Hollis B. Chenery

Interactions between Industrialization and Exports

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By Hollis B. Chenery[*]

Sustained economic growth requires a transformation of the structure of production that is compatible with both the evolution of domestic demand and the opportunities for international trade. This transformation normally involves a substantial rise in the share of industry and—except for a few specialized mineral producers—a shift away from dependence on primary exports toward manufactured goods as a source of foreign exchange. There is considerable evidence that success in developing manufactured exports is critical to this process, and conversely that continued emphasis on import substitution will ultimately lead to a slowing down of growth.

Despite the amount of attention given to alternative strategies of trade and development since the work of I. M. D. Little, Tibor Scitovsky and M. F. G. Scott, there has been little attempt to examine the underlying relationships in quantitative terms. A fuller understanding of the various mechanisms that have been posited requires that the internal and external aspects of industrialization be examined together in a framework that brings out the several interactions among them.

This paper is drawn from a comparative study of sources of industrial growth in selected semi-industrial countries that have followed policies ranging from the extremes of export promotion to import substitution. The core of the analysis is a set of input-output accounts that permits changes in the structure of demand, trade, and production to be analyzed in comparable terms over periods of fifteen to twenty years. I will compare the main effects of different types of trade and development strategy on industrial growth and structure. The methodology emphasizes interrelations on the demand side, which tend to be neglected in other approaches. Attention is focused on the effects of early or late development of manufactured exports, which is a major source of the differences among strategies.

I. The Transformation of Production and Trade

The structural transformation of developing countries is characterized by a period in which the rising share of manufacturing in *GNP* approaches that of primary production and a significant portion of manufactured goods begins to be exported. Countries that have reached this stage have been alternatively described as "semi-industrial" or "newly industrialized."[1] Depending on the criteria used, there were between twenty and twenty-five such countries by 1970.

The present sample consists of seven of the sixteen principal semi-industrial countries identified by Bergsman: Korea, Taiwan, Colombia, Turkey, Yugoslavia, Mexico, and Israel (in ascending order of 1960 per capita income).[2] Japan and Norway, which had largely completed the transformation of production by 1960, are added for comparative purposes. The sample was selected primarily on the basis of the availability of input-output data covering fifteen years or more. Table 1 gives selected structural characteristics for the nine countries.

[1] Joel Bergsman identifies sixteen significant semi-industrial countries, ten of which are the subject of the recent OECD study of "The Impact of the Newly Industrialising Countries."

[2] The remaining nine countries identified by Bergsman are: Egypt, the Philippines, Brazil, Portugal, Hong Kong, Singapore, Greece, Argentina and Spain. Marginal cases include India, Uruguay, Chile, South Africa, Thailand and Malaysia.

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TABLE 1—INDICATORS OF STRUCTURE AND GROWTH

			Per Capita *GNP*		Share of *GDP*		
		Population (millions)	Level (US$1970)	Average Growth Rate[a]	Exports[a]	Manufactured Exports[a]	Value-Added in Industry[a,b]
Group A							
Korea	1955	22	131	–	1.6	0.2	13.1
	1963	27	149	1.6	4.9	1.2	16.9
	1973	33	323	8.0	31.8	24.3	29.7
Taiwan	1955	9	199	–	8.3	1.4	23.6
	1963	12	252	3.0	17.6	6.2	28.6
	1973	15	513	7.4	51.6	38.3	43.8
Israel	1955	2	950	–	11.5	4.9	31.6
	1963	2	1429	5.2	21.4	11.2	35.5
	1973	3	2374	5.2	28.3	15.1	36.7
Norway	1955	3	1244	–	40.7	10.4	35.2
	1963	4	2168	7.2	39.0	12.6	33.1
	1973	4	3179	3.9	43.4	19.1	30.4
Group B							
Yugoslavia	1955	18	329	–	6.6	2.0	41.7
	1963	19	510	5.6	15.6	11.8	40.8
	1973	21	813	4.8	22.3	12.5	41.4
Japan	1955	89	500	–	10.7	9.1	26.5
	1963	97	992	8.9	9.3	7.4	40.8
	1973	108	2349	9.0	10.3	8.8	42.5
Group C							
Colombia	1955	13	285	–	12.4	0.2	19.3
	1963	17	309	1.0	11.9	0.5	23.2
	1973	23	415	3.0	15.5	3.7	24.9
Turkey	1955	24	264	–	5.2	0.2	16.9
	1963	30	319	3.7	5.9	0.3	19.0
	1973	38	461	3.8	8.1	1.5	24.5
Mexico	1955	31	424	–	16.7	3.8	26.8
	1963	40	513	2.4	10.4	1.7	27.2
	1973	56	719	3.4	9.2	3.0	31.1

