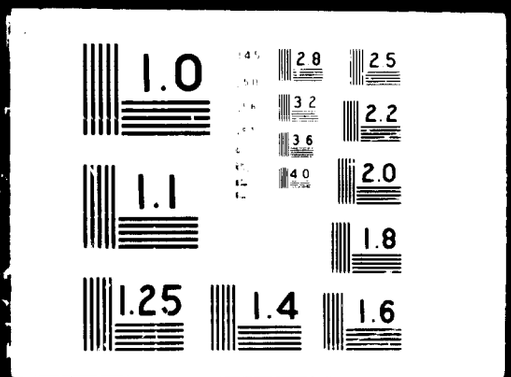


risk at all? According to this study: "The wisdom of the institutional arrangement whereby they act merely as central selling offices for their constituents, having no profit motive of their own, may well be questioned on the ground that it is not necessarily conducive to achieving efficient operations" (Israel Financial Research Institute 1966, pp. 50–51). The study states that management may be tempted to increase staff more than is necessary and may not be sufficiently alert to obtain the best possible arrangement. It is also apt to equate success with the quantity sold rather than with profits. This situation may be particularly serious when only one export marketing organization operates in the industry and the individual manufacturer has to choose between exporting through the existing organization or refraining from exporting altogether.

Information and communication: By providing exporters with relevant market information and facilitating relatively inexpensive communication with potential clients, centralized institutions of the type discussed above help to reduce the burden of financial commitments firms must make. They also reduce the risks associated with such commitments by directing the initial information-gathering activities to the more promising markets, thus shortening the process of information-gathering and evaluation. As a result, more firms are likely to join the ranks of those who seek to export, and once having decided to investigate export possibilities, they tend to investigate more markets and products.

Several institutional arrangements for obtaining information about foreign markets come to mind trade fairs and trade missions, commercial sections of diplomatic delegations, trace information centres, etc.

Problems and obstacles

Export marketing groups are not new. Many such groups have worked successfully for years; on the other hand, many have failed. "Unwillingness to co-operate has been one of the main causes of such failures, but also inadequate planning and organization, faults in the structure and composition of groups, and many other facts have been conducive to these failures" (Israel Financial Research Institute 1966, p. 51).

The obstacles and handicaps to development of export marketing organizations are numerous. They stem mainly from the form of ownership and market sharing when manufacturers export through a centralized marketing organization. Since the partners remain independent, as joint owners, their interest may clash in regard to market sharing and distribution of profits. They inevitably face problems of finding an acceptable basis for sharing the export market, for establishing price and brand policies and, more often than not, for sharing the domestic market.

For lack of a better method, most existing organizations divide the market among their members on the basis of past performance, production capacity or existing shares in the domestic market. Where the earnings of the export group or association are divided among participants in proportion to actual sales of their respective products, a certain amount of mutual competition is likely to be maintained. A slight variant of the joint sales system is the central order-receiving office, which collects all orders received by the participating enterprises and allocates them on the basis of an agreed distribution schedule. This re-shuffle of the initial destination of the orders received entails a certain equalization of profits (GATT 1959, p. 22).

A conflict of interest is particularly acute when products of participating enterprises can readily be substituted for one another. If the co-operation includes market information, advertising and service, the fact that participating firms are offering rival products does not usually entail any adverse consequences. If, on the other hand, co-operation also includes centralization of order booking and distribution, the actual allocation of orders to rival firms may cause difficulties (OECD 1964, p. 13).

To launch an export marketing association successfully it is necessary first to create the desire to co-operate.

The strength of this desire is particularly important, not only in forming the actual export group, but also in determining the degree of co-operation to be achieved and the soundness of its finances. Many small and medium-size enterprises are of a one-man type. The individual concerned wishes to remain his own master and will be reluctant to take part in a collective experiment. The will to co-operate in opening up foreign markets depends not only on knowledge of the possibilities of expansion but, above all, on calculation based on the known advantages of a collective export drive.

The second prerequisite is to create a climate of confidence, an essential condition for continuous co-operation. Mutual confidence is indispensable in determining the formula to be adopted, the partners, and the administrators of the group.

The third essential is the financial base. The authorities in certain countries have realized that the financing of the period of take-off often constitutes a bottleneck that can slow down or even prevent the launching of export groups. To remedy this state of affairs, they have devised various formulae: subsidies, loans free of interest, loans at low-interest rates, or tax exemption for capital placed by firms at the disposal of export groups (OECD 1964a, p. 73–82).

Classification of Export Marketing Organizations

Export marketing organizations may be classified according to various criteria: *(a)* size; *(b)* form of ownership; *(c)* nationality; and *(d)* organizational structure.

Size

Export marketing organizations may be of large, medium, or small size. Large organizations prevail in industrialized countries, while small and medium-size organizations are typical of less-developed countries. The advantages of a large-scale over a small-scale enterprise are evident in both production and foreign trade. The large-scale enterprise is more competitive in terms of production and distribution costs, price and quality. It is more capable of adapting its output to changing conditions of demand. It has greater financial, organizational and commercial resources, as well as more experience in export marketing.

An export marketing group consists of "two or more manufacturers who combine, to varying degrees, their export activities on a voluntary basis in order to strengthen their market positions abroad. The co-operating firms remain financially and legally independent. Export functions, carried out by the firms individually up to then, are combined and centralized. Such co-operation enables the member firms to have their sales and promotion work carried out more extensively, by specialists, and at lower costs" (OECD 1964b, p. 11). Functions such as market research, advertising campaigns and product development, often neglected by small and medium-size firms for lack of financial means could be carried out by the group and lead to more effective marketing abroad. A combined assortment of products also could facilitate the establishment of a more efficient distributions system and group sales force in foreign markets than the firms could achieve individually.

The range of products offered by an association would depend on whether the members belong to identical or different industries. Both types of organizations exist and are equally useful; adoption of either would depend on the region or industry concerned.

By exchanging experience and studying problems together, the firms joining in a common export drive should strive to reduce their costs, raise productivity and achieve a certain division of labour among themselves. To protect the reputation of the group, all partners would have to ensure that each observed minimum standards in business practice and fulfilling orders (OECD 1964a, pp. 63–64).

The Zeta group, a typical example, comprises practically all industrial art firms in the Netherlands. It was established in its present form in 1948 for the purpose of building up an export trade in industrial art products. The group includes about 500 member firms, of which about 40 export regularly. Members are divided into two categories: the numerically larger one consists of small family companies with five to ten employees; the other category comprises factories mass-producing industrial art products.

Since few members could handle export trade on their own, Zeta performs these functions for most of them. Products are exported in Zeta's name and under its trade mark. Since orders are often filled by products from several members, and careful packing of industrial art products is important, all exports are packed at a central plant under Zeta's supervision. The group prepares all shipping documents and collects payment. As a rule, 60 to 90 days' credit is granted, with insurance against non-payment.

Zeta receives periodic information from members about production developments. It also has a limited stock of current industrial art products and a permanent display of the range of products. It has published a joint catalogue of mass-produced products, on the basis of which customers may place orders. Zeta keeps members informed of current market conditions and the reception accorded to individual products (OECD 1964b, pp. 64–66).

