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ABSTRACT

THE COMPARATIVE ADVANTAGE OF DEVELOPING COUNTRIES IN THE MANUFACTURING INDUSTRIES AND THE EFFECTS OF GENERALIZED TARIFF PREFERENCES

By

Zubair Iqbal

Accelerated economic development requires a substantial increase in the imports of industrial materials, capital goods and technical services, besides an expansion in domestic savings and investment. However, the developing countries are unable to generate sufficient exports to pay for the imports required to attain a high growth rate. This has created a large "trade gap" which has to be filled either by aid, or import substitution or export expansion in the developing countries. Import substitution cannot be carried too far due to various structural limitations. The developed countries may not be able to increase their economic aid sufficiently to fill the trade gap. There remains only the expansion of exports of the developing countries. There is little chance for the developing countries to generate a dramatic expansion in their primary goods exports because of low income elasticity of demand (among other reasons) in the developed countries. They must expand their manufactured exports to the developed countries where the demand for manufactures is the greatest. One of the main obstacles in the way of manufactured exports of developing countries to the developed countries is the effective protective tariff barriers in the latter countries

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Tariff preferences in developed countries for the manufactured imports from the developing countries is one way of increasing the export earnings of developing countries. The preferences will give competitive advantage to the developing countries over the producers in the "third," developed, countries equal to the effective protective duties in the preference-giving country. While it is possible to conceive of many preference schemes, the generalized preference system is a relatively easier method of granting preferential treatment to the manufactured exports of the developing countries. Such a system would require all developed countries to grant a duty free access to the manufactured and semi-manufactured exports of all developing countries to their markets without limitation on volume. Under the general preference system, the higher the effective protection in the developed countries, the higher the preference for the developing countries. Therefore, based upon the existing structure of effective tariff protection in the developed countries, the general preference system would give the greater incentives to the establishment in the developing countries of those industries that are subject to higher effective protective duties in the developed countries. The question is: Are these the industries in which less developed countries have (potential or actual) comparative advantage and developed countries comp

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countries comparative disadvantage? This is what the present study seeks to answer. To do this we compare the effective protection rates in the advanced countries with the comparative advantage schedules of developing as well as the developed countries in the production of manufactured and semi-manufactured goods.

Since there is no single explanation of a country's comparative advantage, various theoretical models were considered to develop indexes in order to rank industries by the degree of their comparative advantage. We used the factor proportions, human skills, R & D, and economies of scale models besides Balassa's "revealed" comparative advantage to rank the industries. The input-output technique was used to obtain total requirements of capital, labor and human skills in order to estimate the input ratios for ranking the industries.

The effective protection rates in the developed countries were obtained from the estimates prepared by Professor Balassa. These rates were "normalized" by obtaining a weighted average of the effective rates of EEC, Japan, U. K. and U. S. A., with the rate of each developed region weighted by its total trade in the product to which the rate applies.

Linear regression and rank correlation tests were used to determine the nature and significance of correlation between the structure of effective protective rates in the developed countries and the schedules of manufactured commodities in the developing and developed countries ranked by the various ranki

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the various ranking indexes developed in this study. There is a significant and positive correlation for the developing countries, significant and negative correlation for the developed countries.

Our investigation, therefore, appears to show that, in general, the generalized tariff preference system will give greatest incentive to the establishment of industries in the developing countries in which they have greater comparative advantage. Furthermore, preferences will encourage the developed countries to import those commodities from the developing countries in which the former have least comparative advantage. Hence trade diversion will be minimized.

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THE COMPARATIVE ADVANTAGE OF DEVELOPING COUNTRIES IN THE MANUFACTURING INDUSTRIES AND THE EFFECTS OF GENERALIZED TARIFF PREFERENCES

By

Zubair Iqbal

A THESIS

Submitted to
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I wish to thank Professor M. Kreinin, my Academic Adviser and Chairman, Thesis Committee for his unfailing help, advice and encouragement at every stage in the preparation of this thesis. I would also like to thank Professors V. Smith and W. P. Strassmann, members of my Thesis Committee, for their suggestions that helped me to improve the final draft. There is no way to fully express my gratitude to a large number of fellow graduate students and members of the Faculty in Marshall Hall whose intellectually stimulating company helped me to sharpen my ideas. My thanks to the Yale/Pakistan Project and the Ford Foundation for financial support without which this study could not have been possible.

The sins of omission and commission are of course my own.

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INTRODUCTION

The manufactured exports of developing countries to developed countries are subject to various restrictions like quotas, administrative controls and the tariff duties in the latter countries. Since the nominal tariff rates are escalated by the stage of fabrication, the effective protection provided by the tariff structure in the developed countries against imports of simple manufactures from developing countries is much higher than the nominal rates would suggest. The consequence of this type of tariff structure is to adversely affect the capability of developing countries as potential or actual exporters of manufactures that are of special interest to them.

One way to alleviate the position of developing countries is to remove the trade barriers against their manufactured exports in advanced countries while maintaining them against the imports from other developed countries, i.e., grant preferential treatment to their exports. A general preference system eliminating tariffs in the developed countries on manufactured imports from developing countries, without limitation on volume, will grant the greatest preferences to the commodities that are subject to the highest effective protection in the developed countries. This will

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give greatest incentive to the establishment in the developing countries of those industries that are subject to the highest effective protective duties in the developed countries. The generalized preferences will, therefore, be useful only if these are the industries in which developing countries have relatively greater, and developed countries relatively lower, comparative advantage. If this condition does not hold, that is, if the industries subject to relatively higher effective protection in the developed countries are the ones in which developing countries do not have comparative advantage, then general preferences will not promote the industrial development of the developing countries. They may actually worsen the resource allocation and retard the process of economic growth in the developing countries.

The present study seeks to find out whether generalized preferences will promote the establishment and growth of industries in developing countries in which they have greater comparative advantage and developed countries relatively lower comparative advantage. To do this we compare the structure of effective protection rates in the developed countries with the comparative advantage schedules of the developing and the developed countries in manufactured products. Since there is no single determinant of comparative advantage we will use various models to rank manufacturing industries by the degree of their comparative advantage.

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CHAPTER I

TARIFF PREFERENCES AND THE PROBLEM OF ECONOMIC DEVELOPMENT

INTRODUCTION

One of the few principles that the development policy makers and development scientists are quite certain about is that economic development requires a substantial increase in national investment, that is, an accelerated rate of capital formation. Another such notion is that rapid economic development generally calls for a substantial volume of imports of materials, capital goods, and technical services. If exports are insufficient to finance such imports or domestic savings are insufficient to finance an increased volume of investment, or both (as is often the case), rapid development cannot be attained. This is the familiar concept of "dual gap" analysis which underlies almost all the studies of foreign resource requirements as a solution to the development impasse mentioned above. The commonly used gap analysis brings the "export/import gap" and the "savings/investment gap" together for projecting the foreign resource requirements of developing countries.

The export/import gap is defined as the excess of projected imports of goods and services (exclusive of

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investment income payments) over the corresponding projection of export earnings. In addition to the export/import gap, however, payments of interest, profits and dividends falling due on past loans and investments must be made; the "trade gap" includes these prospective payments over and above the export/import gap. The "savings gap" is the excess of investment requirements over domestic savings at the indicated projected growth rate.[2] In the *ex post* sense, the excess of the domestic use of resources over the domestic supply of resources cannot differ from the net transfer of resources from abroad. The economy adjusts by altering the projected growth rate in order to bring the two gaps closer to equality. However, the two gaps are unlikely to be equal in the *ex ante* sense because there are different sets of assumptions and forces underlying the two gaps. The export/import gap is caused by structural rigidities, domestic or international, which make it impossible, in the short run, to transfer resources freely from domestic production to exports or import substitution. According to Chenery and Strout, whenever the export/import gap is greater than the savings/investment gap, the former tends to (indirectly) determine the latter via its influence on the growth rate of income. Since it is more difficult to bring about a structural transformation than to raise the saving ability of the economy, the export/import gap has a greater constraining effect than the savings/investment gap.[3]

The size of the projected foreign resource requirements, as determined by the gap-analysis depends upon the target rate of growth.

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rate of growth. The higher the target rate of growth selected, the greater will be the need for foreign resources as measured by the size of the trade gap. The objective of developmental efforts is to achieve self-sustaining growth as soon as possible. If today's less developed countries have to achieve self-sustaining growth in the near future, then they must grow at a rate appreciably higher than their current performance. This will, however, open up a much larger foreign resource gap in the future. Many estimates of trade gaps for the developing countries are available, based upon different assumptions.[4] The trade gap is, however, not an estimate of external capital requirements of the developing countries; it only shows the extent to which the imports and exports of developing countries would tend to diverge, on the basis of past experience, if these countries sought to achieve the overall growth rates indicated. The trade gap thus provides an indication of the magnitude of policy adjustments required if the growth objectives of developing countries are to be realized.

EXPORT/IMPORT AND SAVINGS GAPS PROJECTIONS AND THE AID REQUIREMENTS

The most comprehensive projections of savings and export/import gaps of developing countries have been made by the United Nations Conference on Trade and Development (UNCTAD) in 1968.[5] A country-by-country study was undertaken for thirty-seven countries of Latin America, Africa and Asia to project gaps for 1975 at two different target growth rates.

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This investigation is reproduced in Table 1, Appendix II. The export/import gap and the savings gap as defined here are comparable in terms of national income accounting concepts.

These estimates of gap projections are carried out for a low and a high target growth rate. The low rate, considered to be substantially below the absorptive capacity of developing countries, represents something between the high and low rates in the period 1950-1965, averaging out at 5.2 per cent for all developing countries. The "high" rate is considered somewhat higher than the absorptive capacity, averaging out to about 6.1 per cent for all the developing countries. Table 1, Appendix II, shows that twelve countries have an excess of exports over imports, i.e., a "negative" export/import gap at the low target growth rate, but for the high target growth rate, there are only six such countries. Out of the twelve countries showing an excess of exports over imports at the low rate [in 1975], only Brazil and the Philippines have more than 15 per cent of their exports in manufactures. The rest of the countries either export only primary goods, or non-ferrous metals or other raw materials deirved from domestically available natural resources. On the high rate no country with more than 15 per cent of exports in manufactures shows an excess of exports over imports. This will be discussed further in Chapter III of this study.

As for savings gap projections, fourteen countries exhibit surpluses under the "low," and four under the "high" assumption.

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Another important result that can be drawn from Table 1, Appendix II, is that there is a tendency for the projected export/import gap to dominate the savings gap. Excluding the cases where both gaps are "negative," twenty-one out of thirty countries show an export/import gap larger than the savings gap under the "low" projection and nineteen out of thirty-five under the "high" assumption.

The dominance of the export/import gap would become more significant if payment of interest, profits and dividends falling due on past loans, etc., were added to export and import of goods and services. This would give us the trade gap estimates; these are usually more important as a policy guide than the export/import gap. But no long run or even medium term estimates on the trade gap and debt requirements are available for most of the countries. Even for the existing structure of debt and repayment, there is very little information on an individual country basis. The problem is complicated further because factor income payments in 1975 will consist of service payments not only on initial debt but also on new debt incurred during the entire period up to 1975 and hence depend upon the assumptions made regarding the term, size and the composition of new inflows needed to fill the gap during the entire projection period. However, on the basis of some rough assumptions regarding the terms and composition of new inflows, the UNCTAD Secretariat has prepared projections on the trade gap on regional levels.[6] In order to determine factor income payments, it was assumed that only me-half of th

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one-half of the projected trade gap will be filled by public capital inflows if all aid-giving countries contribute one per cent of their gross national product.[7] The trade gap estimates on a regional basis are given in Table I-1.

For the developing countries as a whole the projection of the trade gap for 1975 amounts to $15.4 billion on the low growth rate assumption and $24.2 billion on the high assumption. For the low growth rate assumption the trade gap is estimated to be composed of an export/import gap of $3.4 billion and factor income payments of $12.0 billion; while for the high growth rate assumption, the export/import gap is expected to be $10.0 billion, and net factor income payments amount to $14.2 billion. This is shown in Table I-2. The trade gap figures indicate that there is going to be a very substantial increase in the trade gap by 1975 over the 1963 (base year) level even on the low growth rate assumption. The gap will, however, be much larger if the aid-giving countries fail to contribute one per cent of their income to foreign assistance.

If all developed countries contribute one per cent of their respective GNP in public capital flows and about $4 billion in private capital movements totaling about $17.5 billion, on the high target rate of growth assumption, there will be a residual trade gap of over $7.5 billion to be covered by means other than those giving rise to factor income payments if the target rate of growth necessary for early self-sustaining growth is to be realized.

TABLE I-1*

PROJECTIONS OF TRADE GAP OF DEVELOPING COUNTRIES BY REGIONS, 1975
(Millions of Dollars at 1960 Prices)

AFRICA	ASIA	LATIN AMERICA

TABLE I-1*

PROJECTIONS OF TRADE GAP OF DEVELOPING COUNTRIES BY REGIONS, 1975
(Millions of Dollars at 1960 Prices)

	AFRICA			ASIA			LATIN AMERICA		
	1963	1975 Low	1975 High	1963	1975 Low	1975 High	1963	1975 Low	1975 High
1. Exports of Goods and Services	7857	13987	15026	16055	31981	35385	12338	18929	20142
a) Commodities	6355	11312	12152	14054	27474	30542	10232	15671	16646
b) Invisibles	1502	2675	2874	2001	4507	4843	2106	3258	3496
2. Imports of Goods and Services	8028	14576	18164	15609	32046	37090	11428	20198	24028
a) Commodities	6368	11562	14408	13990	28097	32233	9497	16559	19730
b) Invisibles	1660	3014	3756	1619	3949	4857	1931	3639	4298
3. Export/Import Gap	171	589	3138	-446	65	1705	-910	1269	3886
4. Factor Income Payments[a]	600	1447	2046	2704	6465	7324	1456	3624	4331
5. Trade Gap	771	2036	5184	2256	6530	9030	546	4893	8217

* Table I-1 is adapted from Table 22 in "Trade Prospects and Capital Needs of Developing Countries," UNCTAD Secretariat, 1968, U. N. New York, p. 43.

a Includes estimates of servicing the initial debt as well as the new debt arising from the projected yearly deficits on the assumption that 50% of the trade gap is filled by borrowing.

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TABLE I-2*

PROJECTIONS OF THE TRADE GAP OF DEVELOPING COUNTRIES (TOTAL)
(Billions of Dollars at 1960 Prices)

	1963	1975	
		Low	High
1. Exports of Goods and Services	37.6	67.4	73.5
a) Commodities	31.8	56.6	61.9
b) Services (Invisibles)	5.8	10.8	11.6
2. Imports of Goods and Services	37.5	70.9	83.5
a) Commodities	31.9	59.7	70.0
b) Invisibles	5.5	11.2	13.5
3. Export/Import Gap	-0.1	3.4	10.0
4. Factor Income Payments[a]	4.9	12.0	14.2
5. Trade Gap	4.8	15.4	24.2

* Table I-2 is derived from Table 22, Trade Prospects and Capital Needs of Developing Countries, UNCTAD Secretariat, New York: U. N., 1968, p. 43.

a-The method used in estimating the factor income payments is given in Annex III of Trade Prospects and Capital Needs of Developing Countries, p. 68.

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POLICIES TO FILL THE RESIDUAL TRADE GAP

The residual export/import and associated trade gap can be met by two groups of policies:

(a) Policies to increase import substitution, and

(b) Policies to accelerate exports.

To these policies may be added the acceleration of private foreign investments.

IMPORT SUBSTITUTION POLICIES

Import substitution, essentially internal to the developing countries, has been carried on for quite some time in the more advanced of the developing countries. Import substituting industrialization is usually the first step in the developmental effort of the less developed countries because the existence of "imports still provide the safest, most incontrovertible proof that the market is there."[9] However, as a development strategy it has certain severe limitations. It is limited by the size of the domestic market because a narrow domestic market may not permit the scale of operations in manufacturing that is compatible with the technological requirements for efficiency. Even an extension of the market due to economic integration among the developing countries may not allow import substitution to become a long run policy. Furthermore, import substitution tends to work towards autarkic tendencies in the development process, eliminating international competition and perpetuating inefficiency so that domestic infant industry tends to stay infant forever. In some cases inefficiency has reached such proportions that the net subsi

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the net subsidy received through tariff and non-tariff protection exceeds the total value added, and the operation of such industries subtracts from, instead of adding to, the national product.[10] Import substitution, therefore, cannot be expected to fill the dominant trade gap for most of the developing countries.[11]

EXPORT ACCELERATION

Export acceleration appears to be the only means available to bridge the dominant residual trade gap. Export earnings depend upon the volume as well as the price of exports. Therefore, it is necessary to either increase volume, or price, or both. Unlike import substitution, acceleration of exports of developing countries involves the policies of both developed as well as the developing countries.

EXPORTS OF DEVELOPING COUNTRIES

The export trade of developing countries is largely dominated by primary products and until recently, their manufactured exports to developed countries played an almost negligible role. The demand for foodstuffs and staple consumer goods is generally much less responsive to income growth than the demand for industrial products and services. And technological progress leads to the increasing substitution of synthetics for natural materials. These factors underly the United Nations' evaluation of prospects of individual markets suggesting that the prices of traditional primary products exported by developing countries may well be lower

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in 1975 than in 1960.[12] Based upon the income elasticity of demand for the exports of developing countries in the importing developed countries, the projections of values and gorwth rates of different kinds of exports are given in Table I-3. As the table shows, the growth rate of traditional primary goods exports is expected to be far below the overall annual compound rate of growth of exports. A slight reduction in the growth rate of developed market economies will bring about a further decline in the projected growth rate of exports of developing countries, especially for the primary exports as indicated in the UNCTAD study.[13] From these projections it appears that for the developing countries as a whole it would be unrealistic to look for any improvement from additional exports of primary commodities unless there were reasons to expect a major shift in the import policies of developed countries with respect to primary products.[14] The tariff cuts on primary products negotiated in the Kennedy Round were modest and it is known that in certain commodities the policy intentions of some developed countries will increase rather than diminish the tendency toward self-sufficiency--notably in the case of sugar.[15] On the whole, the developing countries cannot pin any hopes on the expansion of their primary goods exports. In fact the U. N. projections of the performance of primary exports of developing countries are too optimistic.

On the other hand, the exports of manufactured and semi-manufactured goods, though very small as a percentage of

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TABLE I-3*

EXPORTS OF DEVELOPING COUNTRIES BY COMMODITY GROUPS AND PROJECTED GROWTH RATES OF EXPORTS

Item	Value of Exports (Millions of Dollars at 1960 Prices)			Annual Compound Growth Rates of Exports (Percentages)	
	1960	1975		1960-1975	
		Low	High	Low	High
1. Foodstuffs	9262	14160	15644	2.8	3.5
2. Agricultural raw materials	5064	6389	7144	1.6	2.3
3. Non-fuel minerals and metals	3176	5976	6413	4.3	4.8
TOTAL (1, 2, 3)	17502	26525	29201	2.8	3.5
4. Manufactured goods	2416	7916	9086	8.3	9.3
5. Fuels	7422	22220	23620	7.5	8.0
TOTAL (1-5)	27340	56661	61907	5.0	5.6

* Table I-3 was derived from Tables 3, 4 in _Trade Prospects and Capital Requirements of Developing Countries_, Vol. I, UNCTAD Secretariat, New York: U. N., 1968.

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total exports of developing countries, have shown a very significant acceleration over the last decade and the trend is likely to continue as shown by the projections for 1975. While the annual world trade in manufactures has been growing at the rate of around 8 per cent, the manufactured exports of developing countries have been growing at an average annual rate of 9 per cent. So the relative share of developing countries might be expected to increase. This is so even when most of the exports of manufactures from developing countries are subject to quantitative and/or tariff restrictions in the developed countries. If these restrictions are eased, then the actual performance might be much better than the projected rate of growth of manufactured exports.

Where public and private foreign capital flows are unable to fill the dominant trade gap, where further import substitution would be acutely harmful to the economy, and where primary exports are not expected to grow significantly, the support for accelerating the exports of manufactures from developing countries tends to become very obvious and natural. This has become "conventional wisdom," as Professor Raymond Vernon calls it, to stress the role of rapid expansion of manufactured exports in speeding up the process of economic growth.[16]

<u>Manufactured exports and the process of development</u>. The development of manufactured exports in particular and all exports in general has a dual function; one of which is related to the structure while the other is related to the general level of industrial development--both also are, of course, closely

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Industrialization requires the establishment of a complex and highly capital intensive structure of production that will permit a diversification of production and exports. The types of goods demanded are usually not the same for which production capacity exists. There is a structural imbalance making the developing countries greatly dependent upon imports. This structural dependence on imports may be temporary and for a very large developing country, import-substituting industrialization may help in diversifying industrial structure. But this system has well known limitations, reference to which has already been made. The dependence on imports may require continuously growing export earnings since reliance on foreign aid can be considered a temporary solution at best.

Secondly, exports accelerate the process of industrialization both by raising its level and influencing its structure. While the first function could even be fulfilled by the expansion of primary goods exports, the second function can be realized only if the structure of exports is diversified and the share of manufactured exports grows rapidly. This would help in providing for a growth of industrial structure much wider in scope and depth than the one based exclusively on the domestic market. Dependence on a small domestic market for the growth of industrial development does not permit efficient production for technological reasons. Raul Prebisch has therefore stated that a continuous dependence on a small domestic market has created

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> . . . a real vicious circle as regards exports of manufactured goods. The exports encounter great difficulties because internal costs are high, and internal costs are high because, among other reasons, the exports which would enlárge the markets are lacking. Had it been possible to develop industrial exports, the process of industrialization would have been more economical, for it would have made possible the international division of labor in manufacturing.[17]

It is this vicious circle which limits the ability of developing countries to carry out meaningful industrialization and growth.