Source: See Kubo and Robinson.
[a]Shown in percent.
[b]Industry includes manufacturing and construction.

A. *The Sources of Growth*

An input-output model is used to provide a consistent framework for the analysis of growth and structural change. The same twenty-three-sector classification is used for each country, which leads to a comparable decomposition of output growth in each sector into the direct and indirect effects of increases in domestic demand, exports, and import substitution. For this purpose import substitution is defined for each sector by the reduction in the share of total supply that is provided by imports.

The model is based on the following accounting balances for each sector:

$$(1) \qquad X_i = u_i(W_i + D_i) + E_i$$

$$(2) \qquad M_i = m_i(W_i + D_i)$$

where X is total output, D is domestic final demand, W is intermediate demand, M is imports, E is exports, m_i is the share of imports in total supply, and u_i is the domestic share. Assuming that $W_i = \sum a_{ij} X_j$ the level of output can be expressed by the solution to the corresponding Leontief

model as

$$(3) \qquad X_i = \Sigma r_{ij}(u_j D_j + E_j)$$

The coefficients r_{ij} are the elements of the inverse of a Leontief domestic matrix in which the coefficients $(u_i a_{ij})$ represent the amount supplied from domestic sources.

Equation (3) makes it possible to solve for the increase in output of each sector, ΔX_i, in terms of increases in internal and external demand in all sectors (ΔD_j and ΔE_j) and changes in two sets of parameters (Δu_j and Δa_{ij}). The solution for ΔX_i can be expressed as the sum of four factors:[3]

(a) The expansion of domestic demand in all sectors (DD):

$$\sum_j r_{ij}^1 u_j^1 \Delta D_j$$

(b) The expansion of exports in all sectors (EE):

$$\sum_j r_{ij}^1 \Delta E_j$$

(c) Import substitution in all sectors (IS):

$$\sum_j r_{ij}^1 \Delta u_j (D_j^2 + W_j^2)$$

(d) Technological change (TC):

$$\sum_j r_{ij}^1 u_j^1 \sum_k \Delta a_{jk} X_k^2$$

The effects of trade policy are shown by terms (b) and (c), export expansion and import substitution. When there is no change in import proportions or in input-output coefficients, the last two terms vanish and sectoral growth is determined only by increases in internal and external demands.

B. *The Role of Trade*

Trade and development strategies are often characterized by a spectrum varying from inward to outward looking or from "import substituting" to "export led." The

[3]This formulation is discussed in the paper by Moises Syrquin and myself. The superscripts refer to time periods.

direct effects of these policy differences on production are shown most clearly by changes in the share of manufactured exports, which are given in Table 1. Since the sample illustrates a wide variety of development patterns, there is little difficulty in dividing the countries into three groups on this basis. *Group A*: Countries with high or rapidly rising manufactured exports: Korea, Taiwan, Israel, Norway. *Group B*: Intermediate cases: Yugoslavia and Japan. *Group C*: Countries with low manufactured exports: Colombia, Turkey and Mexico.

In the two intermediate cases, manufactured exports rose rapidly before 1960 but maintained a relatively high and stable share of GDP thereafter.