Large-scale export associations have been set up in accordance with the Webb-Pomerene Act in the United States: some are limited to specific products or specified markets; others provide for shipment to any foreign country. Most of the groups were formed to develop a permanent export business. However, an association may be organized to meet a special need or temporary situation. Occasionally an association operates only when there is a surplus to be disposed of in foreign markets. Membership agreements may be permanent or drafted for a limited period with provision for extension; in the latter case, they have usually been extended (Pratt 1956, pp. 71–74).

According to Kramer, numerous advantages have been realized by associations operating under the Webb-Pomerene Act. These include:

(a) Stabilization of export prices;
(b) Reduction of selling costs so that small concerns, unable individually to branch out into foreign markets, are well able to pay their share of the expense;
(c) Standardization of grades, contract terms and sales conditions;
(d) Prompt and efficient filling of orders;
(e) Elimination of harmful practices;
(f) Combating combinations of buyers that might be in a position to play one exporter against another;

(g) Consolidation of cargoes and chartering of ships for better service and lower transportation costs;
(h) Joint advertising and exploitation;
(i) Division of territory, not only among members but also with foreign competitors;
(j) Utilization fo direct export channels and methods (Kramer 1959, pp. 344–345).

However, it should be borne in mind that such associations are usually a form of cartel because the "members agree to pursue certain defined group policies with respect to levels of production, prices and marketing arrangements, as well as other common or specified policies pertaining to industrial or trade activities" (Root, Kramer, and D'Arlin 1966, p. 318).

Form of ownership. In the ownership category, export marketing organizations may be classified as *(a)* private; *(b)* co-operative; and *(c)* State or public.

The type of export organization will depend on the prevailing form of ownership and the economic and social system in the country concerned. In developed countries with a market economy, all three forms of export organizations may be found. In countries with centrally planned economies, the private export organization is non-existent; the second form is widespread; and state-owned organizations are prevalent. In developing countries, all three kinds of organization are available, particularly the co-operative and public types.

Private export organizations: all of the export organizations previously described are private.

Co-operative export organizations: a co-operative is generally defined as "a membership organization designed to do business as a unit, the benefits or profits from which are either distributed to the members or the customers" (Pratt 1956, p. 78).

In developed market economy countries, groups have been organized along co-operative lines to engage in nearly all types of business enterprise. With regard to methods of operation, there is hardly any difference between an ordinary corporation with widely distributed ownership and a co-operative. The distinction applies almost entirely to the method of distributing the profits. This feature of co-operatives is a means of attracting and holding customers.

In less-developed countries, the creation of co-operatives and other associations of small producers is aimed at providing them with some of the benefits, services, economies of scale and bargaining power of large enterprises.

One type of co-operative that might be formed by export manufacturers is the so-called "joint enterprise" co-operative association. In this type, the members amalgamate their individual production processes and business operations in one unit controlled and managed by the organization. Members are small producers working in the same industry or participating in manufacture of the same product, usually established at different locations. The co-operative is mainly concerned with production operations. Although such co-operatives are not common in developing countries, some efforts might be made to encourage their creation (UNCTAD, Vol. 4, p. 89).

More widespread are "common facility" or "common service" co-operatives, in which members maintain the separate identity of their operations and the organization provides one or more of the facilities or services needed by all in the fields of processing, procurement, marketing or shipping. These co-operatives are well adapted to supplying, in part or as a whole, many of the services needed to promote the export products of small industry and handicrafts: representing export industries *vis-à-vis* government authorities; improving processes, products and management methods; disseminating marketing information, and assisting in executing some of the export formalities. Some co-operatives may also engage in contract negotiations and export operations proper.

State trading organizations may be defined as organizations in which there is "direct participation by the Government (or its agent) in foreign trade, including those trading activities in which the Government (or its agent) holds title to exports before transactions and acquires title to imports" (United Nations 1964, p. 1).

The objectives of state trading very between one country and another, depending on the economic system, the national goals and objectives of the country concerned.

In developing countries, the main objectives of state trading are the following: to secure better prices and markets; regulate prices of essential goods, including food supplies; facilitate and increase trade with centrally planned economies; implement trade agreements and barter deals; transfer trade from the control of non-nationals; and raise revenue for the Government. The nature and scope of state trading also vary from country to country, and from commodity to commodity. In the case of some exports, government participation begins from the production stage and is carried through to exportation. In others, government participation is limited to exportation. In still other cases the government role extends to both procurement and export, apart from some indirect influence on production through incentives. In a few cases, the State does not directly undertake production, procurement or export but employs agents or principals for all these transactions, while holding only the title to the export.

In some countries where state trading is an integral part of the economic activities of government corporations in certain sectors (mining, forestry, industry, transportation), the role of the State extends from production, through internal procurement and distribution, to export and import of the goods involved.

A typical example in developing countries is the State Trading Corporation of India (STC), established in 1956. Although wholly state-owned and state-managed, it is a limited company registered under the Indian Companies Act of 1956 and functions as an autonomous commercial organization. The Corporation has been granted the monopoly for import and export of certain commodities in which bulk-contracting and bulk-handling are considered advantageous, or which are in short supply and present peculiar problems of fair distribution. It has also been entrusted, to a limited extent, with some highly speculative commodities in which trading yields a high margin of profit. In addition, it handles the export of some commodities that would otherwise be difficult to sell because of high internal costs. The STC has exclusive rights to export iron ore, salt and cement. Imports of caustic soda, soda ash, raw silk, tin and ball bearings are also handled exclusively by STC. A large share of imports of certain commodities is channelled through the Corporation for the purpose of arranging barter deals, gaining favourable terms or stabilizing internal prices.

This Corporation constitutes the main channel for India's trade exchanges with centrally planned economies. The main commodities it exports to Eastern European countries are mineral ores, cotton textiles, woollen fabrics, shoes, tobacco, etc.

The STC was the first to introduce the system of business associates, whereby it actually helped exporters, particularly those with small capital resources, to export goods that they could not have exported individually. It enabled local suppliers to obtain about 90 per cent of their money immediately after they put the goods on rail, with the STC looking after the export of goods, arranging for letters of credit and waiting for the documents to be negotiated (United Nations 1964, p. 18).

The foreign trade of countries with a centrally planned economy is carried out on the basis of a state monopoly. It covers not only import and export transactions but also currency, insurance, credit and transport operations, and technical assistance abroad – in fact, all forms of economic relations with foreign countries.

In the Union of Soviet Socialist Republics the main administrative bodies in the field of foreign trade are: the Council of Ministers, the Ministry of Foreign Trade and the State Committee on External Economic Relations of the Council of Ministers, as well as the trade offices in foreign countries. The majority of foreign trade operations are carried out directly by the foreign trade firms according to a fixed list of commodities. The Centrosoyuz (a co-operative organization) is also entitled to handle foreign trade operations.

Foreign commercial operations are conducted by foreign trade amalgamations. These are autonomous state trading organizations, operating on a self-supporting basis and carrying out import and export operations and transport operations in foreign trade commodities. The number of such amalgamations is fixed, and each has a specific list of commodity items. This excludes the possibility of competition among Soviet trade organizations in the purchase or sale of goods. The State is not responsible for commercial transactions and other operations of the amalgamation and, conversely, the latter has no responsibility for claims against the State. The range of operations of an amalgamation may be illustrated by the following example: the Machinoexport Foreign Trade Amalgamation deals with foreign trade organizations and firms in 42 countries, while timber products are imported by about 1,000 firms in 55 countries through Exportles. Mashpriborintorg took part in more than 1,500 negotiations with foreign partners (P. A. Chervyakov 1962, pp. 37–62).