OBSTACLES TO THE MANUFACTURED EXPORTS OF DEVELOPING COUNTRIES

There are two main obstacles confronting the developing countries in the expansion of their exports of manufactured goods--internal and external.

(a) Internal Obstacles. The most obvious domestic economic trends and policies which appear to work to the detriment of export performance of the developing countries in manufactured goods are inflation and overvalued currencies.[18] Inflation causes balance of payments difficulties and inefficiency by effectively keeping the price levels in developing countries above the world market level. The same is the effect of overvalued currencies coupled with unwillingness to devalue.

There is a "structuralist" view which suggests that inflation and overvalued currencies are not the basic obstacles to exports of manufactures, but rather the outcome of a severe structural disequilibrium that exists in these countries which is responsible for limiting the growth of their manufactured exports.[19] The factors of production are not mobile, factor

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prices are out of line with their relative endowments, the economic system is monopolistic and the institutions are inefficient and hard to change. These factors create serious supply inelasticities. Therefore, even if a country has potential comparative advantage in the production of a manufactured product, it may not be realized due to structural rigidities.

The structuralist view has led some economists to discount the absolute disparity in prices due to inflation and overvalued currencies as the basic reason for slow growth of manufactured exports of developing countries.[20] They believe that devaluation alone will not be able to eliminate the obstacles in the way of their manufactured exports because structural flexibility is lacking.[21] According to this assertion, inflationary policies cannot be discontinued, at least for the time being, because stagnation without export promotion will be the only alternative to inflation.

A continuing, inward-looking import substituting industrialization without any export horizon is another reason for slow growth of manufactured exports of developing countries. It has also been emphasized that the underdeveloped countries suffer because their entrepreneurs have no information and knowledge of the existence of a potential export market abroad, or that the level of acceptable risk on the demand side in exports may be too big for them.[22]

(b) External Obstacles. Perhaps the most talked about external obstacle is the protective barriers imposed by developed countries against the import of manufactures. These tariffs tend

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tariffs tend to be escalated by the stage of fabrication, and are noticeably higher in some categories of products than in others, particularly in labor intensive products like textiles and clothing. The escalation means that the effective rate of protection on the final product is far above the nominal rate assuring the import competing producers in the developed countries a much higher effective protection than the nominal rates would suggest.[23] Therefore, it is the effective rate that should be considered as the measure of restrictiveness imposed by the structure of tariff rates in the developed countries on manufactured imports from the developing countries. This tends to keep the potential manufactured exports of developing countries out of the markets of the developed countries where the demand for such products is the highest.[24] Apart from this, there is a tendency for the effective tariff rates to rise with the degree of labor-intensiveness as observed by Professor Hal B. Lary.[25]

Although substantial tariff cuts were successfully negotiated in the Kennedy Round over a wide range of products, the deepest concessions made were concentrated in the areas of greatest interest to the industrial nations (such as sophisticated chemicals, machinery, and transport equipment) while tariff reductions in the labor-intensive products were relatively small. This left the structure of tariffs after the Kennedy Round in the major developed economies biased against labor-intensive goods. Similarly, the Kennedy Round left the structure of effective tariff rates on goods of export interest to deve

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Besides tariffs, quantitative restrictions and administrative controls constitute important trade barriers in some areas. With respect to a number of cotton textile and clothing items in particular, it may well be considered that quotas in the framework of the International Long Term Cotton Textile Arrangement, rather than tariffs, provide the real protection for the domestic cotton industry of the developed market economies.[27]

TRADE PREFERENCES FOR MANUFACTURED EXPORTS OF DEVELOPING COUNTRIES

One way to alleviate the position of developing countries is to remove the trade barriers against their manufactured exports in advanced countries. Besides increased export earnings, the removal of trade barriers facing developing countries would help to promote an export-oriented method of industrialization. Additionally, freer access to developed markets would encourage a larger proportion of future investments in processing industries to be made in developing countries close to the source of raw materials with a view to exporting the manufactured goods, rather than raw materials, to developed countries.

However, the removal of trade barriers will be much less important for the developing countries if they are nondiscriminatory. It is claimed by the developing countries in the UNCTAD that the acceleration of their export earnings requires the establishment of preferential access for their

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manufactured and semi-manufactured exports into the markets of developed countries in violation of the non-discrimination-in-trade clause of the GATT. Furthermore, it can be argued that while developed countries are unwilling to increase their foreign aid programs substantially, they may find it convenient to assist the developing countries by providing them a subsidy in the form of preferential treatment to their manufactured exports.[28]

A tariff preference system might work in two ways, or combinations of these: It can increase the returns to an exporter of commodities already being sold abroad, and it can reduce the buyer's price sufficiently to permit new manufactured and semi-manufactured products to be sold in foreign markets. The competitive advantage that preferences in industrial products might give less developed producers must be assessed in terms of the resulting reduction of the effective protection enjoyed by the producers in the developed countries against less developed producers and of the margin of effective preferences given less developed over the producers in the "third," developed, countries will continue to face the full restrictive effect of effective protection in the preference-giving countries, the developing countries will no more be so constrained in their manufactured exports to the developed countries.

The gains from tariff preferences for the manufactured exports of developing countries can be assessed in terms of trade-creation and trade-diversion effects of preferences.

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On the consumption side, the magnitude of trade-creating and trade-diverting effects depends on the effects of preferences on the relative prices of commodities from different sources, and, therefore, on the level of existing nominal tariff rates on which the preferences are based. On the production side, however, the magnitude of these effects depends respectively on how the preferences alter the effective rate of protection of producers in the preference-giving against producers in the preference-receiving country and the margin of preference it establishes for producers in the preference-receiving countries over their competitors in non-preferred, "third" countries.[29] According to Professor Johnson, "the trade-creating incentive might be substantially greater than the calculated effective protection rates would suggest."[30] The dynamic effects of preferences are similar to those of the customs unions such as internal economies, scale effects due to the extension of the market, and external economies such as learning through experience and growth of skills.[31]

GENERAL PREFERENCES

A preference system is determined by factors such as definition of manufactured goods, the tariff quotas, escape clause, the definition of countries as preference-givers and preference-receivers, and the duration of preferences. They can be combined in different ways to give rise to all conceivable types of preference schemes. A general preference system would require all developed countries to grant a duty-free access to the manufactured and semi-manufactured

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exports of all developing countries to their markets without limitation on volume. This might be the best method of providing preferences for the manufactured exports of developing countries because it would be the easiest to administer and leave the specialization and industrial exports of developing countries to their relative competitiveness in production and trading.[32]

Under the general preference system, the higher the effective protection in the developed countries, the higher the preference for the developing countries. Therefore, based upon the existing structure of effective tariff protection in the developed countries, the general preference system would give the maximum incentives to the establishment in the developing countries of those industries that are subject to the highest effective protective duties in the developed countries. Are these the industries in which less developed countries have (potential) comparative advantage and developed countries comparative disadvantage? This is the question that the present study seeks to answer. To do this we compare the effective protection rates in the advanced countries with the comparative advantage schedules of developing as well as of developed countries in the production of manufactured and semi-manufactured goods. If a high degree of positive correlation between the comparative advantage schedule of developing countries and the effective protective rates of the developed countries exists, then a generalized preference system will promote the expansion of industries in the developing countries in which th

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This requires (a) ranking of industries by comparative advantage for various less developed and developed countries, and (b) the estimates of effective tariff rates levied on manufactured products in the developed countries. Since the comparative advantage of a country is a function of many factors, the ranking of industries must be approximated by the use of various models explaining comparative advantage. This will be the subject matter of Chapters IV-VII. The effective tariff rates in the developed countries are estimated and analyzed in Chapter IV.

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NOTES TO CHAPTER I

[1]Hollis B. Chenery and Alan M. Strout, "Foreign Assistance and Economic Development," American Economic Review, September, 1966, pp. 689-733; "Comment" by G. Ranis and J. C. H. Fei, American Economic Review, September, 1968; and Chenery and Strout, "Reply," American Economic Review, September, 1968.

For further detail and alternative approaches to the theory of "dual gaps," see the following: John C. H. Fei, and Douglas Paauw, "Foreign Assistance and Self Help: A Reappraisal of Development Finance," Review of Economics and Statistics; I. M. D. Little and J. M. Clifford, International Aid (Chicago: Aldine Publishing Company, 1965); R. F. Mikesell, Economics of Foreign Aid (Chicago: Aldine Publishing Company, 1968).

[2]See Trade Prospects and Capital Needs of Developing Countries, UNCTAD Secretariat, TD/34/Rev. 1., New York: United Nations, 1968.

[3]The logic underlying this relationship between the savings gap and the trade gap can be inferred from G. Ranis, and John Fei, "Comment," and H. B. Chenery, and A. M. Strout, "Reply," American Economic Review, September, 1968, pp. 897-916.

[4]Bela A. Balassa, "The Capital Needs of the Developing Countries," Kyklos, Vol. 2, 1965; Trade Prospects for Developing Countries, Economic Growth Center, Yale University. Homewood, Ill.: Richard D. Irwin, 1964; United Nations, United Nations World Economic Survey, Vol. 1, 1963; Trade and Development: Trends, Needs and Policies, (New York: U. N., 1964); P. N. Rosenstein-Radan, "International Aid for Underdeveloped Countries," Review of Economics and Statistics, 1961.

[5]United Nations, Trade Prospects and Capital Needs for Developing Countries, Chapters I, II, III. Robin Morris, "Can We Measure the Need for Development Assistance?" The Economic Journal, September, 1970, pp. 650-68.

[6]See The Outlook for Debt Service, U. N., TD/97, Vol. IV, New York, 1968.

[7]Trade Prospects and Capital Needs of Developing Countries, U. N., Annex III.

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[8] *Ibid.*, Annex II, pp. 66-67.

[9] Albert Hirschman, *The Strategy of Economic Development*, New Haven, 1958, p. 212; "Political Economy of Import Substituting Industrialization," *Quarterly Journal of Economics*, September, 1968.

[10] The concept of negative value-added is very controversial. Some economists like Ellsworth think that it is absurd to even imagine that the value-added can be negative. However, strong evidence to the contrary is available. The concept of negative value-added does not imply that the production actually falls, but rather that the cost of inputs in foreign exchange is greater than the foreign exchange value of the commodity produced. This need not be true in domestic prices. For elaboration see the following: Ronald Saligo and J. J. Stern, "Tariff Protection, Import Substitution and Investment Efficiency," *Pakistan Development Review*, Vol. 5, 1965, pp. 249-70; Maizels, *Industrial Growth and World Trade* (Cambridge: Cambridge University Press, 1963), pp. 70-75; Stephen R. Lewis, Jr. and Stephen E. Guisinger, "Measuring Protection in a Developing Country: The Case of Pakistan," *Journal of Political Economy*, 1968, pp. 1170-97; Stephen E. Guisinger, "Effective Protection and the Concept of Negative Value Added," *Quarterly Journal of Economics*, November, 1969.

[11] David Felix, "The Dilemma of Import Substitution--Argentina," *Development Policy, Theory and Practice* (Gustaf F. Papanek, ed),(Boston: Harvard University Press, 1968).

If it were possible to reduce the ratio of import to gross domestic production via import substitution, then each percentage point reduction would mean a drop of about four billion dollars in the import gap by 1975. Referring to *Trade Prospects and Capital Needs of Developing Countries*, U. N., Table 14, the imports in 1975 would be \$70 billion and G.D.P. = \$432.3 billion, therefore,

$$R = (\text{Imports/GDP ratio}) = \frac{70 \times 100}{432.3} = 16.2\%.$$

If now R has to be reduced by one percentage point, i.e., to 15.2%, through import substitution, then the import requirements would fall to:

$$\frac{15.2 \times 70.0}{16.2} = \$65.8 \text{ billion}$$

This indicates that for one percentage point fall in R, the import gap will fall by

$$70.0 - 65.8 = \$4.2 \text{ billion.}$$

[12] See *Trade Prospects and Capital Needs of Developing Countries*, U. N., pp. 19-20, 47.

[13] *Ibid.*, pp. 18-19, Ch. 2.

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[14] Harry G. Johnson, Economic Policies Toward Less Developed Countries, (New York: Praeger, 1967), Chapter V; Boris Swerling, Current Issues in Commodity Policy, Essays in International Finance, No. 38, (Princeton University Press, 1962).

[15] Proceedings of the United Nations Conference on Trade and Development, Second Session, Volume II, Commodity Problems and Policies, (New York: U. N., 1968);

[16] For detailed analysis on this point, see: Raymond Vernon, "Problems and Prospects in the Exports of Manufactured Goods from the Less Developed Countries," Proceedings of UNCTAD, Volume IV, Trade in Manufactures, (New York: U.N., 1964), pp. 200-10.

[17] Raul Prebisch, Toward A New Trade Policy for Development, Proceedings of UNCTAD, (New York: U. N., 1964) Vol. II, p. 40.

[18] Harry G. Johnson, op. cit.

[19] The "Structuralist" view has been propounded and popularized by Raul Prebisch and his disciples at the U. N. Economic Commission for Latin America. Theoretical formulation of this concept has been done by Hirschman, Hagen, Felix and Diaz-Alijandro. This view is, however, distinct from the demand-pull and cost-push types of inflation. It involves supply bottlenecks and price-price spiral as the basis for price disparities and lack of price competitiveness of developing countries in the exports of manufactured goods. For a very good summary of the structuralists--as opposed to monetarist--view, see: E. E. Hagen, Economics of Development (Irvin, 1968), Chapter 11; see also, Hagen, "An Economic Justification for Protectionism," Quarterly Journal of Economics, Vol. 72, November, 1968.

[20] See R. Vernon, op. cit. Professor Vernon considers that price competitiveness is not the only thing in the determination of manufactured exports from developing countries because of structural disequilibria. According to him, if exports were only a function of prices, and if questions of price were the principal obstacles to increased manufactures exports, one suspects that the past record of underdeveloped countries in this field would have been much less dismal than in fact it has been. Lack of information on export opportunities and domestic distortions may completely neutralize the price incentives provided by devaluation. A similar view has been presented by Raul Prebisch in Toward a New Trade Policy for Development (New York: U. N., 1964).

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[21]See Carlos F. Diaz-Alejandro, Exchange Rate Devaluation in a Semi-Industrial Country (Cambridge, Mass.: MIT Press, 1965). Besides considering the structural difficulties, he believes that income effect of devaluation is more significant than its substitution (i.e. price) effects, and that the income effect is always detrimental to the devaluing economy.

[22]R. Vernon, op. cit., pp. 207-11.

[23]cf. Bela A. Balassa, "The Structure of Protection in the Industrial Countries and its Effects on Processed Goods from Developing Nations," Programs for the Liberalization and Expansion of Trade in Manufactures and Semi-manufactures of Interest to Developing Countries, Proceedings of UNCTAD, TD/B/C, 2/36, (New York: U. N., 1967), p. 1; See also the following: W. M. Cordon, "The Structure of a Tariff System and the Effective Protective Rate," Journal of Political Economy, June, 1966, pp. 221-37; Harry G. Johnson, "The Theory of Tariff Structure with Special Reference to World Trade and Development," Trade and Development (Geneva: Librarie Droz, 1965); Economic Policies Toward Less Developed Countries, op. cit.

[24]See A Study of Industrial Growth (New York: U. N., 1963.

[25]Hal B. Lary, Imports of Manufactures from Less Developed Countries (New York, National Bureau of Economic Research: Columbia University Press, 1968).

[26]B. A. Balassa, "The Kennedy Round," Estimated Effects on Tariff Barriers, Part II, UNCTAD, TD/6/Rev. 1, (New York: U. N., 1968).

[27]H. G. Johnson, op. cit., pp. 75-76.

[28]H. G. Johnson, "Trade Preferences and Developing Countries," Lloyds Bank Review, Vol. LXXX, April, 1966, pp. 1-18.

[29]H. G. Johnson, loc. cit., Chapter VI, pp. 163-211.

[30]H. G. Johnson, op. cit., p. 16.

[31]M. Kreinin, "On the Dynamic Effects of Customs Union," Journal of Political Economy, April, 1964.

[32]In reality, it is not possible to have such a generalized preference system due to various administrative, political and economic reasons. The escape clause and positive tariff quotas, etc., will have to be incorporated into the system. For exhaustive sutdies of this subject, see the

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CHAPTER II

CRITERIA OF COMPARATIVE ADVANTAGE

INTRODUCTION

This chapter develops the models which will be used to determine the comparative advantage by which manufactured commodities will be ranked. The theory of comparative advantage states that a country will maximize its gains if it specializes in the production and export of goods in which it has greater relative efficiency, i.e., it can produce these goods relatively cheaply vis-a-vis the rest of the world, and import those products in which it is relatively less efficient, i.e., which cost more at home than abroad. In a perfectly competitive system, market prices will reflect the comparative advantage of a country. But price distortions, especially in the less developed countries, are such that the price mechanism is not an indication of comparative advantage, neither potential nor actual. Hence there is a need to draw upon certain theoretical models to determine the comparative advantage of developed and developing countries, and to rank their industries by the degree of comparative advantage.

There are several alternative explanations of a country's comparative advantage, each subject to its own set of limitations. This is perhaps due to the fact that production and trade patterns are a function of many factors, thus it is not possible to incorporate all of them into one sophisticated theorem of general validity.[1]

CRITERIA FOR RESOURCE ALLOCATION AND COMPARATIVE ADVANTAGE

Planners in developing countries follow various allocation criteria to choose the export and import competing industries that would make the most efficient use of the available resources. Since the principle of comparative advantage also aims at the best allocation of resources, these allocation criteria may be used to rank the industries of a country in a hierarchy that will be consistent with its comparative advantage; these criteria are considered below.

The Classical Criterion of Comparative Advantage. The classical criterion of comparative advantage, though widely accepted as it is, is also the one which has been greatly disregarded by actual policy formulation.

If product and factor markets are perfectly competitive and there is universal free trade and no transport costs, the domestic market price of products will be the same as their world prices. Then the net social benefit (NSB) from starting or expanding production of any good will be given by the difference between the world price of the good in question, say P_i, and the factor cost involved in producing it valued at market prices, say c_i, so that

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or an index of comparative advantage can be attained as:

$$r_i = \frac{p_i - c_i}{c_i}$$

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A ranking of industries by their comparative advantage index will indicate that industries at the top of the schedule should be developed as exporting industries.[2] This is an index of the net benefits generated by using one unit of domestic resources in producing this particular good. This criterion was developed by Deepak Lal.[3] However, because of certain unrealistic assumptions on which this theory rests, it has not been used anywhere.

The criterion is based on the assumptions of perfect product and factor markets and free trade, hardly satisfied in the developing countries because of structural disequilibrium in the economy. The domestic prices of goods and services and factors do not represent the real social costs and benefits of producing or using these goods and factors. This is particularly true of labor under situations of disguised unemployment. Moreover, the degree of distortion is not the same in all industries.

Imperfections are also caused by government intervention in the form of many protective devices, taxes and subsidies.

There is a need, therefore, to find some alternative criteria that are more operational and serve as proxies for

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the classical concept of comparative advantage. This would require that some way be developed by which the index of comparative cost, including potential changes in the future, can be made ope ational by finding a method of valuing inputs and outputs at prices which reflect real social costs and benefits. Once this can be done the social value of setting up a particular industry in line with a country's comparative advantage can be determined, and industries in which the country has the highest comparative advantage will then be potential export industries.

Foreign Exchange Costs Minimization Criterion. While analyzing the dual gaps approach to the foreign exchange requirements in the first chapter we found that most of the developing countries face chronic foreign exchange scarcity. The foreign exchange criterion, therefore, assumes that the only social costs incurred by such an economy are foreign exchange costs, and hence those industries should be chosen and developed for which foreign exchange costs per unit of foreign exchange saved or earned by producing the commodity are the lowest. By producing the commodity the economy may save foreign exchange equal to the c.i.f. price of the good, say P, or if it is earning foreign exchange (if it is an exportable) equal to the f.o.b. price of the good, say P'. Further, if the social costs in both cases are the direct and indirect foreign exchange costs of importing the raw materials and intermediate goods which go into producing the good, and the sum of these costs is, say F, then on the

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foreign exchange costs minimization criterion, industries would be ranked according to the index:

$$r = \frac{P - F}{F} \quad \text{or} \quad \frac{P' - F}{F} .$$

Ranking by this index indicates comparative advantage. This index was used to select export and import competing industries in Pakistan.[4] Bruno, Krueger and Balassa take exception to the use of foreign exchange cost per unit of foreign exchange earned or saved. They would rather introduce the domestic resource cost per unit of foreign exchange as the basic criterion. Therefore, for a given commodity, the cost of a unit of foreign exchange (earned or saved) is taken to equal the direct and indirect domestic resource costs incurred in supplying it domestically, divided by the difference between the foreign price of the product and the foreign exchange cost of direct and indirect imported inputs.[5] It is extended into a programming criterion analyzed in the next subsection.