The four sources of growth of all manufacturing for these three groups of countries are given in Table 2. The subperiods are five to ten years, depending on the availability of input-output data. They extend from the mid-1950's to the early 1970's, except for Japan where it was possible to make approximate calculations for the prewar period. In all countries except Norway, the data cover part of the initial period of import substitution, which is particularly notable in the analysis of Korea, Taiwan, and Colombia. Thereafter the patterns diverge substantially.

In the four countries in Group A, the growth of manufacturing is increasingly due to the continued expansion of exports, which accounts for 50 percent or more of the total increase in output. In Korea and Taiwan, export expansion led to a rapid acceleration of industrial growth; but in Israel, Norway, and Yugoslavia the demand effects of export expansion were largely offset by import liberalization.

The countries in Group C are typical of a larger group (which includes India, Brazil, Chile, Uruguay, and Argentina) whose development strategy has been based on import substitution for several decades (see my book with Syrquin, Table 16). The decomposition of the sources of manufacturing growth shows that export expansion was the smallest of the four factors, accounting for less than 10 percent of the total increase.

TABLE 2—SOURCES OF GROWTH IN MANUFACTURING OUTPUT

		Average Annual Growth Rate	Percent of Total			
	Period		Domestic Demand Expansion	Export Expansion	Import Substitution	Changes in Input-Output Coefficients
Group A						
Korea	1955–63	10.4	57	12	42	−11
	1963–70	18.9	70	30	0	0
	1970–73	23.8	39	62	−3	2
Taiwan	1956–61	11.2	35	28	25	12
	1961–66	16.6	49	44	2	5
	1966–71	21.1	35	57	4	4
Israel	1958–65	13.6	62	27	13	−2
	1965–72	11.3	71	49	−37	17
Norway	1953–61	5.0	65	36	−16	15
	1961–69	5.3	51	58	−19	10
Group B						
Yugoslavia	1962–66	16.6	74	25	−5	6
	1966–72	9.1	72	38	−22	12
Japan	1914–35	5.5	70	33	5	−8
	1935–55	2.8	71	−7	15	21
	1955–60	12.6	76	12	−3	15
	1960–65	10.8	82	22	0	−4
	1965–70	16.5	74	18	−1	9
Group C						
Colombia	1953–66	8.3	60	7	22	11
	1966–70	7.4	76	5	4	15
Turkey	1953–63	6.4	81	2	9	8
	1963–68	9.9	75	5	10	10
	1968–73	9.4	71	16	−2	15
Mexico	1950–60	7.0	72	3	11	14
	1960–70	8.6	86	4	11	−1
	1970–75	7.2	81	8	3	8

Source: See Table 1.

Colombia, the least industrialized of this group, illustrates the typical pattern of declining effects of import substitution with no offsetting rise in export effects. After import substitution is largely completed, manufacturing growth cannot exceed that of domestic demand and therefore tends to decline until there is a change in trade policy.

II. Trade-Development Sequences

The previous section established a rough grouping of countries based primarily on the role of manufactured exports in the structural transformation of the economy. I will now examine the differences in development-trade sequences at a less-aggregated level to ascertain the extent to which they vary among countries and industries. Before doing so, some of the differences in trade policies will be noted.