Foreign trade organizations in Yugoslavia are of a different type. In earlier periods, the dominant type of organization was the foreign trade enterprise, which played a major role in export promotion. More recently, business associations, which were originally concerned with production and general problems but which tended to specialize in the export-import business, have appeared. After some initial successes, organizations of this kind have acquired an important position in the Yugoslav economy. Aside from organizations for promotion of foreign trade that are of a specific character, export organizations strongly tend to polarize around two types: the foreign trade enterprise and the business association. As the process of evolution continues, there is a new trend towards a combined type in some larger enterprises, which endeavour to set up managing boards composed of producer-delegates in their former departments (Rip 1965, p. 25).

Nationality

Export marketing organizations may be: *(a)* locally owned; *(b)* foreign-owned; or *(c)* mixed. These three forms may be found both in developed market economy countries and in developing countries. However, their impact on the economy of a given country depends on the level of economic development, structure of industry and foreign

trade, and degree of dependence on foreign capital (particularly in industry and export trade), as well as the socio-economic structure and policy of the country concerned. In developing countries, foreign-owned export marketing organizations have a much greater influence on the economy and the external sector than in industrialized countries. Most international trading companies are large organizations engaged in importing and exporting. They often handle a large volume of commodities and are often integrated backwards into the production of various products and sometimes integrated forward into the operation of retail outlets.

Most of the world's major trading companies have their origin in Western Europe or Japan. It has been estimated that Japanese trading companies handle between 80 and 90 per cent of Japan's imports and exports. The larger Japanese trading companies, such as Mitsui and Mitsubishi, are active throughout the world, with offices in many big cities.

Trading firms of European origin or with European orientation, such as Jardine Matheson in Hong Kong, are an important factor in trade with countries that were formerly British or European colonies, particularly in Africa and South-East Asia. One of the largest of these firms is the United Africa Company, a part of the giant Unilever complex. United Africa's operations, particularly in West Africa, include everything from manufacturing plants to retail outlets.

The advantages of a trading company are its well-established position in certain parts of the world, its reliability in terms of credit and its general stability. These companies are in a position to sell and service almost any type of product required in their area of operations. Thus they are eminently qualified to represent a number of smaller firms. However, in countries that resent having their foreign trade controlled by foreign firms they may be in a difficult position. Indeed, the Governments of Burma and the United Arab Republic have nationalized their foreign trade (United States Small Business Administration 1966, p. 48).

It is up to the Government of the developing country concerned to weigh the *pros* and *cons* of foreign-owned as opposed to nationally-owned trade corporations. This question cannot be considered in isolation from the problem of foreign investment.

As stated in a recent United Nations document: "It is useful to start with the straightforward recognition that there are bound to be divergencies between the developing country and the foreign investor: the latter is concerned primarily with the business advantages (though not necessarily with the immediate profit maximization) which he hopes to derive directly or indirectly from the contemplated venture, while the Government must seek to secure his contribution—in capital and know-how, at the lowest possible economic and political cost to the country... The differences—while unavoidable—thus are not irreconcilable, but they can be resolved only on the basis of determination and recognition of what are the reasonable and legitimate expectations and requirements of both sides" (ECOSOC 1967, pp. 8—9).

Organizational structure

The choice of organizational structure of export marketing organizations depends on:

(a) The nature of the product to be sold—the type of customers likely to buy it (number, importance and location);

(b) Distribution methods and the choice of distribution channels (direct sales, sales through wholesalers and retailers, sales from stock, sales against quotations);

(c) The size of the firm.

The structure of a marketing organization must be constantly checked in the light of the various factors determining, among other things, the choice of product and the market for it.

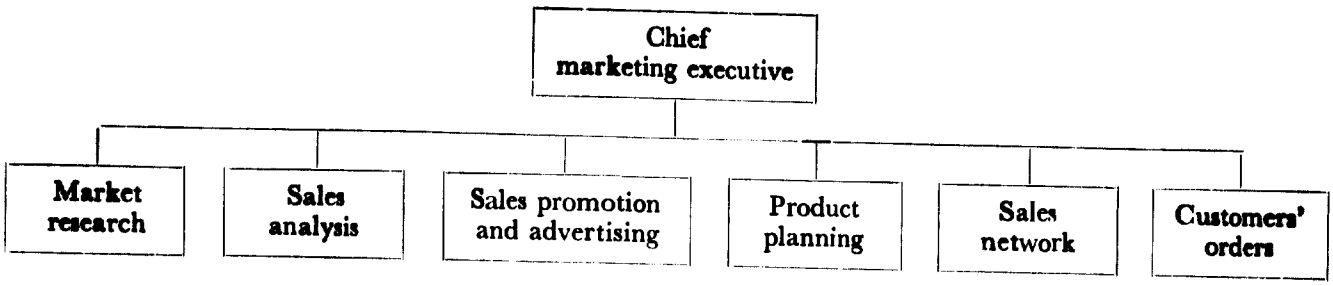
The various types of marketing organizations correspond to those of business organizations: functional organization, organization by product and regional organization. Different types of marketing organizations may result from these basic types.

The functional organization type groups the various departments controlled by the chief marketing executive. It is suitable for small or medium-size firms selling a range of similar products to a single type of customer through the same distribution channels (see chart below).

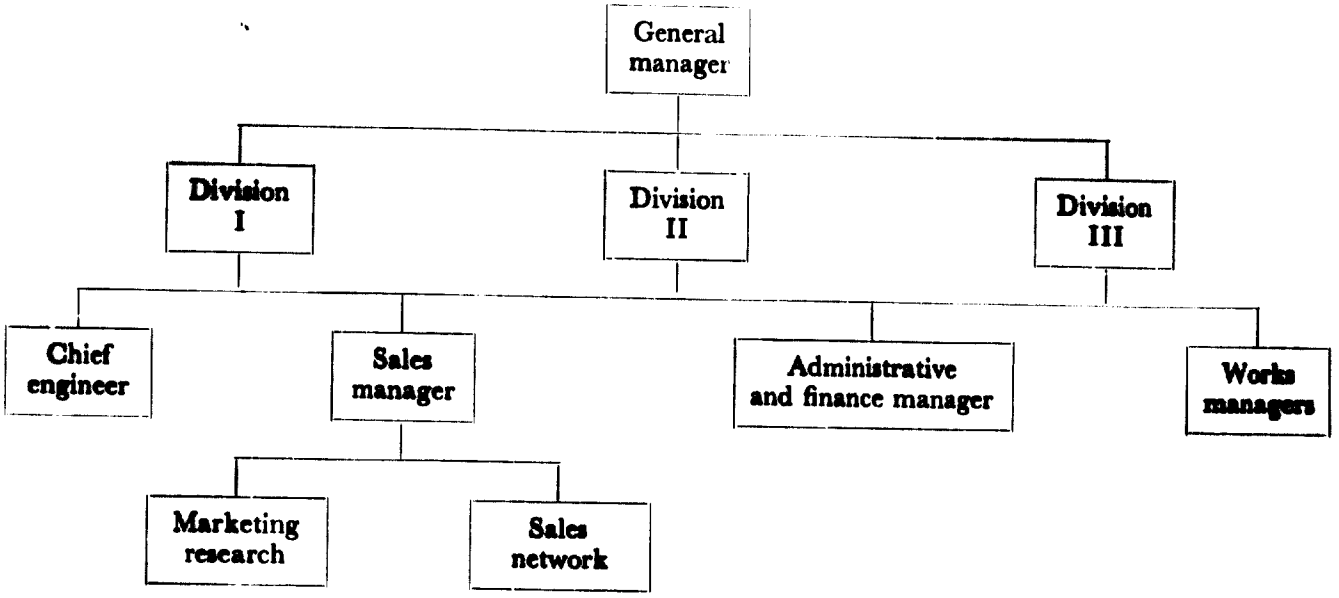
The drawback of this type of organization is that it multiplies the central services and involves two or three sales networks covering the same area, so that one customer may be visited by three different representatives of the same firm. However, it offers the advantage that each sales division specializes in one range of products and has one sales network and one group of customers.

