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K. Bohr - March 16, 1959

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Notes on the Selection of Industrial Projects for Underdeveloped Areas

1. The appropriate point of view from which to consider the selection of industrial projects is the contribution such projects can make to the economic development of the area. This should be the point of view of the public authorities and may or may not coincide with the point of view of private investors in any given case.

2. The problem of selecting projects differs with the stage of industrial development. Industrial growth tends to be cumulative. In general the more industry is developed the easier is the problem of selecting new investments. The development of a market mechanism and a body of industrial entrepreneurs who respond to the market tends to provide a fairly efficient method for directing new investment. However, in the early stages of industrial growth the situation can be quite different. The market is usually small, industrial experience hardly exists at all and the risks of venturing into new fields seem particularly great to private investors. It is in such cases that industrial development generally requires that the public authorities take an active part in assisting industries to get established through promotional efforts, financial inducements of various kinds, or in some cases by the direct investment of public funds. In such situations the problem of selecting the industries that should be encouraged must be faced with a minimum of relevant data and experience and there is therefore a particular need for a systematic and relevant approach.

3. Various criteria have been put forward from time to time as a basis for selecting industrial projects in the early stages of development. The following are some of these:

   (1) Base industries on domestic raw materials.
   (2) Base selection on replacement of imports.
   (3) Favor industries with low requirements of capital relative to other factors.
   (4) Follow the sequence in which industries have developed in other countries.
   (5) Place special emphasis on "key" industries - those having some special stimulating effect on industrial development.
   (6) Invest in projects where the rate of return on capital is the highest.
   (7) Invest in those projects where the social marginal productivity of capital, or the social return, is highest.
   (8) Choose industries on the basis of certain characteristics which indicate their adaptability to the particular environment under consideration.

These assorted "criteria" are individually either inadequate or extremely difficult to apply in situations where industrial development is in its earliest stages. In the following paragraphs we shall

present a systematic approach which uses several of the above criteria in combination and which can be applied in situations where there is initially a minimum of relevant economic data.

4. The most appropriate basic concept from which to develop a method of project selection is the one which directly relates investment to its contribution to the national product - namely the rate of return on the investment. To use this concept for this purpose it is necessary that the costs used in the calculation represent the real costs to the economy and that the value of the product produced represents its real value to the economy. This may involve adjustments to take into account particular values placed on providing employment, saving foreign exchange, or providing external economies, when these are not reflected in the prices charged or paid by the enterprise. The resulting calculation can be said to represent the social return on capital as differentiated from the private return to the enterprise and it provides a sound economic basis for selecting among a group of projects in cases where it can be applied. The main difficulty however, is that its application requires considerable project data which is generally not available, particularly in the early stages of industrial growth. In addition to this the problem of estimating real costs and values may be especially difficult in such situations. Some method is needed to select projects for preliminary analysis before the rate of return method can be applied.

5. The preliminary screening process is quite important because it limits the final investment decision to within a prescribed range of possibilities. Considering the circumstances under which this selection must be made the most appropriate method seems to be a comparison among industries in terms of characteristics which have a particularly important bearing on whether or not they can develop successfully in the area under consideration. The industries which on the basis of their characteristics are the most adaptable to the particular situation tend to be the ones which would appear most promising on the basis of their contribution to the national product. An essential basis for this approach is that the industrial characteristics which are relevant have a technological basis which is sufficiently constant to make inter-country comparisons meaningful.

6. Industries with the following characteristics are generally those most easily adapted to conditions usually found in less developed areas:

a) Industries without important economies of large scale production unless they enjoy special locational advantages or unless they can produce for export. Since domestic markets are generally small, industries that can produce more cheaply on a very large scale will tend to produce at a high cost relative to the cost of imports. A partial exception may be the case of a market protected by unusually high transport costs where imported products are correspondingly much more expensive. Economies of scale are not important in the same way for export industries. These industries, however, must have some special advantage such as proximity to a raw material that loses weight in processing.

b) Industries that do not require large amounts of capital relative to other factors of production. Because of its scarcity the real cost of capital is generally high in underdeveloped areas and so capital intensive industries tend to have high real costs other things being equal. Looked at in another way capital is generally scarce relative to labor and so should be used in combination with as much labor as possible.

c) Industries that do not require large amounts of skilled labor. Skilled industrial labor including foremen and supervisors is also a scarce factor of production - at least in the short run. The same arguments apply to it as apply to capital.