This criterion is a special case of the scarce-factor intensity criterion which indicates that a country should specialize in producing goods drawing more sparingly on its relatively scarce factor, capital or labor as the case may be. The foreign exchange cost minimization criterion suffers from the same shortcomings as any other factor intensity criterion because of common underlying assumptions. It is very misleading to assume that only foreign exchange costs represent real social costs to the economy, unless the economy

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is facing a "strict" foreign exchange bottleneck implying that necessary importables cannot be obtained from domestic production or imports, i.e., both the foreign and domestic rates of transformation are zero. The validity of this criterion thus depends upon the existence of a strict foreign exchange bottleneck.

Programming Criterion and Shadow Prices. The mathematical programming approach, especially linear,[6] has come to be used extensively in the developing countries because it provides a convenient link to the principle of comparative advantage as the optimal pattern of trade is determined simultaneously with the optimum allocation of investment. Bruno has used this approach to select the potential export industries in Israel.[7] The social welfare function--growth target--is maximized subject to the constraints of available primary inputs like labor, capital and foreign exchange. In the process of solution to such a program, accounting or "shadow" prices of the primary inputs are obtained as a by-product of the solution. Such shadow prices are a reasonably accurate measure of relative factor scarcities, and real costs and benefits of different lines of investment providing for the most optimal allocation of resources. The shadow prices of primary factors of production are the social marginal value products of the factors. For the factors in fixed supply, the shadow prices also represent the social opportunity cost of using the factor. Because foreign exchange supply is not fixed and can be increased, the shadow price of foreign exchange i

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change is determined by both the costs of increasing the supply of foreign exchange in terms of domestic resources, and the benefits from having one more unit of foreign exchange given by the marginal productivity of foreign exchange in domestic factories. Since in equilibrium the marginal costs must be equal to the marginal benefits, the exports should be expanded to the point at which the resource cost of earning another unit of foreign exchange is equal to the contribution which foreign exchange makes on the margin to the domestic social product.[8]

Now, given the shadow prices of primary inputs, one can follow Bruno[9] and use the shadow prices to calculate the domestic resources cost per unit of foreign exchange saved (or earned), say e_j. Given the shadow exchange rate e_s, industries can be ranked according to the index:

$$r = \frac{e_j - e_s}{e_s} \quad .$$

Such a ranking is consistent with comparative advantage.

This criterion, however, has its limitations. The linearity assumption on which the approach is based implies constant returns to scale, and hence disregards the opportunities for economies of scale, which may be of great importance. With non-linearity the accounting prices will no longer reflect the marginal social productivity of the input. Therefore it is necessary to modify the development program particularly in the case of exports where the price elasticity

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of demand is also rather low.[10] Moreover, the input-output relationship on which such a model is necessarily based may not be known and may not be stable as is assumed in the programming approach. This method comes close to the concept of comparative advantage and may be used in ranking the commodities for comparison with effective protection rates for countries for which information is available.

The World Price Criterion. Mr. Little[11] has developed a fairly simple and operational social cost-benefit criterion in choosing potential export industries. Assuming for the moment that a country has perfect trading opportunities, that all inputs and outputs are tradeable, and that there are no trade controls, then clearly the shadow prices of inputs and outputs are their world prices. The rule is then to value all inputs and outputs at their world prices, and the ranking of industries by the ratio of net benefits to costs will indicate ranking according to comparative advantage.

To make this criterion operational two of the assumptions must be relaxed: (1) that there is perfectly free trade, and (2) that all inputs and outputs are tradeable--where in fact land and unskilled labor, as well as many goods, are either non-tradeable or not traded.

If the world price criterion is to be operational the first modification would require that instead of taking world prices reflecting average costs and revenues of the inputs and outputs, world prices relfecting the marginal costs and r

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and revenues should be taken. While this involves judgement, it is unavoidable in any estimates which try to peer into the future. The second adjustment requires the pricing of non-traded goods and inputs at world prices. The non-traded inputs can in turn be broken down into tradeable inputs, and the latter can then be valued at world prices. Little and Mirrlees[12] have given various methods of converting non-traded goods into tradeable values. But their methods are exceedingly arbitrary and *ad hoc*, making the technique of questionable value.

Domestic Price Criterion. In analyzing the comparative costs, factor proportions and industrial efficiency in Pakistan's manufacturing industries, Nurul Islam ranks the commodities by the ratio of ex-factory prices of specific domestic products to c.i.f. prices of closely competing imports.[13] If the ex-factory price of the i-th commodity is, say, F_i, and the c.i.f. price of the competing import is P_i, then the following index can be used to rank the commodities

$$r = \frac{F_i - P_i}{P_i} \quad \text{or} \quad \frac{F_i - P_i}{P_i'}$$

where P_i' is the domestic price of competing imports adjusted for overvaluation of domestic currency.

This criterion involves serious data problems. The ex-factory prices have to be based on a direct estimate of the costs of individual manufactured goods. No such information is a

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Growth Criteria. The problem of defining comparative advantage in the context of economic growth is very complex. It is not only a matter of determining the most efficient method of allocating existing resources, but also of mobilizing new resources. There are possibilities of encountering increasing and decreasing returns to scale; the external demand for exports may be highly inelastic, not to speak of structural disequilibrium and uncertainties about the future. A more serious limitation is caused by the non-quantitative interdependence among sectors such as is assumed by growth theorists like Hirschman and Lebenstein. For example, Hirschman, by supposing that one growth sequence (backward or forward linkage) is more effective than another because it economizes on decision making ability or provides a greater incentive to political action, implies a set of criteria having little to do with the criteria already considered. Furthermore, growth is considered a cumulative process which feeds on itself by generating new and more inputs such as increases in labor productivity and managerial ability as well as technological changes which are not only the cause, but also the consequence of the growth process.

One way to take these dynamic factors into account is to follow Nurkse[14] and define "incremental" or "marginal" comparative advantage, which may be different from the existing or "established" comparative advantage. One way of defining "incremental" comparative advantage would be to consi

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consider the technology and production functions as given, and then state that it is economical for a country to move towards the production of those commodities that draw more heavily upon the factors with a relatively greater growth rate. But technology will not remain unchanged. It will make our task of determining comparative advantage more difficult. One could assume that all inputs are growing at a constant, proportional rate and then look at the direction of technological change to define a partial or neo-incremental comparative advantage.[15]

This formulation, however, fails to take into account factors such as external demand conditions and differential rates of technological change at home and abroad. Moreover, incremental comparative advantage cannot be drawn upon to rank industries.

Baer and Kerstenetzky, while writing on import-substituting industrialization in Brazil, make use of a "repercussions effect" index that quantifies the backward and forward linkage effects to rank the industries according to the degree of comparative advantage.[16] Using the input-output table they computed the indexes of dispersion (backward linkage) and sensitivity to dispersion (forward linkage), using the following formulas:

$$U_j = \frac{\frac{1}{m} Z_j}{\frac{1}{m^2} \sum_{j=1}^{m} Z_j} \qquad (j = 1, 2, \ldots . m)$$

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$$U_i = \frac{\frac{1}{m} Z_i}{\frac{1}{m^2} \sum_{i=1}^{m} Z_i} \quad (i = 1, 2, \ldots . m),$$

and

$$U = \frac{(2U_j + U_i)}{2} \; ;$$

where U_j = index of the power of dispersion, U_i = index of the sensitivity to dispersion, Z_j = sum of the row elements of the transposed inverse matrix, Z_i = sum of the column elements of the transposed inverse matrix, m = number of industries. The index U_j indicating the extent of the expansion induced by industry j in the economy as a whole corresponds to an estimate of what Hirschman calls the backward linkage effect. U_i indicates the extent to which industry i is affected by an expansion of the economy at large and is an estimate of the forward linkage effect. The backward and forward linkages were combined in a single index (U) for ranking, giving double weight to the backward linkage because, according to Hirschman, backward linkages are more important than forward linkages.

The repercussions effect index, however, fails to incorporate factor endowments, rates of factor accumulation and technological changes as the determinants of comparative advantage.

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commodities according to comparative advantage have serious data problems and analytical shortcomings. Most of them fail to incorporate various important influences on comparative advantage. It is, therefore, necessary to draw upon alternative explanations of comparative advantage and trade that are analytically sound and which do not involve serious data problems. The following models meet both of the conditions.

ALTERNATIVE MODELS

FACTOR PROPORTIONS MODEL

The factor proportions model states that a country specializes in the production and export of a commodity that draws more heavily on the factor that the country is relatively well endowed with, i.e., a capital abundant country will export capital intensive products and a labor abundant country, labor-intensive products. Therefore a ranking of industries by their relative capital intensity will be consistent with the principle of comparative advantage. Following Professor Kreinin's suggestion[17] if all the industries are arrayed according to simple ratio of capital per worker, then, leaving aside some industries falling in the middle of the schedule, the pattern of trade between any two countries can be explained adequately by the factor proportions model.

The model is based upon the following assumptions:

(a) Perfect competition exists in factor and product markets.

(b) Fixed quantities of the two homogenous factors of p

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production, capital and labor, are fully employed in each country.

(c) For each commodity there is a common production function everywhere, and these production functions are mathematically homogenous of the first order and have the same elasticity of substitution everywhere.

(d) The production functions for the commodities are technologically distinct, i.e., they could be distinguished by factor intensity. This implies that at any ratio of wage rate to capital cost, the optimal ratio of capital to labor in a given industry, i, is always greater or always less than in any other industry, j, in a two-country-two-commodity framework. This is the so-called strong factor-intensity hypothesis.

(e) The quality (but not the quantity) of each factor in each country is identical, as are the production functions.

(f) There is completely free trade and transport costs are zero. However, there is perfect immobility of factors of production between countries.

Assumptions regarding relative factor abundance, identical production functions and strong factor intensity hypothesis are crucial to the use of the factor proportions model to approximate the principle of comparative advantage.

Relative Factor Abundance. There are two alternative formulations of relative factor abundance. Ohlin defines this concept on the basis of the pre-trade ratio of factor prices in

the two-country, two-commodity framework. Denoting countries by the subscripts A and B, and capital and labor by K and L respectively, country A is relatively capital abundant in the Ohlin sense if

$$\left(\frac{P_K}{P_L}\right)_A < \left(\frac{P_K}{P_L}\right)_B ,$$

before the trade begins. By definition capital is relatively cheaper in the capital rich country before trade, and labor in the labor-rich country. Jones, however, defines factor abundance in terms of physical factor endowments.[18] A country is relatively capital abundant if, and only if, it has a higher proportion of capital to labor than the other country. Thus country A is relatively capital abundant if

$$\left(\frac{\bar{K}}{\bar{L}}\right)_A > \left(\frac{\bar{K}}{\bar{L}}\right)_B ,$$

where $\bar{K}$ and $\bar{L}$ represent the total capital and labor stocks respectively. If there are two commodities, X and Y, with identical production functions for each in both countries respectively, i.e.,

$$Q_X = f(K_X, L_X)$$

$$Q_Y = g(K_Y, L_Y), \text{ and if}$$

$$\left(\frac{K}{L}\right)_X > \left(\frac{K}{L}\right)_Y ,$$

then country A will have comparative advantage in the production of X and B in the production of Y. This implies that, in general,

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general, "if the output of the two commodities is in the same proportion in both countries, the relatively capital abundant country will be able to expand its production of the capital-intensive commodity at a lower opportunity cost than the other country."[19] This is the definition of relative factor abundance that underlies our analysis.

Identical Production Functions. For the factor-proportions model, the assumption of identical production functions for a product in different countries is crucial. Having subsumed all supply phenomena under production functions, given identical tastes, we are left only with factor proportions to explain differences in prices as the basis of trade. As Romney Robinson has suggested, admission of different production functions will be fatal to the factor proportions analysis of trade because "comparative advantage theory, to be of the slightest analytic value, would then require an explanation of when and how production functions come to differ. The problem is to stop the theory from degenerating into a surface explanation, explaining anything *ex-post* and nothing *ex-ante*."[20] Hence the need for assuming an identical production function in our analysis.

Strong Factor-Intensity Hypothesis. The assumption of strong factor-intensity specifies that whatever the ratio of wage rate to capital cost, the optimal ratio of capital to labor in any given industry, i, is always greater or less than in any other industry, j. If this assumption holds, then a unique ranking of industries by capital/labor ratios can be

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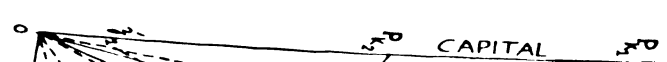
The geometric interpretation of this hypothesis is presented below with the help of diagrams II-1 and II-2.[21]

In diagram II-1, I_1I_1 and I_2I_2 are the unit isoquants for the commodities 1 and 2. It is possible to find a factor price ratio such that the resulting isocost line, P_KP_L, is tangential to both the isoquants. If the factor endowment rays of the countries a and b, under consideration, E_a and E_b, lie within the diversification cone, Z_1OZ_2, then there will be incomplete specialization, international factor-price equalization, and a ranking of commodities by their respective capital/labor ratios will be consistent with their ranking in order of comparative advantage. This is the strong factor-intensity hypothesis.

However, the violation of this hypothesis will make it impossible to uniquely rank commodities by capital/labor ratios that will be consistent with a ranking by the comparative advantage principle for all commodities and countries. Diagram II-2 shows what happens when this assumption is violated.

Diagram II-2 drops the assumption of a one-to-one correspondence between factor prices and commodity prices and constant elasticity of substitution between labor and capital. This gives rise to a factor intensity reversal. If the isoquants intersect more than once, there will be more than one common factor price ratio tangent to isoquants, giving rise to more than one diversification cone with no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FACTOR INTENSITY HYPOTHESIS

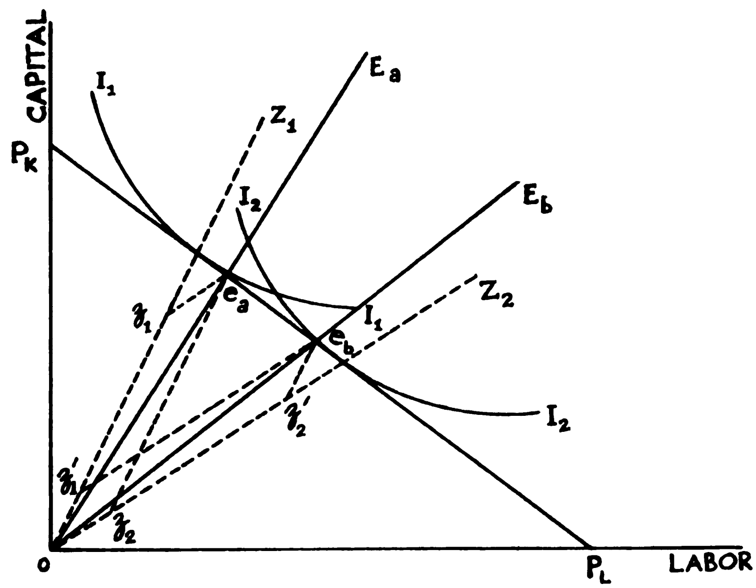

FIGURE II-1

FACTOR INTENSITY REVERSAL HYPOTHESIS

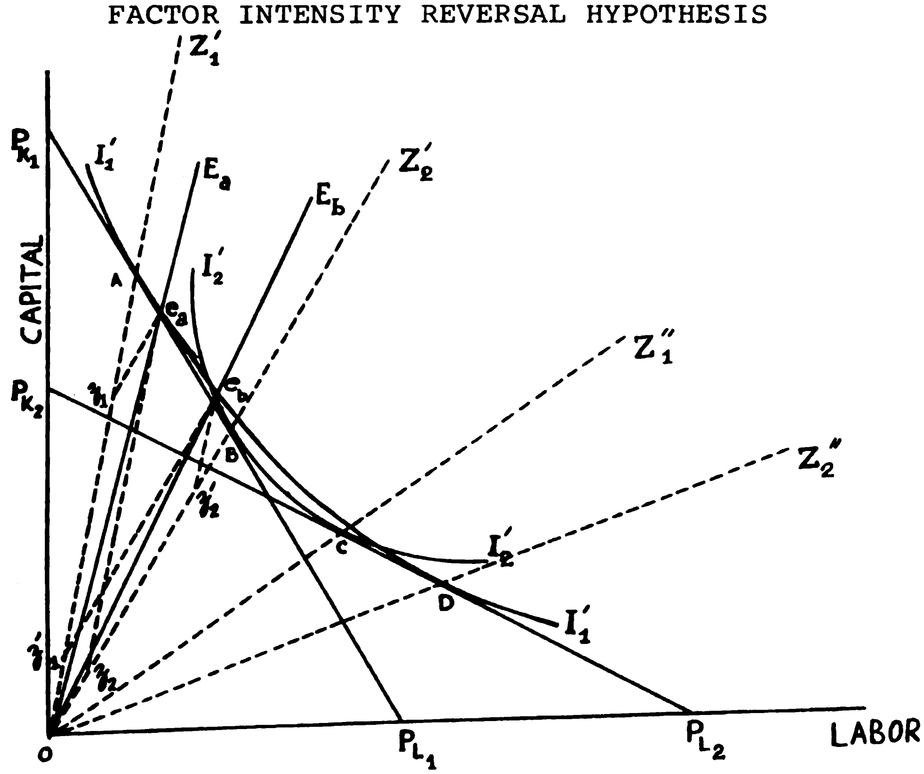

FIGURE II-2

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points in common (save in the degenerate case in which a double intersection is in fact a tangency). Now if the two factor endowment rays in the two-country model fall in different diversification cones, there is no unique way of ranking the commodities consistent with comparative advantage. For a unique ranking it is necessary that the endowment rays lie in the same diversification cone. Diagram II-2 shows two intersections of isoquants and two possible diversification cones $Z_1'OZ_2'$ and $Z_1''OZ_2''$. Under these circumstances we must assume that all the endowment rays either fall in $Z_1'OZ_2'$ or in $Z_1''OZ_2''$ to obtain unique ranking of commodities on the basis of capital/labor ratios.

In our analysis, therefore, we have to include a strong factor intensity assumption, or a much less strong assumption of limiting the factor endowment rays in a single diversification cone when factor intensity reversals and multiple solutions are possible.

Empirical evidence regarding the relevance of a strong factor-intensity assumption is not conclusive. Minhas' seminal work[22] seems to have shown that factor intensities were reversible as the C.E.S. production function fitted by him to international data showed elasticities of substitution both significantly different from unity and zero and also from one another. However, as Leontief[23] has pointed out, such reversals were practically insignificant (18 to 20 out of 210 possibilities) within relevant and observable ranges of factor endowments. Moreover, Fuchs and Merle Yahr[24] have also found little evid

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little evidence of factor intensity reversals. Similarly, investigations by Hal Lary, Moroney, and Hufbauer[25] have also tended to support the rejection of the reversibility hypothesis.

There are alternative methods of ranking industries according to capital/labor ratios. Hufbauer ranks the factor intensity of the final industry only, and does not take into consideration the decomposition of intermediate goods into labor and capital. Lary[26] uses the non-wage value added by manufacture per employee (roughly, value of output minus value of materials used and wages divided by employment) as a guide to interindustry differences in capital intensity. The higher the non-wage value added per employee, the more capital intensive the industry. Both Hufbauer and Lary consider only the direct input requirements and not the total--direct plus indirect--requirements in the production process. The Leontief[27] criterion of ranking industries according to the ratio of "total" capital and labor requirements is a more comprehensive and analytically better technique.

HUMAN SKILLS MODEL

The factor proportions model of trade has been subjected to severe criticism and controversy following the demonstration by Leontief that U. S. trade does not behave in conformity with this model.[28] Does this mean that the factor proportions model is oversimplified and fails to incorporate other and perhaps less systematic factors which have pervading influence on the structure of trade? Corden tri

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tries to answer this by suggesting that realism demands

> the consistent introduction of nontraded goods, of intermediate goods, of economies of scale, of product differentiation, of technical change as a determinant of the trade pattern, of transport costs, and of the size and nature of the home market--all of which would probably alter the model so much as to make it unrecognizable.[29]

This is an impressive array of causal variables not explicitly incorporated in the simple factor proportions explanation of trade patterns. Is it possible that the factor proportions model stressed the wrong type of "generic" factors as Professor Harrod suggests?[30] Recent empirical investigations by Keesing, Yahr, Waehrer, Kenen, and Bhagwati and Bharadwaj conclude that physical capital and labor are not the most effective generic factors whose relative availability determine trade patterns.[31] Moreover, evidence shows that differences in supplies of human skills afford a better factor proportions explanation of trade and location in manufacturing industries than do endowments of physical capital and labor within the framework of the factor proportions model. When human skills are treated as generic factors, the factor proportions theory seems to show results that accord with the intellectual appeal of the factor proportions model.

The Human Skills Model postulates that the availability of labor skills or human capital determines the pattern of international location and trade for a broad group of manufactured goods, those not closely tied to natural resources and those that are produced by the "footloose" industries. A country with relative abundance of highly trained

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personnel and skilled labor will have a comparative advantage in the production and export of skill intensive products while a country with a relative scarcity of skilled labor will have a comparative advantage in relatively less skill-intensive manufactures. A ranking of industries by their relative skill intensity will, therefore, represent a ranking according to the principle of comparative advantage.