The regional organization type is mainly called for whenever the number of dealers becomes very large; it is not always accompanied by regional decentralization of the various services, including those which operate on a nation-wide scale, such as market research or advertising.

Two kinds of regional trading firms are prominent in Israel—those dealing with countries whose international trade is tightly regulated and those trading with geographically remote areas. Israel has trade and clearing agreements with a number of countries of Eastern Europe, Africa, Latin



The type of sales organization based on product has one sales manager for each group of products; he is not subordinate to a single chief marketing executive but only to a division manager.



America and Asia. Several firms specialize in this trade, and their activities have met with varying degrees of success.

Some of Israel's trade with Latin America, Australia, the Far East and other geographically remote areas is also handled by specialized companies. Potential exporters are often unwilling to invest the time and money necessary to establish their own channels of distribution and prefer to leave the marketing function to specialized companies, even at considerable cost. Sometimes, however, a firm that initially exports through a specialized company, may at a later stage as a result of sales growth or improved communications with importers shift to direct selling.

One of Israel's largest regional export firms is Elda, founded in 1963 through a merger of four international trading companies operating in Africa, the Near and Far East, Australia and Latin America. The Government owns 57 per cent of Elda's shares. The remaining shares are held by Zim, Israel's largest shipping line; by Solkoor, the trading company of the General Federation of Labour (Histadrut); and by a number of smaller concerns. Elda has eighteen branches in fifteen countries; the branches act as wholesalers, and they stock merchandise for the firms they represent. The company carries on three basic types of transactions. In about 50 per cent of the cases it serves merely as an agent, obtaining inquiries from buyers and passing them on to suppliers, who ship the goods directly to the buyer. In these transactions Elda operates on a commission basis. Second, the company purchases goods from suppliers, stocks them in its local warehouses and itself sells directly to retailers. The third method is for the company to assume ownership of goods ordered by a customer but not to stock them. In such cases the supplier ships directly to the customer but bills the transaction through Elda. The company's gross profit and loss on these transactions is determined by the spread between the buying and selling price for the goods it handles. Recently the company has been instrumental in establishing local industries in countries where it operates (Israel Financial Research Institute 1966, pp. 14–19).

Export promotion organizations are government controlled or under public or mixed sponsorhip. (The great importance of such organizations for promotion of exports of manufactures from developing countries necessitates a more detailed study than is possible here.)

Export promotion institutions under public or mixed sponsorship official export promotion boards, semi-official export boards, chambers of industry and commerce, export promotion councils bring together representatives of Government, industry and trade. They advise the Government on exports policies and provide services and information to manufacturers and exporters and sometimes to foreign importers.

The role of an official export promotion board is to assist small and medium-size firms in their efforts to export. It can provide to the firms the kind of service they cannot afford to organize themselves.

This seems to be a twofold task: national and external. At the national level such boards should supply manufacturers with basic information on sales possibilities abroad, particularly information of interest to firms in a number of industry branches. They could also help export firms with more detailed information on problems of export organization, such as finding representatives in foreign markets, appointing suitable importers, supplying information on transport charges, providing legal and financial advice, etc. Good advice is particularly important in an export drive in the present era, since successful exporting depends especially on marketing methods and organization. At the external level the task largely consists of providing publicity for particular national products, through advertising abroad (press, radio, television and cinema) or setting up information bureaus at trade fairs and exhibitions in foreign countries (OECD 1964a, pp. 21–22).

The functions of semi-official boards, chambers of commerce, etc., are similar. For instance, the Swedish Small-Industry Export Office, set up in 1949 in co-operation with the General Export Association of Swedish Exporters, helps small and medium-size firms explore and gain a foothold in foreign markets. The Japanese External Trade Organization (JETRO) covers practically all aspects of export promotion at home and abroad by direct action through its centres and branches, research and publications services and other facilities, or by guiding and assisting private export agencies, co-operatives and associations, and co-ordinating their activities (UNCTAD, Vol. 4, p. 90).

In this respect, it may be worth while to review a recent plan of the Government of Iran to promote exports through establishment of a Centre for Export Promotion (*Markaz Tovsea Saderat*). This centre is authorized to utilize the proceeds of a 5 per cent *ad valorem* duty on imported goods for export promotion bonuses to exporters of Iranian commodities and industrial products. The centre is also authorized to use the proceeds for marketing purposes. This is an attempt to bring about an expansion in the volume of export trade. It in effect subsidizes the export sector at the expense of the import sector.

Another new development in Iran is the establishment of several *Shovray Markazi*, Central Councils for export products. For example, the Central Council of Carpets, which handles all problems connected with the production of carpets, will initiate a programme to improve the raw materials used by weavers throughout the country. Additional Central Councils should be established for export promotion of commodities and manufactures and semi-manufactures. The setting up of such councils should enable individual exporters to overcome their inherent weaknesses with respect to access to foreign markets. Both financial and technical assistance must also be provided so that Iranian exporters can maintain their contacts in foreign markets (Ordoobadi 1966, pp. 40–41).

Each export marketing organization should be created in such a way as to meet the special requirements of the industry or industries concerned, and it should have a high degree of adaptability. Practice has shown that particular types of export organizations tend to specialize in determined production sectors, depending on the character of production, on the size of the enterprises that dominate in this sector, and on the kind of service the producers expect from the export organization in question. Frequently producer firms are linked to several export organizations, which may be of different types. Generally speaking, it is in the direct interest of both partners to establish the kind of link that best suits the situation.

Market research and policy of export marketing organizations

Research

Market research should be considered one of the major specialized activities in marketing, along with such functions as the development of export policy, adaptation of a product for export, transportation of the product, credits and financing.