7. The attached table shows an evaluation of these characteristics for a large number of industries based on statistical data from several countries. The lower the coefficient the more favorable is the factor for conditions typical of underdeveloped countries except in the case where location is oriented to raw materials (indicated by R.M.) where this is not necessarily so. Some interrelationships among the coefficients can be observed. Prevalent size varies directly with localization; the more scattered industries generally operate with smaller plants. Behind both is the influence of transport costs which are difficult to measure directly. There is also a tendency for the industries with the lowest and highest capital requirements to have the lowest requirements for skilled labor.

8. It is evident from the table that the application of this type of criteria involves considerable judgment in relating the importance of the various factors to the particular case under consideration. Industries that may appear unsuitable from the standpoint of, say, capital requirements may have advantages with respect to other characteristics and vice versa. However, given knowledge of existing markets, estimates of their prospective growth, and data on a country's resources, the use of this procedure should be of considerable assistance in selecting the industrial fields most worthy of further investigation. (It should be pointed out that although the emphasis in this presentation is on industrial characteristics, the amount of effort required to perform the market analysis and the survey of resources should not be under-estimated, neither should the importance of their contribution to the analysis).

9. Even under the most ideal conditions this method of preliminary screening omits an important factor because it does not take into account relationships among industries to the extent this may be possible prior to project analysis. For this reason the complementarity among industries should be explicitly considered. Some industries require the existence of complementary industries for their proper functioning. In such cases the appropriate unit to consider may be several industries or a group of industries rather than a single one.

10. Finally there are a number of concepts which one encounters in the literature of development which relate to the particular usefulness

of industries in the growth process itself. These are difficult concepts to apply and cannot replace the analysis of the suitability of industries on the basis we have already outlined. However, by introducing a dynamic element into the analysis they do represent a different way of looking at the problem and in certain cases some of them may be helpful in the screening process. These supplementary criteria can be stated briefly as follows:

a) External economics. Industries may differ in the extent to which they are a source of external economies to other industries. To the extent that such differences can be identified, they should be taken into account in the analysis.

b) Growth industries. As an economy grows some industries grow more rapidly than the average because of the high income elasticity of demand for their products. This tends to reduce the risk involved in investing in these industries and should be considered a factor in their favor. Actually this factor should be introduced into the analysis through the market analysis that is required as part of the acreening process.

c) Key industries. On the basis of a study of development in the past, it has been contended that some industries may have a greater effect in promoting industrial growth than others. If these can be recognized, it would appear that they should be given special consideration. However, it is unlikely that the concept of "key industry" represents anything basically new, suggestive as the term may be. In the final analysis a key industry can perhaps be defined as "a growth industry that creates external economies."