Assumptions of the Skills Model. The assumptions underlying the human skills approach are similar to those used in the factor proportions model. We assume identical, homogeneous production functions for a commodity in all countries; perfect skills mobility internally but no mobility internationally; perfect competition and full utilization of resources; and the absence of "skill-intensity reversals"; in order to ensure a unique ranking of commodities according to their skill content. It is necessary to make the "strong" skill intensity assumption so that skill ratios or coefficients of one country could be used to rank industries that will be consistent with the principle of comparative advantage for other countries as well. Based on this assumption we can use the skill content of say, Japanese industries, to represent the same in developing countries.[32]

There is strong logical basis for regarding differences in labor skills availability as the basic explanation underlying location, specialization and trade in manufactured goods. First of all, in most industrial activities, labor is the most important factor of production as reflected by factor

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income shares. Moreover, although human skills can be augmented and are somewhat mobile internationally, in many respects the human resources of a country are subject to slower change and less international mobility than man-made resources such as physical or financial capital. The slower international mobility of human skills ensures that its initial availability in one place compared to another will have strong and persistent influence on industrial location. Furthermore, it is not possible to carry out rapid transformation of skills of a labor force. Some occupational skills can be acquired only through a long process of professional training. Broad classes of skills in any population can only be altered slowly. This is enough to maintain skill differences sufficient to produce persistent patterns of trade among nations. Another reason for taking skills into account in trade theory is that they appear to play an important role in explaining economic growth,[33] and we know that growth and trade are interrelated.

Moreover, various other factors like historical differences in skill supplies propagated down to the present moment by a need for skilled workers to train skilled workers, cultural differences among nations, unequal incomes, selective migration and the arbitrary division of labor that is sustained by trade among developed and developing economies, have created very definite differences in the endowment of skills among developed and developing economies. These factors are sufficient to produce persistent patterns of trade among nat

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There are alternative methods of ranking industries according to the skills model. Kravis and Waehrer have used the differences in wage rates as proxy for differences in skill intensity of commodities because higher wages and greater skill intensity go together. Similar approximations were employed by Roskamp, Yudin and Kenen.[34] Recently Baldwin applied Schulze's concept of human capital in the form of average years and cost of education of labor to rank commodities and determine the structural basis of U. S. trade.[35] Keesing has used the U. S. skill input coefficients to rank industries according to the ratio of "direct" requirements of skilled labor to "direct" requirements of unskilled labor in man-years.[36] All these criteria of human skills are closely related to each other. One expects a positive one-to-one relationship between the level of skills and wage rates. Similarly, average years of education and cost of education are positively related to the level of skills, i.e., the greater the level of skills, the greater the cost in time and resources to acquire it and vice-versa. It is, however, desirable to use the "total" skill requirements to estimate the ratio of skilled labor to unskilled labor in order to rank the industries.

RESEARCH AND DEVELOPMENT, TECHNOLOGY AND THE SCALE ECONOMY EFFECT

Keesing and certain other writers have come out with yet another explanation of the pattern of trade in manufactures.[37]

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It is suggested that a country with greater research and development (R & D) expenditures will have a comparative advantage in the production of newer and more sophisticated products. This is so because on the one hand R & D results in technical progress, lowers costs, attracts resources into industries with greater R & D expenditures and confers comparative advantage on them; on the other hand, it results in the development of new products not available elsewhere which leads to the creation of a comparative advantage for the country in the new commodities. One can, therefore, rank industries by the index of R & D that will be consistent with the comparative advantage. One index of R & D is the percentage of engineers and scientists employed in R & D activities in the total employment of the industry.

The impact of scale economies in production and distribution on the determination of comparative advantage is very important but little quantitative knowledge is available regarding many relevant dimensions of economies of scale so that no really good indicator is available. One commonly used indicator is the size of the home market; this suggests that a large home market is conducive to the export of goods produced under increasing returns to scale, while a small home market is conducive to the export of goods produced under constant or decreasing returns to scale.[38]

"REVEALED" COMPARATIVE ADVANTAGE

Professor Balassa has developed a measure for approximating the comparative advantage to assess the effects of trac

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trade liberalization among the developed countries of Western Europe, Japan and North America.[39] According to Balassa, cost considerations are not sufficient to explain the comparative advantage as it would leave out of consideration the non-price variables if their influence on the determination of comparative advantage is to be assessed. However, it may not be possible to do so in practice. In light of this limitation of the factor-proportions model, it seems desirable to provide information on "revealed" comparative advantage in order to consider the effects of generalized tariff preferences on the exports of developing countries.

The "revealed" comparative advantage can be indicated by the trade performance of individual countries with regard to manufactured products, in the sense that the commodity pattern of trade reflects relative costs as well as differences in non-price factors. The revealed comparative advantage can be estimated either by the export performance index or the export/import ratio index. The export performance index is more relevant to rank industries for analyzing the usefulness of a generalized preference system for the developing countries. (See Appendix I for detailed analysis.)

CHOICE OF MODELS

The theoretical models considered above tend to make the pattern of trade a function of one variable (or one set of variables) or another, while in fact the explanation of trade patterns is not so simple. It is therefore necessary to follow an acelectic approach to the estimation of comp

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comparative advantage. Instead of considering just one model, several alternative models will be used to rank manufactured commodities in developed as well as developing countries consistent with their comparative advantage. This approach will help us to incorporate in our analysis most of the factors that explain the structure of production, specialization and trade. If the ranking of industries comes out about the same on all models, this approach will at least lend some credibility to the results.

The factor proportions, human skills, R & D and scale economies models and the "revealed" comparative advantage are analytically sound and enough data are available to estimate their indexes to rank commodities. We will, therefore, use these models to test whether generalized tariff preferences will grant the greatest incentive to industries in which developing countries have relatively greater, and developed countries relatively lower, comparative advantage. The ranking indexes are developed in Chapter IV.

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NOTES TO CHAPTER II

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CHAPTER III

SELECTION OF COUNTRIES AND COMMODITIES

INTRODUCTION

Our aim is to find out whether or not generalized tariff preferences would grant relatively greater incentives to the establishment of industries in developing countries in which they have relatively greater comparative advantage and developed countries relatively lesser comparative advantage. This requires the selection of a set of countries and manufactured commodities. Only a small number of developing countries have a large manufacturing sector and a great number of manufactured exports. Therefore most of the gains from a preference system will accrue to the more advanced of the developing countries. The selection of developing countries for our investigation will, therefore, be made from these countries. Similarly, not all manufactured commodities can be of immediate interest as potential exports for the developing countries.

The selection of countries and commodities will, therefore, be arbitrary and the method followed for this purpose relies upon an arbitrarily chosen set of economic indicators. The need is to have a set of countries and commodities that will cover the bulk of manufactured exports of the

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SELECTION OF COUNTRIES

The rationale underlying the selection of developing countries is straightforward. Ccuntries with a small amount of and probably erratic manufactured exports, or those specializing in strongly resource-intensive manufactures were not considered. The economic indicators used to help in the selection process were the gross domestic product per capita, the size of the manufacturing sector in the economy, the share and the value of manufactured exports in total exports, and the growth rate of manufactured exports from developing countries to the developed market economy countries (DMEC).[1] These economic indicators are shown in Tables 2-6, Appendix II. Certain arbitrary critical values were assigned to these indicators in order to select the countries; these are presented in Table III-1. Taiwan, Hong Kong, Pakistan, India, Mexico, and Brazil are the developing countries that meet these conditions and thus were selected for our analysis. These countries are fairly advanced among developing countries, produce a large variety of manufactured goods, and are the major exporters of manufactured and semi-manufactured products among developing countries as indicated by Table III-2. Therefore, they are likely to be the main recipients of gains from generalized tariff preferences. Moreover, as these countries are already semi-industrialized rather than non-industrial, they will lend themselves to the application

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TABLE III-1

CRITICAL VALUES ASSIGNED TO ECONOMIC INDICATORS

No.	Economic Indicator	Critical Value Assigned
1	Gross Domestic Product per capita	Below $550.00
2	Manufactured Exports to DMEC's / Total Exports	15% and above
3	Income Originating in Manufactures / Gross Domestic Product	12% and above
4	Value of Manufactured exports to DMEC's	$50 million and above
5	Growth rate of Manufactured Exports to DMEC's	15% and above

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TABLE III-2

EXPORTS OF MANUFACTURES AND SEMI-MANUFACTURES OF SELECTED DEVELOPING COUNTRIES TO THE DEVELOPED MARKET ECONOMIES, 1966

Country	Value of Exports (Millions of Dollars)	Percentage of total
1. Hong Kong	859.0	20.9
2. Taiwan	185.9	4.5
3. Pakistan	120.7	2.9
4. Mexico	229.8	5.6
5. India	451.6	11.0
6. Brazil	160.4	3.9
Other Developing Countries	2,107.7	51.2
Total	4,115.1	100.0

Sources: U. N., "Commodity Trade Statistics," Series D; OECD, "Foreign Trade Statistics," Series C; "Exports of Manufactured Commodities from the Developing Countries," UNCTAD, Vol. IV, (New York: U. N., 1968), Table 15, p. 21.

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of the comparative advantage models analyzed in Chapter II.

The United States and the United Kingdom were selected as representative developed countries as they absorb about 70% of the manufactured exports of the developing countries.

SELECTION OF COMMODITIES

In reality the selection of commodities cannot be divorced from the choice of countries, but for the sake of analytical convenience they were considered separately. For the purpose of commodity selection, the manufactured and semi-manufactured commodities were defined according to the methodology followed by UNCTAD which includes many commodities lying in classes 0-4 according to SITC in manufactures and semi-manufactures.[2] Table 7, Appendix II, lists forty-five commodities classified according to the SITC three-digit classification covering the bulk of manufactured and semi-manufactured exports of the developing countries to the developed market economy countries. Of these, thirty-six commodities were selected for our analysis. They are listed in Table III-3.

The list includes almost all the manufactured and semi-manufactured exports of the selected countries. Moreover, the growth rates of imports of manufactured products into the DMEC's from developing countries were also used in the selection process because the growth rates show the competitive ability of the developing countries in the export of manufactures. Commodities with more than a 10% annual

TABLE III-3

TABLE III-3

SELECTED SAMPLE OF MANUFACTURES

SITC No.	Description of Commodity	SITC No.	Description of Commodity
013	Meat, Tinned or Prepared	656	Bags, Sacks, Linen, n.e.s.
032	Fish, Tinned or Prepared	657	Floor Coverings
053	Fruit, Preserved or Prepared	664	Glass
055	Vegetables, Preserved	665	Glassware
266	Synthetic Fibers	666	Pottery Products
551	Essential Oils and Perfumes	671	Pig Iron
599	Chemical Materials and Prod.	696	Cutlery, etc.
611	Leather	711	Non-electrical Machinery
612	Manufactures of Leather	724	Telecommunications Apparatus
629	Rubber Products	729	Electrical Goods, n.e.s.
631	Veneer and Plywood	821	Furniture
632	Wood Manufactures, n.e.s.	831	Travel Goods, Handbags
641	Paper and Paperboard	841	Clothing
642	Paper Products	851	Footwear
651	Textile Yarn & Thread	892	Printed Matter
652	Cotton Fabrics	893	Plastic Products
653	Woven Non-cotton Fabrics	894	Toys, Sporting Goods, etc.
653.2	Woolen Fabrics	897	Jewelry and Goldsmith
653.4	Jute Fabrics		
655	Special Textile Fabrics		

Source: Table A-II-7.

rate of growth of exports were included in the sample unless the developing countries already accounted for more than 10% of the total imports of a particular commodity in the developed countries. No commodity with less than $5 million in export value in 1966 was included in the sample in order to avoid incorporating the commodities with erratic and unstable markets.

NOTES TO CHAPTER III

[1] Developed market economy countries include all countries of the European Common Market, European Free Trade Area, U.S.A., Canada, Japan, Australia and New Zealand.

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CHAPTER IV

DERIVATION OF THE VARIABLES USED IN THE ANALYSIS

INTRODUCTION

This chapter estimates the effective tariff rates in the developed countries and develops alternative indexes to rank industries in the developed and developing countries by the degree of comparative advantage. We have already seen that only the factor proportions, human skills, R & D, scale economies model, and "revealed" comparative advantage, adequately approximate the principle of comparative advantage. While "revealed" comparative advantage forms the subject matter of Appendix I, and economies of scale are discussed in Chapter VII, other indexes will be developed in this chapter.

THE EFFECTIVE TARIFF PROTECTION[1]

The exports of processed goods from less developed countries to the developed countries are affected by the tariff structure in the developed countries, the transportation costs, the capital intensiveness and the technological requirements of the productive processes in certain products. The transportation costs provide "natural" protection to the importer and permit the remuneration of domestic factors in

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the industrial nations to exceed those in the developing countries. As capital is limited and expensive in the developing countries, it provides them a disincentive for exporting capital-intensive commodities. Similarly due to a shortage of skills and a lack of an advanced industrial structure, the developing countries are rarely able to export commodities at a high level of technological sophistication thereby providing "technological" protection to producers in developed countries. However, in recent years, considerable attention has been given to the effects of the industrial countries' tariff structure on the exports of processed goods from developing countries. This is due to the difference between the "nominal" and "effective" or "implicit" nature of protection provided by the tariff structure.

The ordinary nominal tariffs apply to commodities, but resources move as between economic processes or activities. Therefore, the resource allocation effects of a tariff structure depend upon the effective protection provided for each activity. The effective protective rate is the percentage increase in value added per unit in an economic activity which is made possible by the tariff structure relative to the situation in the absence of tariffs but with the same exchange rate. Alternatively, effective protection may be considered as the excess remuneration of domestic factors of production, obtainable by reason of the imposition of tariffs, as a proportion of value added in a free trade position. Therefore, in order to be able to sell in the protected markets of developed countries, producers in developing countries have to operate with a value added smaller than that in the importing, developed, nations--that is, only if the remuneration of domestic factors in the developing country is considerably lower than in developed countries.

The simple theory of effective protection is based upon some highly restrictive assumptions as enumerated by Leith:

(a) The rate of divergence between the free trade and protected prices of a tradeable measure the nominal tariff rate.

(b) The production functions are linear homogeneous.

(c) Strict input complementarity exists, implying zero elasticity of substitution between inputs.

(d) The elasticity of foreign supply of imports is infinite.

(e) The supply of domestic non-tradeable inputs is infinitely elastic.

(f) The elasticity of supply of other factor inputs to the domestic industry is less than infinite.

(g) Trade and production in protected industries exists both before and after the introduction of protection.

Given these assumptions, consider j as an importable product, and i an importable input for commodity j.

Now let

V_j = value added per unit of jth activity in the absence of tariffs,

V'_j = value added per unit of jth activity after tariff is imposed,

t_j = nominal tariff rate on j,

a_{ij}= input coefficient, i.e., share of ith input in the cost of jth output, <u>net</u> of tariff duty,

t_i = nominal tariff rate on input i,

g_j = effective rate for jth activity,

P_j = pre-tariff price of j.

Now

(1)....... $V_j = P_j(1 - a_{ij})$

(2)....... $V'_j = P_j[(1 + t_j) - a_{ij}(1 + t_i)]$

(3)....... $g_j = \dfrac{V'_j - V_j}{V_j} = \dfrac{P_j[(1+t_j) - a_{ij}(1+t_i) - (1-a_{ij})]}{P_j(1 - a_{ij})}$

(4)....... $g_j = \dfrac{t_j - a_{ij}t_i}{1 - a_{ij}}$,

and

$$g_j \gtreqless t_j \text{ if } t_j \gtreqless t_i.$$

Furthermore, for more than one input,

(5)....... $g_j = \dfrac{t_j - \sum_{i=1}^{n} a_{ij}t_i}{1 - \sum_{i=1}^{n} a_{ij}}$

and

(6)....... $\dfrac{t_j}{1 - a_{ij}}$ = gross subsidy per unit of value added in j due to tariff structure,

$$(7) \ldots\ldots\ldots \frac{a_{ij} t_i}{1 - a_{ij}} = \text{implicit tax rate (average) on value added in } j \text{ due to tariff structure.}$$

Therefore,

$$(8) \ldots\ldots\ldots \quad g_j = S_j - T_j.$$

If j is the manufactured exportable of the LDC's to a developed country, then the granting of a preference to the LDC's on jth product alone, other tariffs remaining unchanged, would reduce the subsidy--so far as competition with the preference-receiving countries are concerned--without reducing the implicit tax on production. In the extreme case of 100% preference on all the manufactured products for the developing countries, the producers in the non-preferred, "third," countries would have a disadvantage by comparison with their competitors in the preference-receiving countries, in the markets of preference-giving countries, to an extent measured by the implicit or effective rate of protection. This would be the most likely outcome if a generalized tariff preference system is introduced, considering that the tariff structures of developed countries which are escalated by the stage of production and obviously bias trade towards raw materials, fuels, and semi-fabricated goods, towards producers' goods rather than consumers' goods, towards goods of a luxury nature capable of bearing high tariffs, and towards both producers' and consumers' goods distinguished by technical superiority sufficient to overcome the competitive disadvantage imposed by tariffs (which are, of course, not

produced by the developing countries).

Introduction of more realistic assumptions like international mobility of resources, the violation of assumptions implying zero elasticity of input substitution, non-traded inputs and production for exports, will affect the magnitudes and the ranking of the effective protective rates.[2] In the absence of a unique method of exactly estimating the actual effective rates, we will use the estimates prepared by B. A. Balassa in our analysis.

Professor Balassa[3] has estimated the effective protection in the developed countries in terms of protection provided to the domestic factors of production by using the pre-tariff input coefficients from the Common Market countries. These estimates are presented in Table 8, Appendix II. These effective rates are "normalized" by obtaining a weighted average of effective rates of EEC, Japan, U.K., and the U.S.A., the main importers of manufactured goods from the developing countries. The effective rate of each developed country (region) was weighted by the value of its total trade in the commodity to which the rate applies. The results are presented in Table IV-1.

ESTIMATION OF COMPARATIVE ADVANTAGE INDEXES

The input-output technique was applied to the estimation of total requirements of primary inputs to determine (1) capital/labor ratios and (2) the human skills ratios for ranking industries. The input-output technique is a method

TABLE IV-1

WEIGHTED EFFECTIVE RATES OF SELECTED COMMODITIES

SITC No.	Description of Commodity	Weighted Effective Rates Pre-K.R.*	SITC No.	Description of Commodity	Weighted Effective Rates, Pre-K.R.
013	Meat, Tinned or Prepared	21.233	656	Bags, Sacks, Linen, n.e.s.	21.091
032	Fish, Tinned or Prepared	27.979	657	Floor Coverings	29.705
053	Fruit, Preserved or Prepared	15.968	664	Glass	25.988
055	Vegetables, Preserved	19.708	665	Glassware	25.988
266	Synthetic Fibers	25.562	666	Pottery Products	25.149
551	Essential Oils and Perfumes	20.697	671	Pig Iron	5.988
599	Chemical Materials and Products	15.350	695 -		
611	Leather	25.433	696	Fabricated Products	29.218
612	Manufactures of Leather	25.116	711	Non-electrical Machinery	16.238
629	Rubber Products	27.063	724	Telecommunications Apparatus	21.867*
631	Veneer and Plywood	39.529	729	Electrical goods, n.e.s.	26.017
632	Wood Manufactures, n.e.s.	27.052	821	Furniture	27.052
641	Paper and Paperboard	11.398	831	Travel goods, Handbags	25.116
642	Paper Products	11.398	841	Clothing	34.688
651	Textile Yarn & Thread	33.175	851	Footwear	30.319
652	Cotton Fabrics	33.585	892	Printed Matter	0.776
653	Woven Non-cotton Fabrics	55.389	893	Plastic Products	28.746
655	Special Textile Fabrics	30.703	894	Toys, Sporting Goods, etc.	35.924
			897	Jewelry	35.924

Source: Table A-II-8

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of analysis, which based on certain theoretical assumptions, makes possible the tracing out of the repercussions throughout the economy of a given change even in the most remotely connected sector. It is this structural interdependence that makes the input-output analysis so useful for estimating the "total"--i.e., "direct" plus "indirect" requirements of labor, capital and skills for the industries. An expansion in one industry, given the output of other industries, causes all other sectors to expand production calling for additional inputs of capital, labor and skills. Therefore, the "total" requirement of a primary input for an industry is determined not only by the increase in the output of that particular industry, but also the secondary increases in the outputs of all other industries as well as the industry under consideration to sustain the required increase in the output of the given industry.

Computational Technique.[4] The computation of total requirements of primary inputs, therefore, requires the "total requirements" input-coefficients matrix. This matrix can be obtained by subtracting the "direct" input coefficients matrix, A, from the identity matrix, I, and inverting the resultant non-singular, square matrix, [I - A].

Notationally:

(9)

$$A = \begin{bmatrix} a_{11}a_{12} \cdots\cdots\cdots a_{1n} \\ a_{21}a_{22} \cdots\cdots\cdots a_{2n} \\ \\ a_{n1}a_{n2} \cdots\cdots\cdots a_{nn} \end{bmatrix}$$

direct input-coefficient matrix where a_{ij} = input of ith industry to the jth industry;

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$$\underset{n\times n}{I} = \begin{bmatrix} 1 & 0 & \cdots\cdots\cdots & 0 \\ 0 & 1 & \cdots\cdots\cdots & 0 \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ 0 & 0 & \cdots\cdots\cdots & 1 \end{bmatrix} \quad \text{identity matrix.}$$

Then

(11)

$$(I-A)^{-1} = \begin{bmatrix} 1-a_{11} & -a_{12} & \cdots\cdots\cdots & -a_{1n} \\ -a_{21} & 1-a_{22} & \cdots\cdots\cdots & -a_{2n} \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ -a_{n1} & -a_{n2} & \cdots\cdots\cdots & 1-a_{nn} \end{bmatrix}^{-1},$$

or

(12)

$$(I-A)^{-1} = \hat{A} = \begin{bmatrix} \hat{a}_{11} & \hat{a}_{12} & \cdots\cdots\cdots & \hat{a}_{1n} \\ \hat{a}_{21} & \hat{a}_{22} & \cdots\cdots\cdots & \hat{a}_{2n} \\ \cdot & \cdot & & \cdot \\ \hat{a}_{n1} & \hat{a}_{n2} & \cdots\cdots\cdots & \hat{a}_{nn} \end{bmatrix} \quad \text{"total" input requirements matrix.}$$

Given the vectors of physical capital, labor and skills coefficients encompassing all the industries in the input-output matrix, the "total" primary input requirements can be obtained by pre-multiplying the total requirements matrix $[I-A]^{-1}$, by the respective primary input coefficients vectors.