Overseas market research uses fundamentally the same principles in elaborating the findings as domestic market research. The primary source of information is the existing literature, including all available statistics. This is followed, if funds permit,

by interviews with foreign customers. Yet overseas market research is regarded as a special branch of market research. For one thing, the cost factor is of far greater significance for the technique to be selected than in the case of investigation of domestic markets. In many firms exports account for only a modest share of total turnover, and these exports may be distributed over a large number of markets. Unless special circumstances prevail, the firms cannot afford to pay the same amount for an analysis of each market that they would be prepared to appropriate for domestic investigation. Therefore, extensive surveys are ruled out in most cases. Thus the need arises for briefer, less exhaustive and less costly investigations that still could provide reliable information on existing sales prospects. A further characteristic of overseas market research is that it almost invariably includes investigations on expedient methods of distribution (OEEC 1956, p. 14).

Export organizations have to solve two major problems: they must select questions to be the subject of information and then find the sources of such information. Furthermore, export organizations are becoming increasingly aware of the need to make projections and calculations of the future prospects of a market.

The patterns of market research organization are varied. They range from market research services of central export offices to the private market research organization specializing in investigations of overseas markets. In between there are the most varied systems of special foreign trade promotion agencies which extend their activities now in this direction, then in another, which occasionally send commissions abroad on a study or goodwill tour, and which provide business addresses or establish contacts with potential customers and representatives.

Great differences exist as to the legal status of market research organizations. Some carry out work in connexion with their Government (as in the United Kingdom). Others are organized as central authorities especially established for this purpose and responsible to the Ministry of the Exterior or the Ministry of Economy, or both (Belgium, Federal Republic of Germany, France). Still others are semi-official institutions receiving government subsidies (Switzerland), and a fourth category includes foundations whose legal status is somewhere between the public and the private organization (the Netherlands).

The way in which Israeli exporters are aided in their search for market intelligence may be considered as an example. The Ministry of Commerce and Industry operates a documentation and market research centre, which collects and classifies a large amount of commercial data. This is made available without charge to exporters and other interested parties. The centre operates two sections, one organized on a regional basis and the other on a product basis. The regional section collects published data on production and trade trends, trade policy and agreements, as well as information on various countries and regional groupings. The information gathered by the second section is classified according to product groups and stored in product files.

Exporters who approach the centre for information are directed to the area or product specialist who deals with the topic under consideration. The specialist places at their disposal the information available and directs them to the relevant sources. Occasionally, the centre circulates reprints of articles and news items to interested parties.

The Export Institute supplements the Documentation and Market Research Centre by publishing newsletters and bulletins containing information about inquiries received from abroad and other news of interest to exporters. The Institute has a membership of several hundred, including manufacturers, traders, shippers and insurance companies. Its budget is financed partly by members' contributions and partly by the Government.

The Institute engages in a large variety of activities, such as organizations of seminars to discuss common problems and the techniques and practices of international trade; employment of experts and consultants to advise manufacturers on their production techniques, design or marketing methods; investigation and follow-up of complaints received directly from dissatisfied foreign customers or relayed through commercial attachés; supervision of quality standards established by the Standards Institute or some other authority and the institution of quality control procedures; organization of trade missions and the arbitration of disputes among manufacturers and traders.

Marketing policy

Marketing policy comprises many elements, which are the ingredients of the so-called "marketing-mix". There is no such thing as a single recipe for preparing a mix that will suit all manufacturers regardless of their products or of the conditions under which they sell. The marketing policy and the export of manufacturers are frequently influenced by the volume of their sales or prospectives sales in particular markets, by the volume of their export business as a whole, and by their financial position.

The elements of any marketing policy or strategy usually fall under the following headings:

(a) *Product:* What product or what line of products does the manufacturer sell?

(b) *Pricing:* How does the manufacturer establish his prices to achieve the desired results?

(c) *Promotion:* What steps does the manufacturer take to ensure that a given product will be accepted at a given price?

(d) *Channelling:* What distributive agents does the manufacturer employ to ensure that his merchandise flows smoothly to the final customer? (OEEC 1957, pp. 53–54).

(e) *Financing:* What funds and credits are provided to facilitate the flow of goods and services from producer to consumer or industrial user?

Product policy and the problem of quality

Product policy is directed towards the adaptation of products to existing needs and wants as revealed by research. Selecting the range of products to be marketed by an export group or association is of paramount importance. A rational selection greatly influences marketing efficiency and, consequently, export costs.

Products are usually divided into consumer goods (including convenience and shopping goods) and producer goods. Convenience goods are bought on a current and routine basis. Shopping goods are considered and compared. The purchase of producer goods is usually based on more rational considerations.

Convenience goods generally lend themselves to mass production by large firms; smaller firms must meet keen competition when marketing such products. In the line of shopping goods the possibility of developing specialties is generally greater than in the other category. A good example is the Eta group in Austria, whose large assortment of jewellery offers innumerable possibilities of variation. Furniture is another field that provides excellent opportunities for manufacturing distinctive products (for example, the Danish furniture industry).

Potential buyers of producer goods generally have more expert knowledge of technical details than buyers of consumer goods and are therefore in a better position to appraise the products. As a result, substitutes constitute a major element of competition in the producer goods industry, and export groups handling such products are likely to be persistent in refusing to include rival products in their collective range.

The basis for deciding the right marketable range of products should be the findings of market research on sales possibilities abroad. To avoid disappointment and financial losses, it seems appropriate to follow four chronological steps in establishing a successful assortment:

(a) Selection of a test assortment of available products to be sold on test markets;

(b) Analysis of sales achieved and of real conditions found abroad;

(c) Adaptation of products to market requirements (quality, appearance, packaging, consumer appeal, price) where necessary and profitable;

(d) Establishment of the final assortment, containing only products that will be successful in the foreign market (OECD 1964b, pp. 28–29).

The problem of quality of products is of particular importance to promotion of exports of manufactures from developing countries in view of the tough competition abroad from manufactures in developed countries, whose products have reached a very high level of sophistication and consumer appeal. Export-oriented industries in developing countries must do their best to match competitors not only in price but in quality. This requires improvements in design, raw materials, standards, equipment, labour skill, production and finishing processes, storage, packing, and other industrial factors and operations.

This does not mean that only high-quality goods will have access to foreign markets. "Within certain limits products of relatively low quality may find a market, even in the most advanced countries, provided they are sufficiently uniform and price is competitively adjusted" (UNCTAD, Vol. 4, p. 91). However, exports suffer if the quality of the goods does not satisfy the consumer. It would undermine the reputation of the export industry in a given country for supplying high-quality goods. In developed countries there exists, in many cases, a certain lack of confidence in the performance of goods produced by developing countries. This relates to the fear, not always warranted, that these countries cannot be relied upon. Even if the prices are acceptable orders are placed elsewhere. This is one of the serious hadicaps to export of new products from the engineering, chemical and pharmaceutical industries in India, for instance.

By insisting on high-quality standards, an export group would encourage its members to co-operate in adapting their production programmes to the requirements of export markets; this also would have a very positive result on product quality in the home market. A particularly strong incentive to improve quality would be the requirement that new products would be accepted in the collective assortment only if they are of higher quality than existing ones. The Delta group, an export association in Denmark, has shown that new and improved products add to the value of the assortment offered even if this means keen competition for the other products.

The packaging should help to emphasize quality. It should accentuate the merits and appearance of products. No article should be included in a group's range of products unless its packaging fulfils these

requirements in a satisfactory manner (OECD 1964b, p. 29).