Some Topics for Discussion

1. Under what conditions might more, rather than less, capital intensive industries be preferred?

2. To what extent is the criteria of basing industries on domestic resources valid?

3. To what extent can choice of technology reflect the factor proportions that exist in underdeveloped areas?

K. Bohr
March 16, 1959

TABLE I

COEFFICIENTS OF ECONOMIC CHARACTERISTICS OF SELECTED INDUSTRIES

Industry	Total Fixed Capital requirements	Machinery & Equipment requirements	Skilled Labor requirements	Degree of Localization	Prevalent size
Boots & Shoes	1	3	1	3	none
Soap & candles	1	1	3	2	none
Cooperage	1	2	3	2	2
Leather goods	1	1	1	2	2
Bedding & mattresses	1	1	4	1	1
Jewelry	1	1	4	4	2
Tailoring & ready-made clothing	1	1	4	2	none
Paints & varnishes	1	2	2	1	2
Hosiery	1	2	1	3-4	none
Knitted garments	1	2	1	2	none
Rubber goods & tires	1-2	3	2	2	5
Brooms & brushes	1	2	1	2	1
Glass (other than bottles)	1	1	3	1	none
Shirts, collars & underclothing	1	1	1	2	3
Electrical machinery, cables & apparatus	2-1	2	4	3	5
Tanning	2	2	1	2	2
Cardboard boxes	2	2	2	1	2
Wool textiles	2-3	3	2	3	3
Furniture	2	1	4	2	1
Sawmills	2	4	3	4(R.M.)	1
Planning mills, woodturning, etc.	2	1	3	2	1
Sheet metal work	2	3	3	1	1
Nonferrous foundries	2	3	4	1	none
Millinery	2	1	1	2	1
Marble, slate, etc.	2	3	4	3(R.M.)	1
Cutlery & small hand tools	2	3	3	3	none
Fabricated plastics	2	1	3	1	none
Steelworks & rolling mills	2-4	4	4	3	5
Steel wire & products	2	2	3	1	none
Stoves, ovens, ranges	2	4	3	2	none
Agricultural machinery & implements	2-3	3	4	4	none
Iron foundries	3	2	3	1	none
Textile dyeing & finishing, etc.	3	3	2	3	none
Earthenware, china, etc.	3	2	1	4	3
Canning, jam, fruit, vegetables	3-2	3	2	3(R.M.)	2
Tobacco	3-1	2	1	3	4
Printing, general	3-2	2	4	1-2	none
Cordage & twine	3	3	2	2	none

Industry	Total Fixed Capital requirements	Machinery & Equipment requirements	Skilled Labor requirements	Degree of Localization	Prevalent size
Breweries	3-2	3	1	1	none
Motor vehicle repairs	3	1	4	1	1
Cement products	3	4	3	1	1
Newspapers & periodicals	3-2	2	4	1	2
Cotton textiles	4	4	2	4	3
Meat-packing	4-3	2	2	3 (R.M.)	none
Fish-curing	4	2	1	4 (R.M.)	1
Shipbuilding	4-1	3	4	3	4
Cement	4	4	3	1	3
Vegetable oil	4	4	2	4 (R.M.)	1
Chemical fertilizers	4	4	1	4	none
Petroleum refining	4	4	4	4	4
Tire retreading & repairing	4	1	2	1	1
Synthetic textiles	4	4	3	4	5
Glass bottles	4	4	3	3	none
Condensed & dried milk	4-3	4	1	4 (R.M.)	1
Bricks & Tile	4	4	2	1	2
Nonferrous rolling, etc.	4-2	4	4	2	none
Bakeries	4-1	1	1	1	1-2
Paper-making	4-3	4	3	1	3
Dehydrated fruit & vegetables	4	3	2	3 (R.M.)	2
Industrial chemicals	4	4	4	2	4
Flour-milling	4-2	3	4	3	1
Butter	4	3	1	4 (R.M.)	1

Numbers refer to position in a ranking of coefficients. The lower the number the lower the requirements, the more scattered the locational pattern, or the smaller the size.

Capital requirements. Based on ratios of value of fixed capital to value added. Australia 1946-47. Where there are two figures the second refers to U.S. 1939.

Machinery and equipment requirements. Based on ratios of value of machinery and equipment to total value of fixed capital. Australia 1946-47.

Skilled labor requirements. Based on ratio of professional persons, skilled workers, and foremen to total employees. U.S. 1930.

Localization coefficient. Based on geographical distribution as measured by employment, U.S. 1939. "R.M." indicates location close to sources of raw materials.

Prevalent size. Based on size of median firm in cases where distribution of employment by firm size shows a regular distribution. U.K. and U.S. 1930 and 1929. In cases where size classification differed between the two countries and most favorable (the smallest) classification has been used. "None" indicates no prevalent size.