The seven developing countries all experienced some degree of balance-of-payments disequilibrium during the 1950's, reflected in foreign exchange shortages and quantitative restrictions (QRs), and exacerbated by overvalued exchange rates. The trade and exchange-rate regimes of four of these countries—Korea, Israel, Colombia and Turkey—have been compared to a larger sample by Anne Krueger. While Korea and Israel show progressive liberalization and reduction of QRs by the early 1960's, Colombia and Turkey maintained high levels of protection and import substituting policies for most of the period. Both the latter had intervals of liberalization and export expansion in the late 1960's.
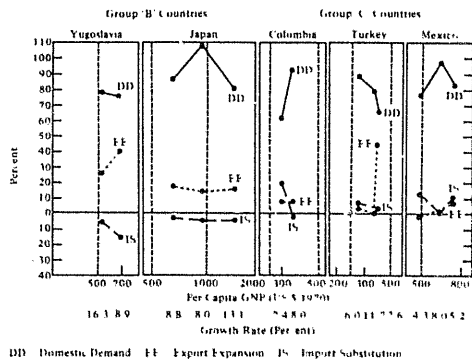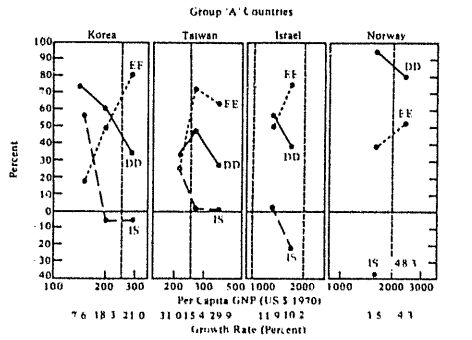
FIGURE 1. SOURCES OF INCREASE IN LIGHT
INDUSTRY (PERCENT)

FIGURE 2. SOURCES OF INCREASE IN HEAVY
INDUSTRY (PERCENT)

Yuji Kubo and Sherman Robinson have extended this comparison to the other countries in our sample. In Group A, Taiwan followed a sequence similar to Korea and liberalized trade even more fully by 1970. In Group C, Mexico followed a moderate form of import substitution strategy with relatively low levels of protection.

In summary, the trade policies of the countries in Group A (plus Japan) actively favored exports since the early 1960's, while those of Group C discriminated against them in varying degrees. In addition the transformation was affected by large inflows of foreign assistance to Korea, Taiwan, and Israel which made possible higher growth rates and more outward-looking trade and development policies.

To indicate the differences in trade-development sequences among sectors, the fourteen branches of manufacturing in our models have been aggregated into three groups:
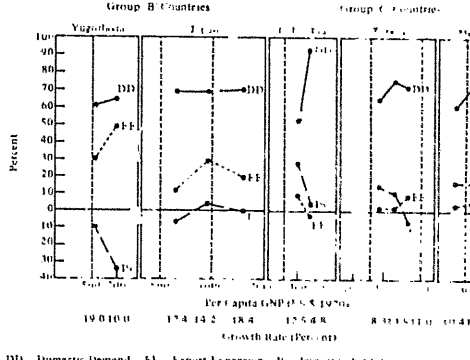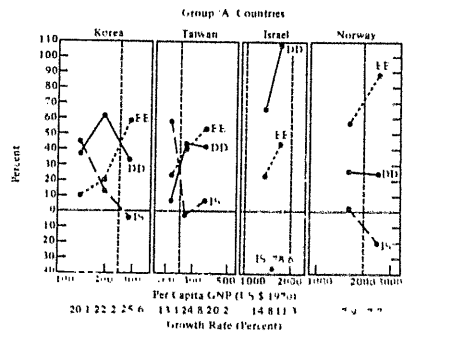
(a) light industry (food, textiles, clothing, wood products, etc.); (b) heavy industry (chemicals, metals, petroleum, etc.), and (c) machinery. Light industry includes sectors in which both demand and factor proportions favor early development while machinery typically develops at a relatively late stage. The three principal sources of growth, expressed as percentages of each sector's increase in output (as in Table 2), are shown in Figures 1, 2, and 3 for each of these sectors.