Yugoslavia's experience, however, shows that improvement in packaging is a task extending beyond the powers of isolated exporters. It requires much stronger efforts, and has led to the establishment of a special branch of industry. Large export organizations can suggest to producers what kind of packaging they should use for a given merchandise, but they cannot impose their views, particularly if the proposed package requires materials in short supply, such as high-quality tin plate, fine paper, or corrugated paper-board. Only the most powerful exporters can impose their views directly, and they do so by importing the needed materials and placing them at the disposal of or selling them to their clients, the producers.

The cost of setting up and maintaining an effective quality control system would be too heavy for the majority of small-scale enterprises in developing countries. However, the Government could shoulder much of the expense by providing technical assistance to approved firms through technological institutes and technological departments of universities. This would also further a more rapid diffusion of better working practices from more efficient undertakings to the lagging industrial branches.

Pricing policy

The price at which merchandise is to be offered for sale in foreign markets is one of the real problems of the export trade. The basic elements affecting the delivered price of an export product are: the factory price and extra charges, including transportation, tariffs, taxes, warehousing etc. Three widely used methods for determining product price are: the domestic factory price, marginal-cost pricing and product modification.

The first method, used most frequently, is simply to use the domestic price structure and add the costs of freight, packing, insurance etc. If the product must compete with less expensive goods of foreign manufacture, however, the domestic price may be too high for the foreign market, especially when shipping, tariff and other special charges have been added. If the product is new and faces little or no competition, the domestic price may still be too high to achieve the ideal price-volume-profit relationship. In rare cases it may be lower than necessary, allowing too much margin for distribution channels.

This faces the export manufacturer (especially a small-scale industry) with the following dilemma: either the volume of exports will be small if the domestic price is used, or more goods can be sold at a lower price but without any margin of profit or even at loss. "Thus, the seller might — and often does — immediately conclude that it is impossible to do satisfactory business abroad. This is not necessarily true because by using a second method of pricing, based on 'marginal' product costing, he may find he can sell profitably at a lower price" (United States Small Business Administration 1966, p. 33).

This second method is based on increment costs. It uses the direct out-of-pocket costs of producing and selling products for export as a "floor" beneath which prices cannot be set without incurring a loss. Each dollar received for the product above this "floor" provides a dollar of contribution to overhead of profit that would not otherwise be realized. It enables the export manufacturer to take competitive prices into account when setting his own prices, and requires him to analyse the profitability of his export sales separately from his domestic business. In using this method the export manufacturer must know the competing prices and price ranges and their importance in the sale of his product in a foreign country. "The marginal cost approach to pricing is only valid when surplus production capacity exists, and when there are no other alternatives for using it on the basis of full costs. It is not valid in a full production situation, since there is no reason why one should export a product priced on the basis of marginal costs when the same product could be sold in this country at full cost" (United States Small Business Administration 1966, p. 34).

The third method of pricing involves modification of the product so that it can be sold at a competitive price and still yield a suitable profit. This means decreasing the value of the contents of a package or stripping down an elaborate product to achieve a certain price level. For example, a candy manufacturer slightly decreased the weight of each piece of candy, made appropriate changes on the label of the package ("weight of contents") and then sold it profitably at a competitive price.

Various considerations enter into the pricing policies of export groups. If the export group's range consists of complementary products or specialties that do not compete in price, pricing may be left to the individual firms. To obtain the most rational pricing policy, however, uniform calculation methods for member firms may be helpful.

If the group's range of products comprises articles competing in price, members will often find it advantageous to agree on minimum prices for the various export markets. If individual firms are able to obtain orders at the expense of other members by competing in price, the group is not likely to survive. To preclude any circumvention of price agreements and to avoid disagreements concerning the interpretation of such agreements, it should be clearly indicated to which groups of buyers the prices apply. The price agreements should also lay

down rules concerning discounts and credit terms and provide for heavy fines for members who break the agreement.

Price agreements sometimes fail because members use different channels of distribution. Distributors should therefore be selected carefully before any agreements are made, particularly if the agreement is to include future members who have established casual connexions with retail distributors; if the price agreements foresee distribution through importers, such casual contacts may prove detrimental to the group's exports (OECD 1964b, p. 30).

Sales promotion policy and advertising

In a specific sense, sales promotion is understood to mean "those sales activities that supplement both personal selling and advertising and coordinate them and help to make them effective, such as displays, shows and expositions, demonstrations, and other non-recurrent selling efforts not in the ordinary routine" (McNair and Hansen 1956, p. 73).

Sales promotion is closely allied with advertising and aids in maximizing the advertising effort. It covers marketing and merchandising activities completely controlled by the manufacturer and exporter that help in the development of sales. Sales promotion differs from advertising in that regular advertising media are not used. It assists selling rather than participating in it (Pratt 1956, p. 193).

One of the difficulties experienced by nearly all trade enterprises after launching their export drive is the high cost of advertising abroad. A particular difficulty is that a large part of these costs has to be paid in foreign currency. For this reason preference is given to advertising media that can be paid for in domestic currency. Only enterprises with considerable resources of foreign currency (and this is rarely the case in developing countries) can influence the demand for their products through advertising in large importing countries where, for instance, one minute of advertising on television may cost US$1,000 to $2,000. Small-scale and medium-size firms are unable and disinclined to budget adequately for advertising overseas. If such advertising is to be successful and bring increased returns, it must be treated as an investment and this should be reflected in the price of the product.

The reasons why advertising abroad may prove more successful if effected through export organizations rather than by single enterprises are the following:

(a) The costs are considerably lower when an export organization advertises, under its own name, several similar or different products of various producers.

(b) The permanent presence of an export organization on the foreign market is a prerequisite to easier advertising. Central trade organizations with a good knowledge of foreign markets and the changing tastes and purchasing power of consumers are more competent to select the best advertising media for the purpose than small firms that lack experienced personnel or are located in remote areas.

(c) A single export organization is likely to ensure the reputation of its trade name abroad and the continuity of sales for a larger number of enterprises. For instance, the Yugoslav organization, "Jugoinvest", with its tradition of serious work, can provide good references for firms whose interests it represents. This is also the case with other large Yugoslav enterprises, such as Centroprom, Tehnopromet, Centrotekstil, and Jugodrvo, which sell under their names the products of many other enterprises and thus enable these enterprises to acquire a good reputation abroad. Centroprom has developed the practice of reserving half of the available space on the product package for its own name and giving the rest of the space to the enterprise whose product it sells.

The choice of advertising media depends on the kind of product to be promoted and the amount of available resources at the disposal of the exporter. In Yugoslavia exporters generally tend to entrust the foreign partner who is the importer of their goods, or any other enterprise operating on the foreign market, with the task of organizing the foreign publicity compaign (Rip 1965, pp. 16—18). One of the most common forms of collective export advertising is participation in exhibitions or fairs. This often consists of renting a large stand where the various firms arrange separate displays of their products. The expenses may be greatly reduced by employing expert assistance and by collectively using display-stand personnel, transport etc. There may also be an advantage in using other media in collective advertising, such as printed advertisements, commercial radio and television, posters, and show cards.

Chanelling policy

Today the physical distribution of goods is considered to be only one aspect of channelling policy; another aspect is promotion.