Notationally,

$$(13) \qquad (f_{k1}, f_{k2}, \ldots, f_{kn}) \begin{bmatrix} \hat{a}_{11} & \hat{a}_{12} & \cdots\cdots & \hat{a}_{1n} \\ \hat{a}_{21} & \hat{a}_{22} & \cdots\cdots & \hat{a}_{2n} \\ \vdots & \vdots & & \vdots \\ \hat{a}_{n1} & a_{n2} & \cdots\cdots & \hat{a}_{nn} \end{bmatrix} = \begin{bmatrix} X_{k1} \\ X_{k2} \\ \vdots \\ X_{kn} \end{bmatrix},$$

where (f_{kj}) is the coefficient matrix vector of the primary input K, and $[X_{kj}]$ is the vector of total requirements of kth primary input for all the industries in the input-output matrix. Similarly, X_{kj} is the total requirement of kth input in jth industry.

Once these input requirements are calculated, the input ratios to rank industries can be obtained easily.

ESTIMATION OF CAPITAL/LABOR AND HUMAN SKILLS RATIOS

Capital/Labor Ratios. The total capital and labor requirements were obtained by pre-multiplying the inverse or total requirements matrices by vectors of capital and labor coefficients respectively. The capital coefficients were computed in the net form by dividing the net book value of capital stock and the inventories by the current value added of the respective industries. The inventory values included the inventories of finished products, work in process, and materials.[5] The labor coefficients were estimated in man-years as the ratio of the number of workers employed in an industry and its value added, i.e., the number of man-years required to produce one unit of value added.

The data on capital and labor coefficients was not available in sufficient detail for the developing countries. We, therefore, used the capital and labor coefficients of the Japanese industries for 1954 in estimating the input requirements for the developing countries. It is expected that these coefficients adequately reflect the industrial structure of the selected developing countries of today.[6] For the U. S. economy, the data on capital stocks was made available by Professor M. Gort of the State University of New York, Buffalo,[7] and inventory values were obtained from the Censuses of Manufacturing, Agriculture, Mining and Business. Mr. Alterman of the U. S. Bureau of Labor Statistics furnished the data on labor inputs for the U. S. economy (1963). The capital and labor coefficients for the British industries in 1960 were obtained from the studies prepared by the Cambridge University Growth Project.[8] These coefficients are presented in Tables 9-11, Appendix II, and were used along with national input-output tables to obtain capital and labor requirements. Capital/labor ratios were used to rank industries in the developed countries--a higher ratio implies higher comparative advantage. However, for the developing countries the ranking was done by labor/capital ratios--a higher labor/capital ratio indicates higher comparative advantage. These ratios are presented in Tables IV-2 - IV-6. The switch in ratios is aimed at determining the nature of and significance of correlation between effective tariff rates in the developed countries

TABLE IV-2

TABLE IV-2

TOTAL CAPITAL AND LABOR REQUIREMENTS OF MANUFACTURING INDUSTRIES IN MEXICO (1960)
(Per 1 Million Dollars of Output)

SITC	Description of Commodities	Capital in $1000/=	Labor man years)	Labor/ capital in $
013	Processed Meat Products	1233.239	3433.855	0.00270
032,053,055	Other Processed Products	1247.715	3265.694	0.00261
266	Synthetic Fiber	724.365	1278.996	0.00176
551	Essential Oils & Perfumes	1259.106	3038.813	0.00241
599	Chemical Materials & Products	1271.867	3276.193	0.00257
641,642	Paper & Paper Products	929.517	2219.159	0.00238
651-653	Textiles and Fabrics	969.979	3753.222	0.00386
655-657	Textile Products, n.e.s.	891.132	3605.884	0.00404
664-666	Glass, Glassware, Pottery Prod.	1155.031	1999.629	0.00173
671	Pig Iron	908.618	1794.274	0.00197
696	Fabricated Metal Products, and Cutlery Products	996.166	2530.026	0.00253
711	Non-electrical Machinery	610.693	1874.386	0.00306
729	Electrical Goods, n.e.s.	890.345	2082.204	0.00233
841,851	Clothing, Footwear	823.621	3370.294	0.00409
892	Printing & Publishing	731.603	1899.177	0.00259
629,893	Rubber and Plastic Products	767.481	1490.660	0.00194
894,897	Other Manufactures, n.e.s.	698.792	2631.996	0.00376

Source: Table 9, Appendix II, Inverse Input-Output Table of Mexico.

TABLE IV-3

TOTAL CAPITAL AND LABOR REQUIREMENTS OF PAKISTAN AND INDIA
(Per One Million Dollars Worth of Output

No.	SITC Equiva-lents	Description of Commodities	Pakistan: Total Labor Requirements (Man years) L	Pakistan: Total Capital Require-ments ($) K	Pakistan: L/K	India: Total Labor Requirements (Man years) L	India: Total Capital Require-ments ($) K	India: L/K
1	013,032, 053,055	Food Products	4298.64	929,457	0.00462	4247.287	1,034,516	0.004105
2	651-657, 841	Textiles,Clothing	4139.09	878,599	0.00471	3871.982	865,090	0.004475
3	631,632, 821	Wood Products, Furniture	5688.52	1,536,815	0.00370	--	--	--
4	641,642, 892	Paper, Products, printing	2825.10	861,588	0.00327	--	--	--
5	611,612	Leather and Leather Products	5229.49	1,238,073	0.00422	2770.693	540,391	0.005127
6	629	Rubber Manufactures	3688.76	1,095,556	0.00336	2468.905	668,961	0.003690
7	551,599	Chemical Industries	2877.51	1,080,762	0.00266	970.950	490,399	0.001979
8	664-666	Glass, Glassware, Pottery, etc.	2130.21	882,386	0.00241	1772.104	669,510	0.002646
9	671	Basic Metals Industries	2075.399	678,669	0.00305	1059.771	469,321	0.002258
10	711	Non-electrical Machines	3324.29	959,125	0.00346	1716.477	554,052	0.003098
11	724,729	Electrical Manu-factures	2411.21	755,702	0.00319	1456.890	527,960	0.002759
12	894,897	Misc. Manufactures	5323.59	1,056,787	0.00503	--	--	--
13	695,696	Fabricated Metal Products	4257.16	1,305,363	0.00326	1059.771	469,321	0.002258
14	851	Footwear	4139.09	878,599	0.00471	2770.693	540,391	0.005127
15	653*	Non-cotton Fabrics	--	--	--	4238.565	945,490	0.004536

Source: Table 9, Appendix II; Input-Output Matrices (Inverses) of Pakistan and India.

TABLE IV-4

TAIWAN'S TOTAL LABOR AND CAPITAL REQUIREMENTS
(Per One Million Dollars Worth of Output)

No.	SITC Equivalents	Description of Commodities	Total Labor Requirements (man-years)	Total Capital Requirements (Dollars)	Labor/ Capital
1	013,032 053,055	Canned Food Products	3,939.5398	1,483,913	0.002654
2	651-657	Textiles	4,431.4421	1,274,022	0.003478
3	631,632	Lumber & Plywood Products	2,850.1838	931,791	0.003058
4	641,642	Paper, Paper Products	2,395.4004	1,586,373	0.001509
5	611,612	Leather, Leather Products	5,775.9468	1,883,616	0.003066
6	629	Rubber Products	2,635.3586	1,206,354	0.002184
7	893	Plastic Products	2,086.1414	2,358,225	0.000884
8	551,599	Miscellaneous Chemicals	2,210.5524	1,901,447	0.001162
9	664-666	Glass, Glass Products and Clay Products	1,890.6505	1,397,343	0.001353
10	671	Iron and Steel	2,600.7848	1,121,763	0.002318
11	695,696	Simple Fabricated Metal Products	2,742.7580	1,484,218	0.001847
12	711	Non-electrical Machinery	3,104.3132	1,355,711	0.002289
13	724,729	Electrical Appliances	2,624.4051	1,648,264	0.001592
14	851	Footwear	5,775.9468	1,883,616	0.003066
15	841	Clothing	4,431.4421	1,374,022	0.003478
16	894-897	Miscellaneous Manufactures	3,740.0858	1,153,121	0.003244

Source: Table 9, Appendix II; Inverse Input-Output Matrix of Taiwan, 1961.

TABLE IV-5

TOTAL REQUIREMENTS OF CAPITAL, LABOR AND HUMAN SKILLS IN THE UNITED KINGDOM (1960)
(for £ 1 million worth of output)

		Factor Proportions			Human Skills		
SITC	Description of Commodities	Capital (£1000)	Labor man-years	Capital/Labor (£)	Skilled Labor-S_1 man-years	Unskilled Labor-S_2 man-years	$\frac{S_1}{S_2}$
013,032, 053,055	Processed Food	3605.899	2929.882	1230.7284	929.432	2145.062	0.43320
551,599	Chemicals	4756.909	2289.710	2077.5159	797.444	1489.557	0.53535
611,612, 851	Leather, Leather Products, footwear	2814.556	3860.619	729.0426	677.091	3181.924	0.21279
629	Rubber Products	3410.278	2964.759	1150.2715	766.708	2195.453	0.34922
631,632, 821	Wood Products and Furniture	1987.990	2980.044	667.1009	594.735	2394.143	0.24841
641,642, 892	Paper and Paper Products, Printing	2877.099	2307.108	1247.0586	730.11	1608.128	0.45401
651-657	Textile Products	3450.008	3493.463	987.5610	615.512	2876.143	0.21400
664,665, 666	Glass, Glassware and Pottery	3012.596	2468.176	1220.5758	593.635	1880.270	0.31571
671	Pig Iron, Products	5406.415	2555.990	2115.1941	650.481	1985.540	0.32760
695,696	Fabricated Metal Products, Cutlery, etc.	3298.355	2949.964	1118.1000	718.876	2228.605	0.32256
711,729	Electrical and non-electrical machinery, products	2742.798	2614.896	1048.9128	813.726	1803.402	0.45121
841	Clothing	2814.556	3860.619	729.0426	677.091	3181.924	0.21279

Source: Table 11, Appendix II; Inverse Input-Output Table of the United Kingdom

TABLE IV-6

TOTAL (DIRECT AND INDIRECT) CAPITAL AND LABOR REQUIREMENTS
OF VARIOUS INDUSTRIES PER $1 MILLION
OF OUTPUT (1963) IN THE U. S. A.

SITC No.	Total Capital Requirements in Thousands of Dollars	Total Labor Requirements in Man Years	Capital Requirement per Unit of Labor (In $, K/L)
013	3681.821	206.112	17863
032	3681.821	206.112	17863
053	3681.821	206.112	17863
055	3681.821	206.112	17863
266	2488.286	148.671	16737
551	2526.923	135.354	18669
599	2519.419	135.091	18649
611	1496.531	173.730	8614
612	1496.531	173.730	8614
629	2272.782	179.950	12630
631	2600.308	298.907	8699
632	2848.840	393.147	7246
641	2686.389	181.721	14783
642	2962.879	206.105	14375
651	3193.237	315.321	10127
652	3193.237	315.321	10127
653	3096.384	351.684	8804
655	3096.384	351.684	8804
656	2995.055	249.558	12001
657	2995.055	249.558	12001
664	2132.415	163.480	13043
665	2132.415	163.480	13043
666	2308.820	174.625	13221
671	2919.251	182.364	16007
696	2525.916	201.649	12526
711	2347.645	188.283	12468
724	1853.726	177.800	10426
729	2040.115	192.105	10619
821	1633.902	259.325	6301
841	2119.687	342.340	6191
851	1711.711	288.878	5925
892	1934.880	177.464	10903
893	2272.782	179.950	12630
894	2222.712	215.890	10295
897	2222.712	215.890	10295

Source: Table A-II-10 and the "'Total' Input Requirements Table, U. S. Economy (1963)," <u>Survey of Current Business</u>, November, 1969.

and the comparative advantage schedules of developed and developing countries, approximated by the relative capital (or labor) intensity.

Human Skills Ratios. Three alternative human skills indexes were developed to rank industries. They are the Total Skills requirements, the "direct" skills requirements (or Keesing), and the Productivity indexes.

(1) Total Skills Requirements Index. The occupational structure of industries was divided into the following five groups of skills:

1. Professional and technical workers,
2. Administrators and managers,
3. Clerical workers,
4. Sales workers,
5. Manual workers and unskilled service workers.

If x_{j1}, x_{j2}, x_{j3}, x_{j4}, and x_{j5} represent respectively the quantities of different types of skills required to produce one unit of value added in jth industry, then the coefficients of skilled and unskilled labor for various industries and sectors can be estimated in the following way:

Skilled Labor Coefficient for jth industry =

$$X'_j = \frac{\sum_{i=1}^{4} x_{j1}}{\sum_{i=1}^{5} x_{ji}} ,$$

and

Unskilled Labor Coefficient for jth industry = X''_j =

$$\frac{x_{j5}}{\sum_{i=1}^{5} x_{ji}} .$$

Given these skill coefficients we obtain the total requirements of skilled labor (S_{j1}) and unskilled labor (S_{j2}) in the following way:

(14) $(X'_j)\ [I-A]^{-1} = [S_{j1}]$

and

(15) $(X''_j)\ [I-A]^{-1} = [S_{j2}]$

where (X'_j) and (X''_j) are the skill coefficients vectors and $[S_{j1}]$ and $[S_{j2}]$ are the total skill requirements vectors.

We then obtained the ranking of industries by S_1/S_2 for the developed countries and by S_2/S_1 for the developing countries. The higher the ratio, the greater is the comparative advantage. The switching of ratios was, once again, aimed at emphasizing the significance and nature of correlation between comparative advantage of developing as well as developed countries and the structure of effective protection in the developed countries.

The skill coefficients for industries in the United States and Britain were obtained from skills matrices for the U. S. economy and Britain developed by Harowitz, Zymelman and Herrenstadt.[9] No information on skill coefficients was available for the developing countries. Therefore, Japanese skill coefficients for 1950 were used to determine total skills requirements ratios for industries in the developing countries.[10] These coefficients are presented in Tables 11-13,

Appendix II. The total skill requirements ratios are presented in Tables IV-5, IV-7-10.

(2) <u>The Keesing (Direct Requirements) Index</u>. This index is based upon Keesing's estimates of direct skill requirements ratios for the U. S. economy in 1960.[11] He divides the occupational structure of American industries into the following eight occupational groups:

1. Scientists and engineers,
2. Technicians and craftsmen,
3. Other professionals,
4. Managers,
5. Machinists,
6. Other skilled manual workers,
7. Clerical, sales and service workers,
8. Semi-skilled and unskilled workers.

Keesing assumes that managers, manual skilled workers and clerical workers, etc. do not have a significant effect on the trade patterns of countries. If X_{k1}, X_{k2}, X_{k3}, X_{k4}, X_{k5}, X_{k6}, X_{k7}, and X_{k8} represent the direct requirements of respective skills for the kth industry, then the Keesing skill index, S, can be computed as:

$$S_k = \frac{2(X_{k1} + X_{k2} + X_{k3}) + X_{k5}}{X_{k8}} \quad (16)$$

The higher this index, the more skill-intensive is the commodity. The American industries were ranked by this index as shown in Table 14, Appendix II. The occupational

TABLE IV-7

TOTAL REQUIREMENTS OF HUMAN SKILLS OF MANUFACTURING INDUSTRIES OF MEXICO (1960)
(per one million dollars of output)

SITC	Description of Commodity	Skilled Labor-S_1 (man years)	Unskilled Labor-S_2 (man years)	S_1/S_2
013	Processed Mean Products	944.052	3029.689	3.20923
032,053, 055	Other Processed Products	903.663	2971.723	3.28853
266	Synthetic Fiber	641.981	655.742	1.02143
551	Essential Oils & Perfumes	1168.346	1906.091	1.63144
599	Chemical Materials & Products	1050.122	2256.605	2.14889
641,642	Paper & Paper Products	895.516	1307.756	1.46033
651-653	Textiles and Fabrics	831.593	2825.923	3.39820
655-657	Textile Products, n.e.s.	810.212	2813.799	3.47291
664-666	Glass, Glassware, Pottery Products	787.323	1172.379	1.48906
671	Pig Iron	718.456	1087.905	1.51422
696	Fabricated Products, Cutlery Products	778.527	1753.099	2.25181
711	Non-electrical Machinery	625.562	1253.435	2.00369
729	Electrical Goods, n.e.s.	872.163	1214.385	1.39238
841,851	Clothing, Footwear	1078.618	2688.067	2.49213
892	Printing & Publishing	1011.988	889.918	0.87937
629,892	Rubber and Plastic Products	769.824	894.387	1.16180
894,897	Other Manufactures, n.e.s.	692.388	1905.288	2.75176

Source: Table A-II-12, Inverse Input-Output Table of Mexico.

TABLE IV-8

LABOR SKILLS REQUIREMENTS OF TAIWAN
(Per One Million Dollars Output)

No.	SITC Equiva-lents	Description of Commodities	Total Skilled Labor Requirements (man years)	Total Un-skilled Labor Requirements (man years)	Unskilled Labor / Skilled Labor
11	013,032, 053,055	Canned Food Products	644.8483	3185.9034	4.94054
2	651-657	Textiles	606.7359	3839.7609	6.32855
3	631,632	Lumber and Plywood Products	337.7647	2493.6740	7.38287
4	641,642	Paper, Paper Products	438.9386	1935.7348	4.41003
5	611,612	Leather, Leather Products	891.8606	4793.4213	5.37463
6	629	Rubber Products	450.3200	2202.0003	4.88985
7	893	Plastic Products	549.7966	1550.1647	2.81952
8	551,599	Miscellaneous Chemicals	510.8853	1719.4420	3.36561
9	664-666	Glass, Glass Products and Clay Products	326.0449	1607.7247	4.93099
10	671	Iron and Steel	493.7568	1927.6271	3.90400
11	695,696	Simple Fabricated Metal Products	466.0252	2284.0183	4.90106
12	711	Non-electrical Machinery	675.3178	2378.8228	3.52252
13	724,729	Electrical Appliances	669.2467	1958.8471	2.92694
14	851	Footwear	891.8606	4794.4213	5.37463
15	841	Clothing	606.7359	3839.7609	6.32855
16	894-897	Miscellaneous Manufactures	557.9043	3200.6531	5.73692

Source: Table 12, Appendix II; Input Output Matrix (Inverse) of Taiwan, 1961.

TABLE IV-9

LABOR SKILLS REQUIREMENTS OF PAKISTAN AND INDIA
(Per Million Dollars of Output)

No.	SITC Equivalents	Description of Commodities	PAKISTAN Skilled Labor Requirements (man years)	PAKISTAN Unskilled Labor Requirements (Man years)	PAKISTAN Unskilled/Skilled Labor	INDIA Skilled Labor Requirements (man years)	INDIA Unskilled Labor Requirements (Man years)	INDIA Unskilled/Skilled Labor
1	013,032, 053,055	Food, Manufactured Products	1679.686	2590.920	1.542502	636.163	3670.462	5.769687
2	651,657, 841	Textiles and Clothing	1376.681	2738.467	1.989180	446.328	3392.049	7.599901
3	631,632	Wood Products	2022.913	2667.347	1.318568	223.832	1852.856	8.277886
4	641,642	Paper, Products	1552.327	1264.771	0.814758	--	--	--
5	611,612	Leather & Leather Products	2139.221	3092.594	1.445663	452.629	2343.256	5.176990
6	629	Rubber Products	1949.567	1743.693	0.89440	406.345	2088.928	5.140774
7	551,599	Chemical Indus.	1595.900	1289.188	0.807812	221.424	737.390	3.330217
8	664-666	Non-Metallic Mineral Prod. (glass, pottery)	956.447	1172.568	1.225962	171.580	1068.494	6.227380
9	671	Basic Metals Industries	1153.453	925.412	0.802297	191.366	703.458	3.675982
10	711	Non-electrical Machinery	1727.908	1599.056	0.925428	401.300	1258.512	3.136087
11	724,729	Elec. Manufac.	1210.916	1087.026	0.897689	398.513	1043.366	2.618140
12	894,897	Misc. Manufac.	1370.269	3954.233	2.885734	--	--	--
13	695,696	Fabricated Metal Products	2297.488	1961.673	0.853830	401.300	1258.512	3.136087
14	821	Furniture	1954.100	2736.275	1.400273	--	--	--
15	851	Footwear	1336.003	2392.441	1.790745	350.118	2445.767	6.985550
16	892	Prin. and Pub.	1729.024	1115.720	0.645288	--	--	--
17	653 4	Jute Textiles	--	--	--	568.295	3719.380	6.544805

Source: Table 12, Appendix II; Input-Output Matrices (Inverses) of Pakistan and India.