Outward-Looking Sequences. In Group A countries, each sector shows the same decline in import substitution and rapid rise of exports as a source of growth that was indicated in Table 2. This shift is earlier and more pronounced in light industry, where import substitution is only significant in the first period, and takes place last in machinery. These differences also persist at less-aggregated levels. There is a corresponding change in the pattern of exports in
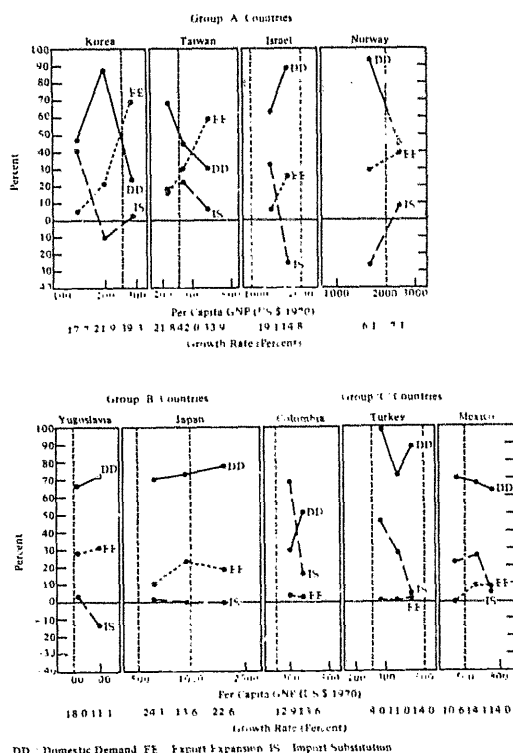
FIGURE 3. SOURCES OF INCREASE IN MACHINERY
(PERCENT)

each country (not shown) with a growing component of heavy industrial products.

Despite these differences in degree, the major impression from these comparisons is a general similarity in the trade-development sequences of each sector in the three developing countries in Group A. After an initial period of strong import substitution, export expansion became the major source of industrial growth in Korea and Taiwan in each major sector, and also led to an acceleration of growth in each. In Israel, however, exports predominated only in light industry.

A final phase of import liberalization in each sector is shown by Norway, Israel, and Yugoslavia. In this phase export expansion is partly offset by increased imports, so that the rate of sectoral growth is determined primarily by domestic demand.

Inward-Looking Sequences. Although there are some significant differences in

timing, the inward-looking countries of Group C indicate the effects of the exhaustion of import substitution possibilities in all sectors. The failure to develop manufactured exports (except on a modest scale in light industry) has led to the decline of the rate of growth shown in both light and heavy industry, but not yet in machinery.

Even though Colombia, Turkey, and Mexico are relatively large countries and have had fairly rapid rates of growth, the expansion of the domestic market has not offset this failure. A more detailed analysis shows these countries lagging particularly in machinery and metal products, sectors in which the countries in Group A have had above average growth.

In summary, the general features of the inward-looking pattern carry over to each of the major sectors, as in the case of the export-led strategy. While the opportunities for import substitution persist longer in heavy industry and machinery than in light industry, its ultimate decline is similar.

III. Concluding Remarks

This paper illustrates an approach to the analysis of structural change in which internal and external factors are treated together in an interindustry framework. The method is adapted from techniques used in development planning and takes advantage of information collected for this purpose. It can be extended to encompass production functions and factor use by sector in order to provide a more complete analysis of the sources of growth and structural change.

The effects of trade policy on industrial structures that are revealed by this analysis are quite striking. Although import substitution is an important feature of early stages of industrialization in all developing countries, it can be accelerated or retarded by trade policy. The later stage of expansion of manufactured exports is more susceptible to policy influence and is shown to have a large effect on the subsequent course of industrial development.

This methodology can also be used to explore the effects of the balance-of-payments constraint on the pattern of develop-

ment. In this context the development of manufactured exports appears even more important as a source of foreign exchange than as a source of demand because it provides one of the principal means of exploiting comparative advantage and of avoiding balance-of-payments bottlenecks.

To complete the linkage between industrialization and export growth, it would be necessary to examine the changes in comparative advantage that result from the acceleration of growth and learning by doing in successful export-led strategies. This process, which is explored in my paper with Donald Keesing, has been a major factor behind the growing share of the semi-industrial countries in world markets for manufactures. Their success in exporting manufactured goods has in turn contributed to more rapid industrial growth in a cumulative process.

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