Most export groups of small and medium-size firms are unable to raise the capital required to finance their own sales organizations on the export market. However, if co-operation is restricted to a single market, a group may find it advantageous to establish its central office in the export market

itself rather than in the domestic market. In any case, a realistic evaluation must be made of the ability of participating firms to build up a volume of exports that will enable the group to maintain its own sales organization in the export market.

During the early period of an export group, when exports are limited, it is customary to use existing channels of distribution, such as agents, importers and wholesalers. The cost of distribution, in the form of sales commissions would then vary *pari passu* with the group's export sales. At the same time the group might allocate a certain percentage of the sales to a fund that could later serve as the initial capital for the group's own sales offices in the market concerned.

If an export group has succeeded in building up a rational export range without any rival products, it will probably be able to find an efficient distribution organization for its products. However, if the range includes rival products it might be difficult to centralize distribution on the export market. In this case it might be advisable for members to select individual distributors, but they could still co-operate in advertising and co-ordinate their general marketing policies.

It is sometimes difficult for group members to agree on channels of distribution in the various markets. The group management might then request a marketing bureau or trade association to study available distribution channels (OECD 1964b, p. 36).

Financing for export

The capital at the disposal of small firms in developing countries is as small and limited as their volume of business. The relatively long period in which their capital is tied up also adds to their difficulties. More often than not a merchant has to pay the supplier the full or partial value of a commodity in advance to make certain that the merchandise will be made available to him. There is no assurance, however, that the supplier will abide by his commitment to deliver the merchandise if the price of the commodity should rise as a result of external or internal factors, such as crop failure, increased demand etc. (Ordoobadi 1966, p. 39). The difficulties of small-scale industries in obtaining financing, whether for investment in plant and equipment or working capital, are well known. The financing difficulties of small industries manufacturing for export appear to be even greater than those confronting producers catering to the domestic market. Export trade involves heavy commercial and promotional expenses, particularly broad travel, display and exhibition of lines of goods, advertising and occasionally establishment of facilities abroad for after-sale servicing. All this increases the financial needs and lengthens the rate of turnover of the working capital (UNCTAD, Vol. 4, p. 97).

Therefore Governments and various public bodies offer financial assistance to exporting firms, especially those of small size. The extent of this financial assistance differs considerably from country to country. It may be provided in the form of a public grant (subsidy) or as a loan on favourable repayment and interest terms.

Public grants are primarily intended to help small and medium-size firms to initiate export trade. In many countries such grants are for joint expenses only, but they may be extended to include advertising material, such as brochures and posters. Often the public authorities will also pay for an information office at exhibitions.

A considerable part of public grants is limited to supporting export functions discharged by a number of firms collectively. Such assistance is often an important incentive to more permanent co-operation. In some cases public authorities have even offered financial assistance for the administration of export co-operation itself and the establishment of joint sales offices abroad. As a rule such aid has been given in the form of loans towards the investment proper, but there have been cases where the State has made direct grants towards the operation of a group in its initial stage.

Most of the joint measures mentioned so far presuppose *ad hoc* co-operation, but they have frequently proved to be the forerunner of permanent export co-operation (OECD 1964b, pp. 49–50).

Many export traders and industrialists encounter problems arising from the difference between the domestic and export prices of goods. As a result export incentive schemes have been devised to cover the losses caused by the price gap. However, difficulties in export financing occur because banks provide advances on losses of export prices of the goods concerned. If domestic prices are 20 to 25 per cent higher on many of the engineering goods (in many cases, the difference is as high as 50 to 60 per cent), the exporter may be able to obtain credit for about 60 to 70 per cent of the domestic value. To meet this problem in India, the Matharani Committee has recommended the introduction of a guarantee scheme to be operated by the Export Risks Insurance Corporation. This guarantee would cover 75 per cent of the loss arising from the provision of credit to cover this difference between domestic and export prices. Credit facilities are normally provided at a lower rate of interest in many countries.

In Yugoslavia stimulus for export trade was at one time provided through a system of export coefficients to neutralize the difference between higher domestic and lower foreign prices. As a

rule the coefficients were fixed at a level to compensate for the difference between the domestic price and the most often quoted foreign price obtained for exports of a given article. By multiplying the export coefficient by the realized export price, converted into domestic currency at the official settlement rate, the amount to which the enterprise was entitled was determined.

Through subsequent amendments the system of export coefficients was abolished and replaced by a new system of export premiums, granted directly to exporters. Depending on the type of exported goods, the exporters receive premiums amounting to 10, 22 or 32 per cent of the value of exported goods, calculated in national currency, by using the settlement rate. Export enterprises are freed from the obligation to pay a turnover tax. To promote trade, exporters, especially those who sell bulky products in which the transport cost is a price factor, are granted rebates on freight charges (Rip 1965, p. 7).

Measures that tend to make exports more profitable than sales on the domestic market may be considered direct subsidies. Cheap loans to exporters are a convenient form of subsidy. These do not necessarily appear in the government budget; their volume and terms of availability can be adjusted at short notice; and they can be administered by financial institutions in the course of their routine functions. This type of export financing is carried out to enable exporters to compete with foreign industries on an equal footing. However, the justification for an the efficacy of public loans to exporters may be questioned. "It is, of course, practically impossible to ensure that loans granted to finance a given export order will indeed be used for that purpose. The Government does not even pretend to be able to tie the loans which it approves to specific transactions. Exporters are allocated a credit quota which is established with a commercial bank on the basis of the firm's export performance or undertakings for a whole year. The firm can utilize its quota as it sees fit, with few restrictions. The quota can be enlarged if the firm obtains more export orders than it had anticipated when the quota was established. If exports fall short of expectations, a fine is payable on the excess funds drawn and the quota is reduced" (Israel Financial Research Institute 1966, p. 37).

One of the useful functions of a central exporting organization could be to engineer improvements in the size and flow of export credits and, for some lines of manufacture, production credits. Such activities would probably prove crucial to the success of some enterprises in the export field, and such an agency could constitute a powerful pressure mechanism for influencing future bank-lending policies (Glover 1966, p. 20).

Domestic and International Assistance to Export Marketing Organizations

Financial and technical assistance to export marketing organizations cannot be isolated from assistance to export-oriented industries in developing countries, nor can the latter assistance be isolated from assistance to industries in general. Aid to export marketing organizations can be considered as direct or indirect assistance to export-oriented industries to the degree that aid to over-all industry of itself has a bearing on the export potentialities of recipient countries.

Undoubtedly the establishment of an appropriate institutional framework and an adequate system of export marketing organizations to promote export-oriented industries depends mainly on the domestic promotion efforts of developing countries.

Among the principal functions of export promotion are the provision of information on foreign trade and markets to exporters and manufacturers, so that they may evaluate the possibilities of placing their products on new markets abroad, and the facilitation of contacts between domestic exporters and foreign importers. Along with strengthening quality control and promoting sales abroad, Governments can make their most effective contribution towards expansion of the export trade by spreading knowledge about trade and trade sources.

Governments may aid the promotion of exports by giving advice on production and export problems and providing training facilities for personnel. They also may assist in the formulation of minimum and uniform standards to be met by manufacturing processes and products.