TABLE IV-10

TOTAL SKILL REQUIREMENTS PER MILLION DOLLARS OF OUTPUT IN U. S. INDUSTRIES (1963)

SITC	Total Skilled Labor Requirements (in man years) (1)	Total Unskilled Labor Requirements (in man years) (2)	Total Skilled Labor Requirements Per Unit of Unskilled Labor (man years) 1/2
013	66.23389	140.51726	0.47135
032	66.23389	140.51726	0.47135
053	66.23389	140.51726	0.47135
055	66.23389	140.51726	0.47135
266	58.48164	90.17667	0.64852
551	54.98552	79.84508	0.68865
599	51.64904	90.17667	0.61987
611	36.94547	136.07076	0.27151
612	36.94547	136.07076	0.27151
629	59.21207	120.58467	0.49104
631	56.51263	242.47513	0.23306
632	72.92902	320.39453	0.22762
641	51.84514	130.86914	0.39616
642	57.74442	146.73225	0.39353
651	58.73003	256.57239	0.22890
652	58.73003	256.57239	0.22890
653	65.77014	283.84129	0.23171
655	65.77014	283.84129	0.23171
656	53.46978	194.50789	0.27489
657	53.46978	194.50789	0.27489
664	44.81665	118.38448	0.37856
665	44.81665	118.38448	0.37856
666	46.98184	128.41057	0.36587
671	42.55332	142.42001	0.29878
696	60.95037	140.85676	0.43271
711	42.55332	129.13870	0.45101
724	61.45302	115.98638	0.52982
729	63.40664	128.12369	0.49488
821	62.92258	211.67381	0.29726
841	61.54647	280.81126	0.21917
851	57.71474	231.14629	0.24968
892	86.72599	90.38221	0.95954
893	59.21207	120.58467	0.49104
894	66.44263	149.35757	0.44485
897	66.44263	149.35757	0.44485

Source: Table A-II-13; "Total Input Requirements Input-Output Table, U. S. Economy (1963)," Survey of Current Business, November, 1969.

data for other countries was not available in detail sufficient to construct the Keesing skill index.

(3) Productivity Index. There is a systematic and unique relationship between the productivity and the skill composition of an industry. Zymelman has shown that a higher level of productivity is systematically associated with a higher proportion of highly skilled workers in the final product and vice-versa.[12] This holds for all manufacturing industries in twenty-one countries analyzed by Zymelman. A ranking of industries by the level of productivity will, therefore, be consistent with the principle of comparative advantage. The higher the productivity, the greater is the comparative advantage of skill-intensive, developed countries, where productivity is estimated by fitting linear regression of the following form:

$$y_j = A + B_{ij}X_{ij} + B_{2j}X_{2j} + \ldots\ldots + B_{nj}X_{nj} + \epsilon \,, \tag{17}$$

where

y_j = value added per person in industry j, i.e., productivity in industry j.

x_{ij} = The proportion of type of labor (or occupation i (i = 1,2, ... , n) in the total labor employed in industry j;

B_{ij} = Regression coefficients;

A = Regression constant;

ϵ = Regression error.

The productivity (y_j) estimates were obtained from the study prepared by Zymelman for the U. N. Planning and Programming Series,[13] and are presented in Table IV-11.

TABLE IV-11

PRODUCTIVITY INDEXES OF MANUFACTURING INDUSTRIES
(in U. S. Dollars)

SITC	Description of Commodity	U.S.A. (1960)	U.K. (1960)	Japan (1960)	Argentina (1960)
013-055	Food and Beverages	11,250	2,410	1,140	2,070
651-657	Textile Mill Products	6,370	2,230	890	1,600
841	Clothing and Other Fabricated Textiles	5,990	2,840	600	710
611,612,851	Leather & Leather Products including Footwear	6,210	1,730	1,020	1,130
821	Furniture & Fixtures	7,180	1,810	730	640
631,632	Lumber & Wood Products, Including Furniture	7,180	1,800	760	640
641,642	Paper & Paper Products	10,680	3,330	1,530	3,070
892	Printing & Publishing	10,610	2,430	1,490	2,110
629	Rubber Products	9,980	3,060	1,360	1,600
551,599	Chemicals & Chemical Products	19,320	3,560	2,750	2,540
664,666	Glass, Stone & Clay Products	10,490	2,090	1,320	1,390
671	Iron and Steel	11,450	2,550	--	--
695,696	Fabricated Metals, Excluding Machinery	9,380	2,110	1,160	1,500
729	Electrical Equipment	9,750	2,100	1,570	1,500
861	Professional and Scientific Instruments	11,160	3,000	1,140	--
894,897	Misc. Manufactures (Sporting Goods, Toys, etc., n.e.s.)	7,200	2,100	970	1,820

Source: M. Zymelman, "Productivity, Skills and Education in Manufacturing Industries," Planning for Advanced Skills and Technology, Industrial Planning and Programming Series No. 3, (New York: U. N., 1969), pp. 120-37.

RESEARCH AND DEVELOPMENT

There is no exact method of ranking industries according to their R & D intensiveness. One R & D index that has been used by Keesing for the United States[14] is the ratio of engineers and scientists employed in R & D activities to the total skilled labor in the industry. Practically no information is available on the employment of human skills in R & D for the developing countries. Therefore, we shall confine ourselves to a theoretical discussion of the R & D and general preferences, to be presented in Chapter VII below.

AGGREGATION OF EFFECTIVE RATES

While the estimated values of the effective protection rates in the developing countries are available at the three digit SITC classification level, it was not possible to obtain the ranking of industries in the developing countries according to various indexes developed in this chapter at the same level due to the highly aggregated nature of developing countries' input-output tables. Therefore, it was necessary to adjust the effective protective rates by obtaining weighted averages of tariff rates for the three digit SITC industries consistent with the available input-output detail, with each rate weighted by the value of world trade in the product to which it applies.

CONCLUSION

In this chapter we have estimated the effective protection rates in the developed countries and alternative methods of ranking commodities in developing and developed countries in the order of their comparative advantage.

NOTES TO CHAPTER IV

[1]See B. A. Balassa, "Tariff Protection in Industrial Countries: An Evaluation," Journal of Political Economy, December, 1965, pp. 573-94; Giorgio Basevi, "The United States Industries and Industrial Labor," Review of Economics and Statistics, May, 1968, pp. 147-60; W. M. Corden, "The Structure of Tariff System and the Effective Protective Rate," Journal of Political Economy, June, 1966, pp. 221-37; G. H. Johnson, "The Theory of Tariff Structure with Special Reference to World Trade and Development," Trade and Development (Geneva: Librairie Droz, 1965); Economic Policies Toward Less Developed Countries (Washington, D.C.: The Brooking Institution, 1967); Stephen R. Lewis and Stephen E. Guisinger, "Measuring Protection in a Developing Country: The Case of Pakistan," Journal of Political Economy, 1968, pp. 1170-97.

[2]For elaboration on the issue of assumptions and the implications of their relaxation, see: Clark J. Leith, "Substitution and Supply Elasticities in Calculating the Effective Protective Rate," Quarterly Journal of Economics, October, 1968.

[3]B. A. Balassa, Kennedy Round Estimated Effects on Tariff Barriers, Part II, UNCTAD, Table A, pp. 209-13; "Tariff Protection in Industrial Countries: An Evaluation," Journal of Political Economy, December, 1965.

[4]This formulation of total requirements input-output matrix is adapted from: W. I. Abraham, National Income and Economic Accounting, (Englewood Cliffs, N.J.: Prentice-Hall Inc., 1969), notably Appendix to Chapter 5, pp. 184-88. A rigorous proof is discussed by Leontief in his Input-Output Analysis, (Cambridge: Cambridge University Press, 1966). The input-output tables and their inverses were obtained from the following: Wouter Tims, Input-Output Table for Pakistan, 1963-64 (in current prices), mimeographed, Harvard Development Advisory Service and Planning Commission, Government of Pakistan, 1965; Council for International Economic Cooperation and Development, Executive Yaun, Taiwan's Interindustry Inverse Matrix Table for 1961 (37 sectors), September, 1964, Taipeih; Mexican Input-Output Tables 1960, (Mexico: Banco De Mexico, S. A.); A. S. Manne and A. Rudra, et. al. "A Consistency Model of India's Fourth Plan," M.I.T. Center for International Studies, Sankhya, Series B, September 1965, pp. 57-144. "Total Requirement (Inverse)

Input-Output Matrix, U. S. Economy, 1963," Survey of Current Business, November, 1969; British Input-Output Relationships 1954-1966, A Program for Growth, No. 3, Department of Applied Economics, University of Cambridge, Supervised by Stone, Richard; Champman and Hall, 1963. No input-output tables are in existence for Hong Kong and Brazil.

[5]The methodology followed in the estimation of capital coefficients is derived from the following: John W. Kendrick, Productivity Trends: Capital and Labor, National Bureau of Economic Research, (New York: Columbia University Press, 1956); "Industry Changes in the Non-Labor Costs," Industrial Composition of Income and Products, (Kendrick, ed.) Brookings Institution and National Bureau of Economic Research, (New York: Columbia University Press, 1968), pp. 151-75; D. Creamer, S. P. Dolseovolsky and I. Borenstein, Capital in Manufacturing and Mining, Its Formation and Financing, (Princeton, N.J.: Princeton University Press, 1960).

[6]The Japanese capital and labor coefficients were obtained from the following sources: National Income Accounts, 1957, Economic Research Institute, Economic Planning Agency, Japan; National Wealth Survey, 1955; Economic Bulletin No. 1, February, 1959; Capital Structure of the Japanese Economy, Council for Industrial Planning, Tokyo, 1958; Japan Labor Yearbook, Council of Industrial Planning; T. Watanake, "Approaches to the Problems of Inter-Country Comparison of Input-Output Relation: A Survey and Suggestions," International Comparisons of Inter-Industry Data, U. N. Industrial Planning and Programming Series, No. 1, (New York: U. N., 1969), pp. 187-210.

[7]The Gort-Boddy estimates will appear in a forthcoming article on productivity changes in the U. S. economy from 1945-46 to 1963-64. Professors M. Gort and R. Boddy were kind enough to let me use their estimates of capital stock.

[8]A Program for Growth, Capital, Output and Employment, 1948-1960, The Department of Applied Economics, University of Cambridge, Chapman & Hall, April, 1964.

[9]M. A. Horowitz, M. Zymelman, and I. L. Herrenstadt, Manpower Requirements for Planning: An International Comparison Approach, (Boston: Northeastern University Press, 1966), pp. 16-17, 46-47.

[10]Ibid., pp. 30-31.

[11]Donald B. Keesing, "Labor Skills and the Structure of Trade in Manufactures," The Open Economy, (Peter B. Kenen, ed.), pp. 1-14, especially Table 1.

[12] M. Zymelman, "Productivity, Skills and Education in Manufacturing Industries," Planning for Advanced Skills and Technology, Industrial Planning and Programming Series No. 3, (New York: U. N. , 1969), pp. 103-38.

[13] M. Zymelman, op. cit., Annex I, pp. 119-37.

[14] D. B. Keesing, "The Impact of Research and Development on United States Trade," The Open Economy, (New York: Columbia University Press, 1968).

CHAPTER V

EFFECTS OF GENERAL PREFERENCES ON DEVELOPING COUNTRIES WHEN COMPARATIVE ADVANTAGE IS ESTIMATED BY THE FACTOR PROPORTIONS AND HUMAN SKILLS MODELS

INTRODUCTION

In this chapter we draw upon the factor proportions and human skills models to compare the schedules of manufactured commodities in developing countries ranked according to their comparative advantage with the effective tariff rates in the developed countries to determine the usefulness of generalized tariff preferences. On the assumption that the less developed countries will respond to preferences and expand production and exports of the preferred commodities, it is important to know whether the expansion will take place in industries in which these countries possess the greatest comparative advantage. The gains from generalized tariff preferences, therefore, depend upon the extent to which the structure of effective protection in manufactured products in the developed countries is positively correlated with the comparative advantage schedules of developing countries in manufactures.

FACTOR PROPORTIONS MODEL AND THE DEVELOPING COUNTRIES

While analyzing the investment criteria and the comparative advantage in the developing countries in the second chapter, we came across the problem of defining the prospective or "incremental" comparative advantage in the dynamic setting of changing factor endowments and technological change which obtains during the growth process. Growth is associated with the investment or capital formation; increase in the supply of labor through immigration, natural increase, education and training, and the increase in the quantity of natural resources through discovery of resources previously unknown. As the stock of factors of production changes, the specialization that is most advantageous changes as well. Furthermore, growth is accelerated by the growth of technology which may not necessarily be growing at the same rate and in the same direction in all the countries. This may give rise to differences in production functions from country to country and cause shifts in comparative advantage completely independent of the changes in factor endowments.

The changes in factor-endowments and technological change may be expected to greatly limit the usefulness of the factor proportions model in determining the comparative advantage of a developing country.[1] Nevertheless, a developing country's present comparative advantage provides the best available guide to its appropriate choice between industry and agriculture, complex and simple manufactures, import-replacement and export expansion, as it develops.[2] This is so because the fact that economic development is proceeding does not alter conditions sufficiently to alter the conclusions. One should also note that growth is taking place in developed as well as the developing countries accompanied by capital formation, etc., and such developments are likely to neutralize each other, leaving the relative factor endowments substantially unchanged. Moreover, the countries selected are semi-industrial rather than totally non-industrial so that some indication regarding their comparative advantage exists and it can be adequately reflected by the factor proportions model. However, this is also a limitation because past industrial development may not have been along comparative advantage. Furthermore, if unequal rates of change in productivity were the only allocational difficulties caused by economic development, relative factor endowments and calculations of comparative advantage based on it would still be the best single guide to allocation. Besides, if a country's techniques are advancing in one field, broadly speaking they tend to be advancing in other fields as well, and this widespread advance tends to leave relative resource endowment an important factor in comparative advantage.[3] Moreover, even in a country in which technical progress is taking place and changing comparative advantage, previous comparative advantage is the point of departure from which allocation should be decided.

It is, therefore, reasonable to use the ranking of manufactured commodities in developing countries according to labor/capital ratios as representing the degree of comparative advantage. Developing countries endowed with relatively greater stock of labor than capital are expected to have comparative advantage in the production and export of relatively labor-intensive commodities i.e., those for which labor/capital ratios are relatively higher. If the structure of effective protection rates in the developed countries is significantly and positively correlated with the schedule of manufactured commodities ranked according to labor/capital ratios in the developing countries, then the generalized tariff preferences for the manufactured exports of developing countries will promote the expansion of industries in which these countries possess comparative advantage. Chapter IV applied the input-output technique to rank manufacturing industries according to the ratio of total labor and total capital requirements.

The input-output tables for the developing countries are not available in detail sufficient to estimate labor/capital ratios for the commodities at the three digit SITC classification level. Input ratios could only be estimated for less than twenty broad groups of manufacturing industries. The effective protection rates were accordingly adjusted by obtaining weighted averages of tariff rates for the three digit SITC classified industries consistent with the input-output details available for developing countries with each rate weighted by the value of world trade in the product to which it applies.

In order to analyze the relationship between the effective tariff rates in the developed countries and the comparative advantage schedules of the developing countries in manufactured products, the following three alternative forms of linear regressions were fitted:

(1) $Y = \hat{\alpha} + \hat{\beta} X + \epsilon$ (simple linear regression)

(2) $Y = \hat{\alpha} + \hat{\beta} \log X + \epsilon$ (semi-log linear regression)

(3) $\log Y = \hat{\alpha} + \hat{\beta} \log X + \epsilon$ (double log linear regression)

where

Y_i = effective protection rate on activity i in the developed countries,

$\hat{\alpha}$ = regression constant,

$\hat{\beta}$ = regression coefficient--the slope of the regression line,

ϵ = the regression error.

A scatter diagram showing the relationship between effective tariff rates in the developed countries and comparative advantage indexes of the developing countries shows that a linear regression model will provide a good fit. Since the number of observations is small for the developing countries, it is desirable to use logarithmic models as well since these models are useful when the sample is small. Moreover, the double log transformation provides a measure of "constant elasticity" of Y with respect to X, $(\Delta Y/\Delta X \cdot X/Y)$, β.

In addition to the regression analysis, Spearman rank correlation was used to test the relationship between effective tariff rates in developed countries and schedules of manufactured commodities ranked by labor/capital ratios in developing countries.

STATISTICAL TESTS AND RESULTS

Regression Analysis. The results of country-by-country investigation are summarized in the equations given below:

Taiwan:

$$\begin{array}{llll} (4) & & \hat{Y} = 20.24910 + 0.00041952\ X & R^2 = .25449 \\ & & \qquad (1.784091)\quad (1.431031)^* & R = .50447 \end{array}$$

$$\begin{array}{llll} (5) & & \hat{Y} = 18.260492 + 0.00286330\ \log X & R^2 = .2819467 \\ & & \qquad (2.023655)\quad (1.902880)^* & R = .53099 \end{array}$$

$$\begin{array}{llll} (6) & \log & \hat{Y} = 10.199451 + 0.2881432\ \log X & R^2 = .3000411 \\ & & \qquad (1.2330501\quad (2.994333)^* & R = .54776 \end{array}$$

Number of observations = 16

Pakistan:

$$\begin{array}{llll} (7) & & \hat{Y} = 17.260988 + 0.00054513\ X & R^2 = .270008 \\ & & \qquad (1.12940)\quad (1.470021)^* & R = .519623 \end{array}$$

$$\begin{array}{llll} (8) & & \hat{Y} = 19.272443 + 0.0117738\ \log X & R^2 = .242715 \\ & & \qquad (1.1372)\quad (1.83001)^* & R = .492661 \end{array}$$

$$\begin{array}{llll} (9) & \log & \hat{Y} = 11.221334 + 0.159853\ \log X & R^2 = .166758 \\ & & \qquad (1.10270)\quad (1.23175)^{**} & R = .408360 \end{array}$$

Number of observations = 15

India:

$$\begin{array}{llll} (10) & & \hat{Y} = 18.210218 + 0.0053498\ X & R^2 = .418721 \\ & & \qquad (2.01390)\quad (1.480009)^* & R = .647087 \end{array}$$

$$\begin{array}{llll} (11) & & \hat{Y} = 20.219655 + 0.0161059\ \log X & R^2 = .418942 \\ & & \qquad (2.11600)\quad (1.69154)^* & R = .647258 \end{array}$$

$$\begin{array}{llll} (12) & \log & \hat{Y} = 10.104456 + 0.371114\ \log X & R^2 = .438983 \\ & & & R = .662558 \end{array}$$

Number of observations = 14

Mexico:

$$\begin{array}{llll} (13) & & \hat{Y} = 18.3555 + 0.00386926\ X & R^2 = .267557 \\ & & \qquad (1.98021)\quad (1.337501)^{**} & R = .517259 \end{array}$$

$$(14) \quad \hat{Y} = \underset{(1.87531)}{19.86370} + \underset{(1.510021)*}{0.00198637} \log X \qquad R^2 = .207962, \quad R = .456023$$

$$(15) \quad \log \hat{Y} = \underset{(2.033691)}{12.86440} + \underset{(1.163580)}{0.111783} \log X \qquad R^2 = .0874562, \quad R = .29573$$

Number of observations = 18.

ψ = the t-statistic values are given in the parentheses.
* the starred values indicate significant results at the 0.05 level; ** indicates significant results at the 0.10 level.

The regression analysis indicates significant and positive correlation between the structure of effective protection rates in the developed countries and the schedules of commodities ranked by labor/capital ratios in the developing countries. The parameter is not very large for any of the developing countries; this is perhaps due to the high level of aggregation. Yet this aggregation is imposed by data constraint. Moreover, the manufactured products are in general subject to relatively higher tariffs with relatively small spread between tariff rates. However, in all cases, the coefficient of correlation (R) indicates a significant and positive correlation between the tariff structure of the developed countries and the comparative advantage of developing countries in manufactures.

Rank Correlation. The conclusions of the regression tests are reinforced by the rank correlation tests which show significant and positive (between .4 and .7) correlation between effective protection rates of the developed countries and the schedules of manufactured commodities ranked by labor/capital ratios in the developing countries. The results of rank correlation tests are summarized in Table V-1.

HUMAN SKILLS MODEL

In this section we apply the Human Skills Model to rank manufactured commodities in developing countries in the order of their comparative advantage to test for the relevance of generalized tariff preferences. The developing countries with a relative abundance of unskilled labor are expected to have comparative advantage in the production and export of relatively less skill-intensive products. The Total Skill Requirements Index, as developed in Chapter IV for the developing countries, i.e.,

$$\frac{S_2}{S_1} = \frac{\text{Total Requirements of Unskilled Labor}}{\text{Total Requirements of Skilled Labor}}$$

can be used to rank manufactured commodities. Such a ranking represents the comparative advantage of developing countries--the higher the index, the greater is the degree of comparative advantage of the developing countries.

Statistical Tests and Results. Data was drawn upon from Chapter IV to fit linear regressions and rank correlation tests were carried out to determine the nature of the relationship between the structure of effective protection rates in the developed countries and the schedules of manufactured commodities ranked by the total skills requirements index in the developing countries. The results of the country-by-country investigation are summarized below.