Governments may offer services that are of fundamental importance in increasing productivity. Such assistance may indirectly aid the diversification of exports. Productivity can usually be improved through technological research, the use of consultants and the training of personnel at all levels.

In developing countries these measures are all the more important because the stage of industrial development is lower. Measures that increase productivity may acquire primary importance within the aggregate of measures that diversify industry. This is even more vital when the possibilities of exporting manufactures are being considered. Special attention should therefore be given to the establishment of institutions that would accelerate the training of manpower and advise industry on all matters relating to increased productivity.

The training of specialized personnel is another essential phase of export promotion. This generally

includes the training of personnel in export enterprises and industries, public and private institutions, and banks and institutions dealing with foreign trade. Technical and financial assistance by foreign Governments and international organizations is needed in this field if developing countries are to accelerate the rate of their industrialization and economic growth. The Group of Experts on United Nations Technical Assistance relating to Exports of Manufactures and Semi-manufactures stated in October 1966 that the emphasis of United Nations assistance should always be placed on the training of national personnel.[2]

The expert group, set up to advise on the areas in which the United Nations should render technical assistance in the field of development and promotion of exports, pointed out in its report:

> "Potential exporters in the developing countries are generally subject to a variety of structural disabilities, which prevent them from entering foreign markets, even where external obstacles to trade are not important. These weaknesses are largely a result of their inexperience, their small operational size, and their predominantly domestic-oriented approach. The United Nations could provide important assistance to overcome many of these difficulties. Among the different areas suggested, mention was made of training domestic personnel in the necessary techniques, provision of experts for the solution of specific problems, help in the establishment of export companies specializing in particular areas and products. Discussion centred on the advantages of producers organizing themselves together for export through such institutions and arrangements as exporters' associations, chambers of commerce, producers' agreements for pooling production facilities to accommodate large export orders, co-ordination of marketing efforts, the umpiring of quality control, etc., and in so doing to achieve collectively what is not possible individually. Technical assistance to form such institutions or arrangements on a national or regional basis should be provided upon request" (Document ID/B/11, para. 19).

Similar ideas were developed in 1964 at the first session of the United Nations Conference on Trade and Development (UNCTAD). As stressed in the report of its Second Committee (Trade in Manufactures and Semi-manufactures): "An effective dissemination of relevant information and the organization of appropriate promotion services, both on a national and international scale, call for wide experience and substantial resources which are, at present, beyond the means of most developing countries" (UNCTAD, Vol. I, p. 150).

In view of the importance of basic information to the export effort, one of the most useful areas of United Nations technical assistance could be the establishment by UNCTAD and UNIDO of a central training, consultancy and information service for exports, which could be supplemented by the setting up of regional and sub-regional centres where necessary. The report on the above-mentioned meeting of experts in Geneva points out that such a service is a major need and that a proposal to this effect should be worked out as a matter of urgency. A start could be made by setting up a consultancy and training service to develop personnel and to help businessmen in developing countries build up their export marketing organizations as well as to assist Governments and trade associations in their export promotion activities (Document ID/B/11, para. 31).

There is no doubt that export marketing organizations have a high potential as an instrument for expansion and diversification of exports and for promotion of export-oriented industries in developing countries.

[2] The Group of Experts met in Geneva, 24–28 October 1966, under the joint auspices of the United Nations Conference on Trade and Development and the Centre for Industrial Development (now UNIDO). The report on the meeting is contained in UNIDO (1967), Document ID/B/11 (see para. 9).

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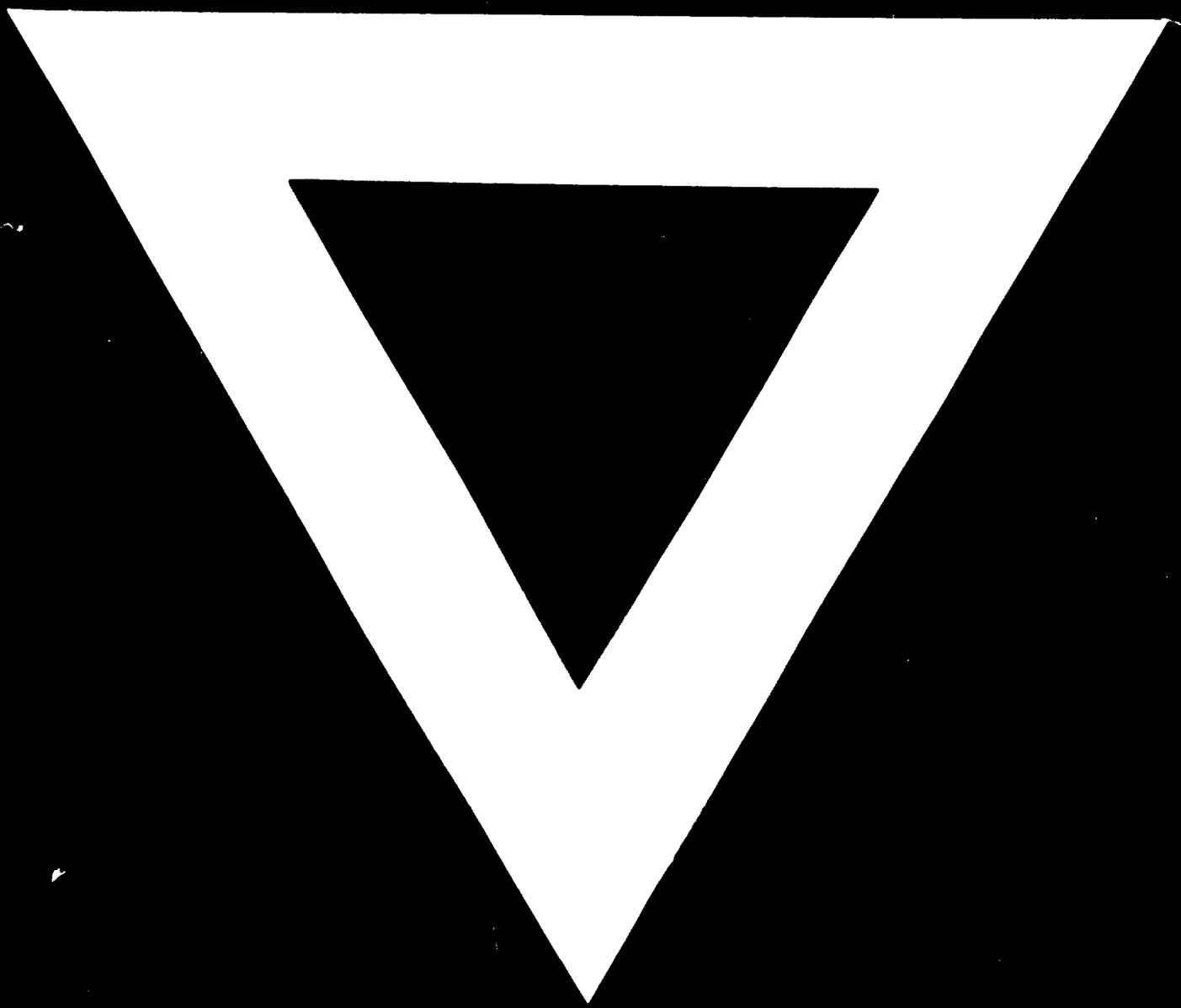

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