Regression Analysis. The following equations

TABLE V-1

RESULTS OF RANK CORRELATION TEST--THE FACTOR PROPORTIONS MODEL

Countries	Rank Correlation Coefficient r*	t - value	Significance Level	Number of Observations
Taiwan	0.4400	1.6852	0.075	16
Pakistan	0.5070	1.93167	0.05	15
India	0.7170	2.93826	0.025	14
Mexico	0.3710	1.54707	0.075	18

$$* \; r = 1 - \frac{6D^2}{N(N^2-1)}$$

where

D = difference between each X and Y pair,

N = number of pairs of variables.

Sources: Tables IV-1 - IV-4.

summarize the results of linear regression tests:

Taiwan:

(16) $\hat{Y} = 22.49325 + 0.095398\ X$ $\qquad R^2 = .410051$
$\qquad (1.89322) \quad (2.23597)^*$ $\qquad R = .64035$

(17) $\hat{Y} = 12.98600 + 0.121756 \log X$ $\qquad R^2 = .432090$
$\qquad (2.00451) \quad (1.93740)^*$ $\qquad R = .65733$

(18) $\log \hat{Y} = 7.90776 + 0.543330 \log X$ $\qquad R^2 = .395882$
$\qquad (1.67191) \quad (2.09841)^*$ $\qquad R = .62919$

Number of observations = 17.

Pakistan:

(19) $\hat{Y} = 18.35486 + 0.039871\ X$ $\qquad R^2 = 0.471822$
$\qquad (1.900386) \quad (2.39320)^*$ $\qquad R = 0.68689$

(20) $\hat{Y} = 20.577976 + 0.030647 \log X$ $\qquad R^2 = 0.569272$
$\qquad (2.07051) \quad (1.960883)^*$ $\qquad R = 0.75450$

(21) $\log \hat{Y} = 8.54499 + 0.261719 \log X$ $\qquad R^2 = 0.375705$
$\qquad (1.90335) \quad (1.87115)^*$ $\qquad R = 0.612947$

Number of observations = 17.

India:

(22) $\hat{Y} = 22.78608 + 0.0981809\ X$ $\qquad R^2 = .402201$
$\qquad (1.93871) \quad (2.07033)^*$ $\qquad R = .63419$

(23) $\hat{Y} = 18.02658 + 0.019441 \log X$ $\qquad R^2 = .379446$
$\qquad (2.01866) \quad (1.77150)^*$ $\qquad R = .61599$

(24) $\log \hat{Y} = 9.32583 + 0.423287 \log X$ $\qquad R^2 = .350336$
$\qquad (1.23650) \quad (2.14766)^*$ $\qquad R = .60028$

Number of observations = 16.

Mexico:

(25) $\hat{Y} = 17.0568 + 0.042051\ X$ $\qquad R^2 = .275841$
$\qquad (1.73741) \quad (2.19100)^*$ $\qquad R = .525206$

(26) $\hat{Y} = 12.15374 + 0.0221157 \log X$ $\qquad R^2 = .275896$
$\qquad (2.11960) \quad (2.01531)^*$ $\qquad R = .525258$

(27) $\log \hat{Y} = 7.33701 + 0.324346 \log X$ $\qquad R^2 = .295395$
$\qquad (1.93691) \quad (1.97115)^*$ $\qquad R = .543502$

Number of observations = 18.

$X_i = (S_2/S_1)_i$ of the respective countries,

ψ = The values in parentheses are the t-statistics.

* Indicates that the results are significant at the 0.05 level.

The regressions show very significant and positive correlation between the structure of effective protection in the developed countries and the comparative advantage schedules of developing countries in manufactures as approximated by the total skills requirements index. It implies that the higher the comparative advantage of the developing countries in a product, the greater is the effective protection provided to the activity producing that product in the developed countries. Therefore, generalized preferences will promote the expansion of those industries in the developing countries in which they have relatively greater comparative advantage.

Rank Correlation. The rank correlation tests reinforce the results of regression analysis as indicated by the strong positive correlation between effective tariff rates in developed countries and skill indexes in the developing countries (Table V-2). This means that as the proportion of unskilled labor in the total labor employed in an industry increases, the effective rate of protection in the developed countries also increases.

COMBINING THE FACTOR PROPORTIONS AND HUMAN SKILLS MODELS

The existing stock of human skills in an economy can be regarded as the capital stock embodied in people, or the human capital. This is so because the acquisition of a

TABLE V-2

RESULTS OF RANK CORRELATION TESTS--HUMAN SKILLS MODEL

Countries	Rank Correlation Coefficient	t-value	Significance Level	Number of Observations
Taiwan	0.6000	2.59806	0.025	16
Pakistan	0.73830	4.08852	0.001	17
India	0.7660	3.76106	0.001	15
Mexico	0.4690	2.05422	0.05	18

Sources: Tables IV-1, IV-7-9.

skill involves investment and gives rise to a stream of income overtime. In the current state of economic knowledge, it is useful to treat human and non-human (material) capital as alternative forms of capital in general.[4] It is, therefore, desirable to aggregate human and non-human capital to obtain a generalized stock of capital and use it in ranking the commodities according to their relative capital intensity. One way of doing this is to treat the difference between skilled labor and unskilled labor wage rates as an approximate measure of the return to human capital, capitalizing this rental to secure alternative estimates of human capital.[5] This can be added to the material capital to obtain total capital required in each industry. Unfortunately no information on the structure of wages in developing countries is available making it extremely difficult to aggregate human and physical capital.

In this analysis it appears unnecessary to aggregate human and material capital, because both human skills and factor proportions models yielded the same results. This was demonstrated by Kenen and Baldwin.[6] However, there could be offsetting effects. The ranking in terms of aggregate capital intensity may fail to improve the results; it may even reverse them.

PRODUCTIVITY MODEL

No information was available on the productivity indexes for the countries included in our study. However, evidence on Argentina and Japan indicates significant and negative correlation between productivity indexes and the structure of effective protection on manufactures in the developed countries. The results are summarized by the linear regressions given below:

Argentina:

$$\hat{Y} = \underset{(2.00973)}{36.7664} - \underset{(2.87351)^{*}}{0.0100766}\,X \qquad R^2 = .327434 \quad R = -.572218$$

Japan:

$$\hat{Y} = \underset{(2.01057)}{35.5588} - \underset{(2.299140)^{*}}{0.00990247}\,X \qquad R^2 = .343461 \quad R = -.586055$$

Number of observations = 17.

t-values are given in the parentheses.

* Indicates significant results at .10.

This reinforces the conclusion that the tariff structure of developed countries discriminates more heavily against the manufactured products in which developing countries are likely to have comparative advantage, i.e., the commodities with relatively lower productivity indexes.

CONCLUSIONS

The country-by-country analysis as presented above shows a significant and positive relationship between the effective protection in the developed countries and the comparative advantage in the developing countries. Since no input-output tables for Brazil and Hong Kong are in existence, it was not possible to carry out any investigation for these countries. However, it is expected that the conclusions drawn from the study of the other four developing countries will also hold true for Brazil and Hong Kong. A generalized tariff preference system for the manufactured exports of developing countries will, therefore, be in conformity with the comparative advantage of the developing countries.

NOTES TO CHAPTER V

[1]The impact of growth on resources endowment and comparative advantage forms the basis for Nurkse's work on "incremental" or "marginal" comparative advantage. For details see:

Ragnar Nurkse, Problems of Capital Formation in Underdeveloped Countries and Patterns of Trade, A Galaxy Book (New York: Oxford University Press, 1967), pp. 193-226; Hla Mynt, "International Trade and the Developing Countries," International Economic Relations, (Paul A. Samuelson, ed.) International Economics Association, (Macmillan, 1969), pp. 15-35; Trade in Manufactures, Proceedings of UNCTAD, Vol. V (New York: U. N., 1965).

[2]E. E. Hagen, Economics of Development (Homewood, Ill.: Richard D. Irwin, 1968), pp. 417-80; Hollis B. Chenery, "Comparative Advantage and Development Policy," American Economic Review, March, 1961, pp. 18-51.

[3]E. E. Hagen, op. cit., pp. 443-46.

[4]Harry G. Johnson, "Toward A Generalized Capital Accumulation Approach to Economic Development," The Residual Factor and Economic Growth, Organization for Economic Cooperation and Development, Paris, 1964; T. W. Schultz, (ed.) "Reflections on Investment in Man," Journal of Political Economy, Supplement, Vol. LXX, No. 5, part 2, October 1962, pp. 1-8; G. S. Becker, Human Capital (New York: National Bureau of Economic Research, 1965).

[5]Peter B. Kenen, Skills, Human Capital and U. S. Foreign Trade, International Economics Workshop paper, Columbia University, December, 1965 (mimeographed); "Nature, Capital and Trade," Journal of Political Economy, Vol. 73, October, 1965; R. Bhardwaj and J. Bhagwati, "Human Capital and the Pattern of Foreign Trade: The Indian Case," Indian Economic Review, October, 1967.

An alternative form is suggested by Roskamp and Mc Meekin who capitalize the excess of wages and salaries over the national average wage rate to obtain an estimate of embodied human capital. See their article, "Factor Proportions, Human Capital, and Foreign Trade: The Case of West Germany Reconsidered," Quarterly Journal of Economics, Vol. 82, February, 1968.

[6] P. B. Kenen, *op. cit.*, Robert E. Baldwin, *Determinants of the Commodity Structure of U. S. Trade* (mimeographed), Social Systems Research Institute, University of Wisconsin, 1969.

CHAPTER VI

EFFECTS OF GENERAL PREFERENCES ON DEVELOPED COUNTRIES WHEN COMPARATIVE ADVANTAGE IS ESTIMATED BY THE FACTOR PROPORTIONS AND HUMAN SKILLS MODELS

INTRODUCTION

The generalized tariff preferences for the manufactured exports of developing countries will change the sources of supply of certain manufactured products imported into the developing countries. The developing countries may be able to outcompete the domestic producers and the exporters of developed countries. To the extent that exporters of developing countries tend to replace the exporters of developed countries due to discriminatory tariff cuts, some trade diversion--i.e., shift in the source of import supply from a relatively efficient to a less efficient source--will result. The trade diversion effect will be minimized if the generalized preferences give the greatest incentive to developing countries to export commodities in which developed countries have least comparative advantage. In other words the allocative loss to developed countries will be minimized if the structure of their effective protection rates is significantly and negatively correlated with their comparative advantage schedule. Theoretically one would expect a politically "rational" tariff structure to be negatively correlated with comparative advantage, as the least competitive industries are expected to press for the highest protection. This chapter uses the schedules of manufactured commodities ranked by factor proportions and human skills models and compares them with the structure of effective protection rates to analyze the effects of general preferences on developed countries.

THE FACTOR PROPORTIONS MODEL

As the developed countries are favorably endowed with capital relative to labor, it is logical to assume that they will have comparative advantage in the production and export of capital-intensive products, and comparative disadvantage in the production of relatively labor-intensive commodities. It is, therefore, possible to rank commodities by the capital/labor ratios as suggested in Chapter IV and compare the schedule of ranked commodities with the structure of effective protection rates. The input-output technique was used to obtain "total" capital and labor requirements in order to compute the capital/labor ratios for the manufacturing industries of the United States and the United Kingdom. Chapter IV explains the methodology of estimating capital/labor ratios in detail.

Linear regression and rank correlation tests were carried out to determine the nature of correlation between effective tariff rates in the developed countries and capital/labor ratios in the U. S. and U. K. by drawing upon the estimates of effective tariffs and K/L presented in Chapter IV.

<u>Regression Tests</u>. Three alternative forms of linear regressions were fitted to regress capital/labor ratios on effective protection rates. The results are summarized by the following equations:

United States:

(1) $\hat{Y} = 43.7832 - 0.001568\ X$ $\quad R^2 = .268944$
$\dagger$ (2.60093) (-2.10391)* $\quad R = -.518598$

(2) $\hat{Y} = 47.3556 - 0.000663 \log X$ $\quad R^2 = .09613$
(2.92106) (-1.29271)* $\quad R = -.310049$

(3) $\log \hat{Y} = 26596.7 - .76224 \log X$ $\quad R^2 = .100023$
(3.0000) (-1.0829) $\quad R = -.316264$

Number of observations = 35.

United Kingdom:

(4) $\hat{Y} = 41.69940 - 0.0388467\ X$ $\quad R^2 = .597245$
(2.970132) (-3.182530)* $\quad R = -.772816$

(5) $\hat{Y} = 44.1546 - 0.0305807 \log X$ $\quad R^2 = .607387$
(2.83510) (-2.77150)* $\quad R = -.77935$

(6) $\log \hat{Y} = 556.1830 - 0.512711 \log X$ $\quad R^2 = .544482$
(3.089881) (-2.54190)** $\quad R = -.73789$

Number of observations = 13.

$\hat{Y}_i$ = The effective protection rate on i-th activity in the developed countries,

X_i = the capital/labor ratio of the i-th industry,

$\dagger$ = the t- values are presented in the parentheses,

* indicates values that are significant at the 0.05 level.

The regression analysis indicates very significant and negative correlation between capital/labor ratios in the United States and United Kingdom and the effective protection rates in the developing countries. This result conforms with Basevi's conclusions that the U. S. tariff structure provides especially heavy protection to the labor-intensive industries.[2] This means that the U. S. and U. K.--the two major importers of manufactures from the developing countries--tend to protect most heavily the activities in which they have least comparative advantage. A generalized preference system will, therefore, give the greatest incentives to developing countries to export those commodities to developed countries in which the latter have least comparative advantage. Hence, the trade diversion effect will be minimum.

Rank Correlation Tests. The results of rank correlation tests (Table VI-1) tend to reinforce the conclusions derived from regression analysis. Very significant negative rank correlation coefficients characterize the relationship between effective protection rates in the developed countries and comparative advantage schedules of the U. S. and U. K.

TABLE VI-1

RESULTS OF RANK CORRELATION TESTS--
FACTOR PROPORTIONS MODEL

Countries	Coefficient of Rank Correlation (r)	t-Value	Significance Level	Number of Observations
U. S. A.	-0.61116	-4.227407	0.005	35
U. K.	-0.86540	-5.4415	0.01	13

Sources: Tables IV-1, IV-5,6.

HUMAN SKILLS MODEL

Developed countries with a relative abundance of professional personnel and highly trained labor are expected to have comparative advantage in the production and export of the relatively skill-intensive goods, and comparative disadvantage in the relatively less skill-intensive products. We can, therefore, rank commodities according to their skill content to represent comparative advantage. The schedule of ranked commodities can then be compared with the structure of effective protection rates.

As developed in Chapter IV, three alternative skill indexes--the Total Skills Requirements, the Keesing Skill and the Productivity Indexes--were used to rank the commodities. Linear regression and rank correlation tests were carried out to determine the nature and significance of correlation between effective protection rates (Y) and the schedules of industries for the United States and United Kingdom, ranked by the human skills indexes (X).

Regression Tests.

U. S. A. The results of regression tests regressing human skills indexes (X) on effective protection rates (Y) in developed countries are summarized by the equations given below:

(a) The Total Skill Requirements Index (S_1/S_2):

(7) $$\hat{Y} = \underset{(4.10080)}{38.2583} - \underset{(-2.71901)^*}{0.0321996}\, X \qquad R^2 = .281609 \quad R = -.530668$$

(8) $$\hat{Y} = \underset{(3.58991)}{64.5978} - \underset{(-3.00461)^*}{0.027356} \log X \qquad R^2 = .392586 \quad R = -.626567$$

(9) $\log \hat{Y} = 8027.39 - 0.10056 \log X$ $\quad R^2 = .281173$
$(2.98000)\ (-2.27325)^{*}$ $\quad R = -.530257$

Number of observations = 35.

(b) The Keesing Skill Index (S):

(10) $\hat{Y} = 37.0569 - 0.0033009\ X$ $\quad R^2 = .290301$
$(4.60032)\ (-2.1130)^{*}$ $\quad R = -.59080$

Number of observations = 32.

(c) The Productivity Index (y):

(11) $\hat{Y} = 40.7779 - 0.0016975\ X$ $\quad R^2 = 0.264707$
$(2.00019)\ (-1.77725)^{**}$ $\quad R = -.514497$

(12) $\hat{Y} = 46.1640 - 0.0000908 \log X$ $\quad R^2 = 0.0912906$
$(2.2336)\ (-0.62013)$ $\quad R = -.302143$

(13) $\log \hat{Y} = 820411.0 - 1.16796 \log X$ $\quad R^2 = 0.133697$
$(2.63000)\ (-0.69300)$ $\quad R = -.365645$

Number of observations = 18.

United Kingdom. The following equations summarize the results of regression tests:

(a) Total Skills Requirements Index (S_1/S_2):

(14) $\hat{Y} = 42.3178 - 0.00729763\ X$ $\quad R^2 = .39177$
$(3.29781)\ (-2.235510)^{**}$ $\quad R = -.625915$

(15) $\hat{Y} = 47.7023 - 0.0229742 \log X$ $\quad R^2 = .434055$
$(3.49915)\ (-2.511943)^{*}$ $\quad R = -.658828$

(16) $\log \hat{Y} = 812.5690 - 0.294248 \log X$ $\quad R^2 = .227069$
$(2.095483)\ (-1.988101)$ $\quad R = -.476518$

Number of observations = 13.

(b) Productivity Index (y):

(17) $\hat{Y} = 42.7928 - 0.000209225\ X$ $\quad R^2 = .159585$
$(2.94116)\ (-1.55730)$ $\quad R = -.399481$

(18) $\hat{Y} = 41.2415 - 0.00858098 \log X$ $\quad R^2 = .17210$
$(2.87690)\ (-1.730496)^{**}$ $\quad R = -.41485$

(19) $\log \hat{Y} = 499.4999 - 0.0795775 \log X$ $\quad R^2 = .0832986$
$(2.23009)\ (-1.00475)$ $\quad R = -.288615$

Number of observations = 18.

*;**; indicate that the results are significant at the 0.05 and 0.10 levels respectively.

Tests involving total skills requirements indexes show pronounced negative correlation between the structure of effective protection rates in the developed countries and the comparative advantage of the U. S. A. and U. K. The parameter is rather small for the United Kingdom which could be due to the high level of aggregation. However, the coefficients of correlation (R) are, in general, significantly high and negative. The Productivity Index, on the other hand, fails to show any significant results. This index is based on theoretically weak foundations as it considers the skill content of the "final" products only. This could be a reason for the weak negative correlation indicated by the Productivity Index.

Rank Correlation Tests. The results (Table VI-2) of rank correlation tests tend to support the conclusions derived from regression analysis presented above.

CONCLUSION

We have used factor proportions and human skills models to analyze the relationship between effective protection rates of developed countries and the comparative advantage of the U. S. A. and U. K. in manufactured products.[2] The statistical investigation shows that the developed countries tend to protect most heavily the industries in which they have least comparative advantage. Therefore, a generalized preference system granting the greatest incentives to

TABLE VI-2

RESULTS OF RANK CORRELATION TESTS--
ALTERNATIVE HUMAN SKILLS INDEXES

Countries	Coefficients of R Correlation - r	t-value	Significance Level	Number of Observations
		TOTAL SKILLS REQUIREMENTS INDEX (S_1/S_2)		
U. K.	-0.6950	-3.0536	0.05	13
U. S. A.	-0.50061	-3.2065	0.01	35
		KEESING SKILL INDEX (S)		
U. K.	--	--	--	--
U. S. A.	-0.59080	-3.33570	0.01	32
		PRODUCTIVITY INDEX (Y)		
U. K.	-0.54660	-2.35757	0.05	18
U. S. A.	-0.65340	-3.22556	0.01	18

Sources: Tables IV-1,5,10,11.

developing countries that are subject to the greatest protection in the latter, will minimize the trade diversion effect of preferences. Furthermore, it may help move resources in the developed countries toward industries in which they have relatively greater comparative advantage and away from those sectors in which they have least comparative advantage.

NOTES TO CHAPTER VI

[1]In view of the fact that the U.K.'s input-output table was not available in required detail, the effective protection rates were adjusted by obtaining weighted averages of tariff rates for the three digit SITC classified industries consistent with the input-output detail available for the U.K. The bulk of world trade in a product was used as weight for the tariff rate on that product.

[2]Giorgio Basevi, "The United States Tariff Structure: Estimates of Effective Rates of Protection of United States Industries and Industrial Labor," Review of Economics and Statistics, Vol. 48, May, 1966, pp. 147-60.

[3]Although no effort to aggregate human and non-human capital was made to obtain ranking of industries according to their overall capital intensity, such an aggregation is most likely to improve the results because both factor proportions and human skills models yielded the same results. A multiple regression was, however, carried out to determine the degree of interdependence between the structure of effective protection in the developed countries and the comparative advantage schedules of the U.S.A. as approximated by capital/labor ratios and human skills (total requirements) ratios. The results are summarized by the equation given below:

$$\hat{Y} = 45.579 - \underset{(0.0109364)^{*}}{0.002270\,X_1} - \underset{(0.005226)}{0.0092224\,X_2}$$

$$t_1 = 1.7646 \qquad t_2 = 2.07602$$

$$R_{\hat{Y}X_1} = -.535088 \qquad \bar{R}^2 = .3555$$

$$R_{\hat{Y}X_2} = -.509648 \qquad \text{F-Ratio} = 7.9988$$

(* values in parentheses are standard errors)

where,

$\hat{Y}_i$ = Effective tariff protection rate on i-th activity in the developed countries;

X_{i1}= K/L of i-th industry in the U.S.A.;

X_{i2}= S_1/S_2 of i-th industry in the U.S.A.

CHAPTER VII

RESEARCH AND DEVELOPMENT, TECHNOLOGY, ECONOMIES OF SCALE AND THE GENERALIZED TARIFF PREFERENCES

INTRODUCTION

The factor proportions models of trade assume that tastes are given, knowledge is or ought to be a free good and that scale effects are absent. However, these assumptions are often not satisfied. It is, therefore, possible to cut down the unexplained variance in international division of labor by incorporating the influences of such aspects as research and development (R & D), technology and the economies of scale. In this chapter we will try to analyze the R & D and the economies of scale in the context of generalized tariff preferences.

R & D AND THE STRUCTURE OF TRADE

One way of analyzing the impact of technology on the pattern of trade is to look at the relative intensiveness of a country in "research and development" expenditures. Research and development brings the technical progress that either creates new products which confer temporary "availability" advantage on the economy, or helps to develop new processes, lowers costs, attracts resources into these industries and confers comparative advantage on the economy in research-intensive industries.

The influence of R & D on the trade pattern can be analyzed in three alternative ways: neo-factor-proportions formulation, the market-scale model, and the product-cycle approach.

Neo Factor-Proportions Approach. Harry Johnson,[1] in his Wicksell lectures, introduces a "dynamic" theory of comparative advantage that draws upon a neo-Schumpeterian interpretation of innovation as the basis of future patterns of trade. In this analysis, human capital engaged in research and development is considered as a component of a nation's factor-endowment and influences its trade pattern in the fashion indicated by the factor-proportions model. This would imply that nations well-endowed with human capital resources suited for R & D--i.e., developed countries--are expected to produce and export R & D-intensive products and import technologically simple products. On the other hand, developing countries, scarce in R & D resources, are likely to export technologically simple products and import R & D-intensive products. This would require, *inter alia*, that the productivity of R & D resources in a given line be described by a production function that is invariant among countries, i.e., the phenomenon of factor-intensity reversals is absent.

Keesing; Gruber, Mehta and Vernon; and Baldwin[2] use models similar to the one presented above to determine the comparative advantage and export-competitiveness of the

U.S.A. versus the OECD and other developed countries. It is possible to use either the ratio of R & D scientists and engineers in total employment in each industry, or the ratio of R & D expenditures to value added in each industry as the R & D index, to rank commodities according to their relative R & D intensiveness which would approximate the principle of comparative advantage. If effective tariff protection rates in the developed countries are relatively higher on commodities with a relatively lower R & D-intensiveness index, then a preferential treatment of manufactured imports from developing countries into developed countries will have desirable economic effects on developing countries.

Rank and linear correlations were computed for the commodities arrayed by their respective R & D indexes in the U. S. A. (per cent of engineers and scientists in total employment), and the effective protection rates in the developed countries. The results as presented in Table VII-1 below indicate significant negative correlation between tariff rates in the advanced countries and the R & D index of U. S. industries, suggesting that a generalized preference system would produce very little trade diversion. In the absence of any information on an R & D index for developing countries, it is not possible to find out the usefulness of generalized preferences for developing countries. It is, however, expected to encourage the exports of products, not intensive in R & D, from developing to developed countries.

TABLE VII-1

RESULTS OF CORRELATION TESTS ON EFFECTIVE PROTECTION RATES AND THE R & D INDEX

Values of test statistics t-value, and significance level	Type of Test	
	Spearman Rank Correlation (r)	Linear Correlation (R)
Value of the Correlation Coefficient	-0.4942	-0.511209
t-value	-1.60797	-1.83274
Significant at	0.12	0.10

Source: Footnote 2, Table IV-1

Market-Scale Approach.[3] This approach recognizes the *ex ante* uncertainties on both the supply and the demand sides of the innovative process involving expenditures on R & D activities. Uncertainty regarding the returns for different R & D expenditures helps us to develop a stochastic model of R & D in which it is assumed that an investment of given size in R & D has the chance of lowering unit costs of production by, say, r-per cent in every industry. The expected value of the return on R & D investment would then be directly proportional to the initial size of each industry's sales. As the sales of a country's exports are greater than those of its import-replacements, each country would tend to place its R & D factors in its export industries. In other words, each country's exportables will be the ones that are relatively more intensive in each country's R & D factors.

This model may not give the same conclusions as the previous, neo-factor-proportions model because the mode of ranking the industries is different. Moreover, it has not been tested for validity and general applicability. However, it implies that the best way to turn a potential comparative advantage into actual trade flows is to concentrate R & D activities in the sector or industry with the greatest potential comparative advantage where such a potential is determined by something else such as market structure. No definite conclusions are derivable from the Market-Scale Model regarding the generalized preference system except that generalized preferences will help the developing as well as developed countries to allocate their R & D expenditures towards exportables and result in gerater efficiency.

Product Cycle Approach.[4] Vernon and Hirsch have developed an alternative approach to incorporate R & D in the study of trade structure. It is assumed that the development and production of manufactured commodities undergoes various changes and phases with respect to the type of production function, the factor inputs, and prices. The pattern of production overtime can be broken into various phases or stages such as the early or "new" stage, the "growth" or the middle stage and the latter or "mature" stage. In the early stage, the production process is characterized by stress on problem-solving; research and development to determine the most efficient method of production and distribution. It is the stage that involves strong R & D-intensiveness and relatively less of other factors. The growth stage involves more innovation and establishment of more capital-intensive plants aimed at mass production and distribution. The skills required are essentially efficient management and marketing ability rather than highly trained human capital for R & D. In the third stage, or mature stage, the product and the process of production become fairly standardized and capital-intensive, but the composition of the labor force changes as the proportion of unskilled and semi-skilled workers rises and the R & D-intensiveness is minimized as there is very little basic problem-solving at this stage.

The product-cycle model indicates that the less developed countries can expect to have competitive advantage in mature commodities because the need for R & D-oriented scientists and engineers is comparatively limited. Commodities can be ranked according to the stage in their development as suggested above with developing countries expected to have comparative advantage in the mature commodities.

Typical mature products include food products, textiles, wood products, simple fabricated products and machinery.[5] We have already seen that effective tariff rates are higher for textiles, wood products and other simple manufactures (Table IV-1). Therefore, heuristically, it is possible to suggest that generalized tariff preferences for the manufactured exports of the developing countries will be in keeping with an efficient system of trade structure as determined by the product cycle model.

ECONOMIES OF SCALE, COMPARATIVE ADVANTAGE, AND GENERALIZED PREFERENCES

The received theory of international trade states that the forces of the market will lead every country to production which utilizes its full comparative advantage as determined by factor endowment and thereby results in maximum welfare in each country and in the world, if there is full employment, perfect competition and no economies of scale and externalities.

However, the violation of these assumptions adversely affects the predictive ability of the theory, especially if economies of scale exist. This poses much more severe problems to the theory than the violation of, say, perfect competition. The inclusion of economies of scale--at the plant, company and market level--adds an additional dimension besides factor endowments, however defined, in the determination of comparative advantage. Moreover, the scale effect at the economy or the market level is more relevant in the case of generalized preferences involving the extension of market size. One way of looking at the economies of scale effect on the structure of trade is to state that a large home market is conducive to the export of goods produced under increasing returns to scale and a small home market is conducive to the export of goods produced under constant or decreasing returns to scale.[6] This is so because the large home market enables firms to install special purpose equipment, take advantage of bulk purchases, spread overhead and other fixed costs over a large number of units, and economize on the use of transport so as to minimize unit manufacturing costs.

Great emphasis has been placed by the proponents of generalized tariff preferences, like Prebisch,[7] on the role played by the size of the market in the efficient allocation of resources and the realization of potential comparative advantage of the developing countries in manufacturing. According to Prebisch,[8] the small size and the low per capita income of most of the developing countries has led to sheltered, small-scale domestic industries unable to compete in the world market. A real vicious circle has been created as regards the export of manufactured goods of the developing countries. These exports encounter great difficulties because internal costs are high, and internal costs are high because, among other reasons, the exports which would enlarge the markets are lacking. Therefore, preferential export trade for developing countries is one avenue of escape from the impasse of the limited market. What this means is that as overall size of the market increases, an industry's capacity to lower its costs by moving towards its optimum scale of output also increases. Thus the only thing standing in the way of a stagnant industry and its optimum scale in production is the size of the market, if the industry is technically feasible in the developing economy. This argument, however, overstates the case for scale economies. The real point is that, if scale economies cannot be exploited, the real return to investment in industrial activity will fall, raising thereby the resource costs necessary to achieve the same level of industrialization. In order to determine the relevance of the scale economies in the context of "dynamic" comparative advantage of the developing countries and the need for tariff preferences for their manufactured exports, we present a simple model below.

Model. The model brings the market, technology and growth together to explain the role of market size in the efficient allocation of resources and growth.[9] The size of the market in a particular country depends upon the level of per capita income, population, and its technical capability. Moreover, the size of economy needed to support a given industry changes as the quality of the industry's product changes.

The model is based on the assumption that as techniques advance in any industry, the scale of production needed to employ those techniques most economically also increases. It does so because economic use of advanced techniques involves plants of increased capacity and increased specialization among productive units. It is further assumed that the state of techniques in use determines per capita and aggregate income in the economy and thereby partly influences the determination of the market for each type of product. As technology advances, the "required" size of industry increases, where "required" size of an industry is defined as the size required to achieve the minimum unit cost at any given state of technology. The size of the industry justified by the demand for the product at that minimum unit cost will be termed "justified" size of the industry. Both technology and market sizes have a positive influence on the "justified" size, while the "required" size is a function of state of technology alone.

The interaction between the required and the justified size determines the minimum justified size of the industry. This is shown in Figure VII-1 where P indicates the minimum justified size of the industry. However, changes in technology and market will affect the justified and the required sizes of the industry, and it is not necessary that they will increase at the same rate. If the "required" size of the industry grows more rapidly than the "justified" size, then the system will not permit an industry size greater than where required size is equal to the justified size (Figure VII-1a). As a matter of fact the minimum justified size of the industry is also the maximum size. If the "justified" size grows more rapidly, then the system will be self-propelling (Figure VII-1b), because, (a) if the industry was initially justified, it will always be justified, and (b) even if the industry was not initially justified, it may become so.

Let us concentrate on the relationship between the size of the industry and the state of technology in the system where "required" size grows more rapidly than the "justified" size in order to determine the significance of market size and scale effect in the context of trade

THE "REQUIRED" AND "JUSTIFIED" FUNCTIONS

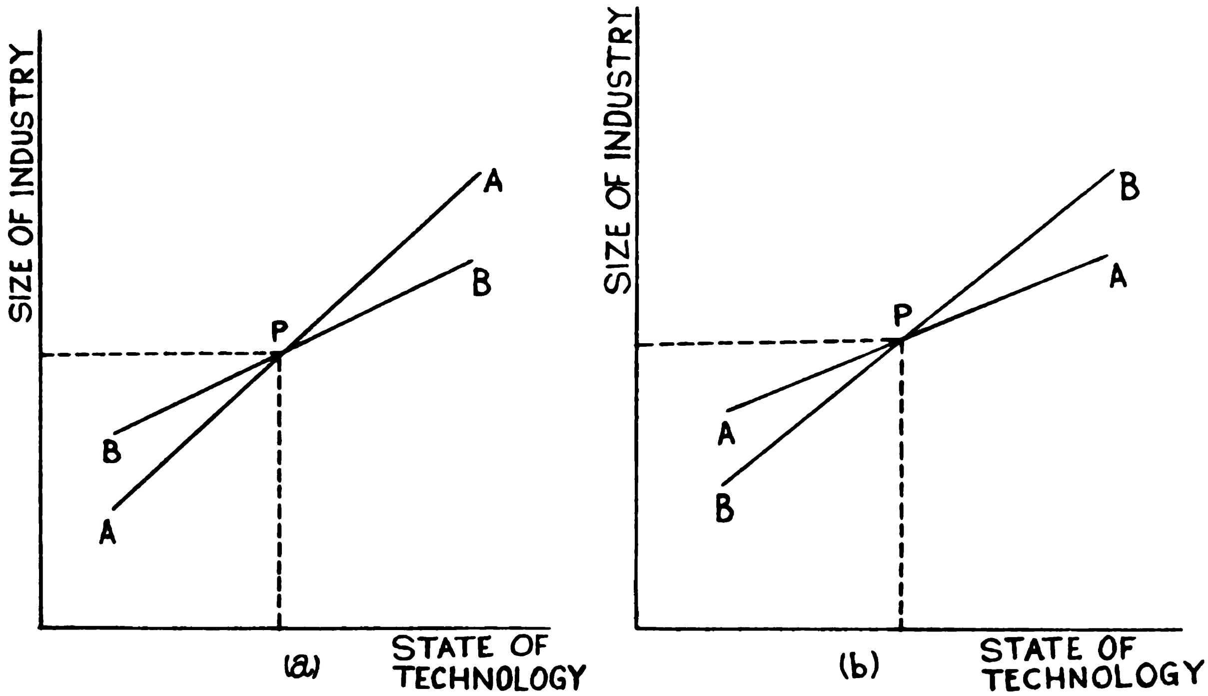

FIGURE VII-1

AA = "Required" size function, given the size of the market.
BB = "Justified" size function, given the size of the market.

THE SCALE EFFECT OF PREFERENCES

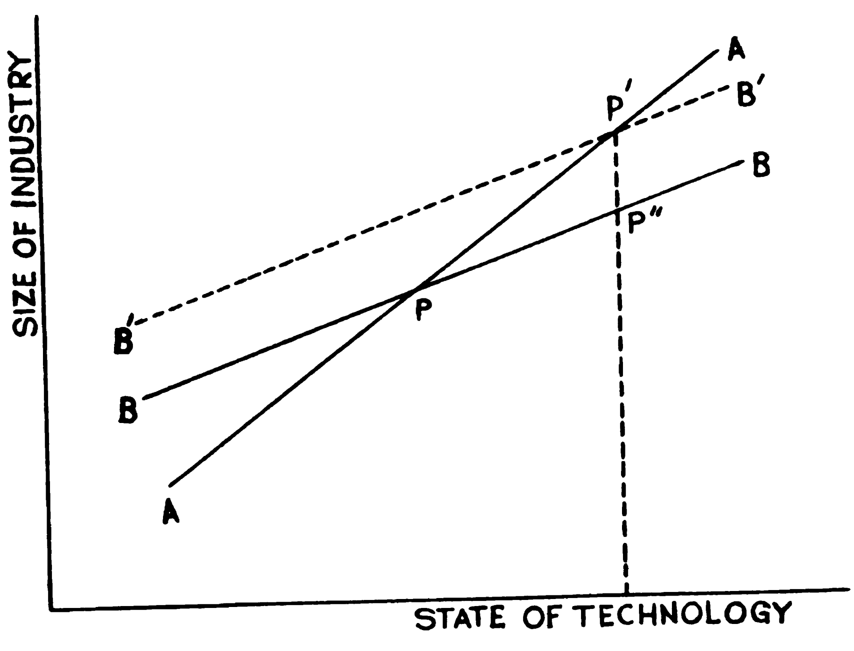

FIGURE VII-2

preferences. Consider Figure VII-2. AA and BB show the "required" and the "justified" sizes of an industry respectively for different levels of technology, given the size of the market. In such a system, if the industry was not initially justified, it will never become so, and even if it was initially justified, it may cease to be so after some point (P) in the level of technical progress. In a typical developing country, growth is associated with new industries and, hence, better technology. With technological changes the required size may increase more rapidly (from P to P') than the justified size (from P to P"). Such a situation cannot be sustained and will force the developing country to continue to use the inefficient technique and be content with a lower growth rate, associated with P in Figure VII-2. If, however, the market size can be increased through the extension of exports into the developed countries, then the justified size for the given level of technology may rise sufficiently (from BB to B'B') to be equal to the required size, P'.

Different industries will have different justified and required sizes given the state of technology and market. Since the resource base and the income level determine the size of the market, different countries will have different market sizes and hence justified sizes for various industries, larger for the countries with bigger markets and smaller for the countries with smaller markets. Therefore, for bigger countries, the point of intersection between required and justified sizes, that is, the minimum justifiable size of the industry, will be larger than for a smaller country, and a relatively greater ability to produce commodities with greater economies of scale effects than the smaller countries.

Moreover, the scale effect is not equally important for all industries. Industries with a relatively moderate or smaller scale effect will be characterized by a flatter "required" size line. It is, however, not easy in practice to specify industries which have relatively greater economies of scale effects. This model suggests that economies of scale are very important for the developing countries of relatively small size at the intermediate level of industrialization and growth.

ESTIMATES OF THE ECONOMIES OF SCALE

Chenery[10] and Maizels[11] estimated the impact of economies of scale (market) on manufacturing by computing multiple regressions of the effects of per capita income and population--two determinants of market size--on manufacturing production for about fifty countries. Dividing all manufacturing into fifteen groups, Chenery found a significant and positive correlation between manufacturing production and size of population. This implies that in a country with larger population, manufacturing production is a larger share of total production, presumably due to the economies of scale. This relationship was more significant for products like automobiles, aircraft, chemicals, electronics, paper and paper products. On the other hand, Maizels found a significant positive correlation with population for only one of the six manufacturing groups he considered, i.e., basic metals, and found a negative correlation for food, beverages, and tobacco.

Even though these studies fail to incorporate technology in the analysis of the economies of scale, they indicate roughly that commodities in which developing countries are likely to have comparative cost advantage do not exhibit strong economies of scale effect and that a generalized preference system cannot be expected to be helpful just on the grounds of the scale effect.

In contrast to these studies, Keesing[12] used value added of the average plant in each industry as an indicator of economies of scale in the absence of a better indicator. Higher value added per establishment implies relatively greater economies of scale. He found that more sophisticated industries such as aircraft, drug and other chemicals, petroleum refining, motor vehicles, electrical equipment, paper and paper products, etc., have larger economies of scale. The simple manufactures such as textiles, glass, stone and clay products, fabricated metal products, simple machinery, lumber and wood products, and rubber products, etc., were found to have very low economies of scale. If it is assumed that the structure of industries is the same in developing countries as in the United States, then Keesing's estimates suggest that the scale effect is not strong for commodities in which less developed countries are likely to have comparative advantage.

Using a product-cycle model, Seev Hirsch[13] analyzed the relevance of economies of scale for new, growth, and mature stage commodities in order to explain the structure of trade. He found that a relatively larger market gives competitive advantage in the production of all types of manufactured commodities. However, the economies of scale effect is the strongest in the newly developed products like electronics and weakest for the mature commodities like wood products, textiles, machinery and other fabricated products. Moreover, according to this model, developing countries have comparative advantage in the production of some mature commodities that enjoy relatively weak scale effects.

In order to determine the role of economies of scale in the determination of comparative advantage of a country in manufactured products, Hufbauer[14] has also presented an extensive analysis. He estimates the scale economies as the regression exponent (d)[15] in the regression equation of the following type:

$$V = Kn^d$$

where

n = number of workers employed,

V = ratio between value-added in plants employing n persons and average value-added for the four-digit U. S. census bureau industry, and

K = constant.

The estimates indicated significantly high scale effects in transport equipment, synthetic fibers, paper and paper products, chemicals, iron and steel, and electrical machinery. Relatively low (even negative) scale effects were found in manufactures like man-made textiles, clothing, leather products, glass and mineral non-metallic products, and miscellaneous manufactures. Table 15, Appendix II presents these estimates.

If it is assumed that the structure of production is similar in all the countries including the developing world, i.e., industries showing a higher scale economy effect in the United States are also the ones with a relatively high scale economy effect in developing countries, then the U. S. data developed by Hufbauer can be used to rank commodities by a scale economy index that may represent potential comparative advantage. Then the tests for the relevance of generalized tariff preferences in the context of scale effects can be conducted.

Spearman rank and linear correlation tests between the schedule of commodities ranked by Hufbauer's index of economies of scale and the structure of effective protection rates in the developed countries were carried out by drawing the data from Table 1, Chapter IV, and Table 15, Appendix II. The rank correlation test shows a modest negative correlation of -.2506 ($t = -1.52056$) between the effective tariff rates and the index of economies of scale for the industries included in this study.

The linear correlation test gives a similar result as indicated by the correlation equation given below:

$$\hat{Y} = 40.130183 - 0.0099328\,X \qquad R = -.148508$$
$$T = 1.97723$$

where

$\hat{Y}_i$ = Effective tariff rate on i-th activity in developed countries,

X_i = scale economy index (d) for industry i.

The rank correlation test appears to suggest that the tariff structure of advanced countries does not discriminate against the actual or potential manufactured exports of developing countries characterized by relatively higher economies of scale. However, these results should be interpreted with caution because of various limitations of this kind of analysis. The estimator of scale economy used in this analysis does not encompass all the dimensions of scale effects, and, therefore, may not be accurate.[16] Therefore, it will be misleading to use the analysis given above to draw any definite conclusions regarding the influence of tariff policies of the developed countries on the growth potential of manufactured exports of the developing countries, especially where economies of scale have a singificant influence.

The generalized tariff preferences may, however, help a developing country that is so small that the domestic market cannot permit the efficient utilization of its technical capability and the industrial capacity. For such a country the extended market into the developed world will be of great importance. However, most of the countries that are going to gain substantially from a generalized tariff preference system such as Pakistan, India, Mexico, and Brazil, already have fairly large markets that can sustain the efficient utilization of most of the industries within the reach of their technical capability.

CONCLUSION

A high economies of scale effect is not enough to justify tariff preferences. Most of the manufactured products in which the developing countries can be expected to have potential or actual comparative advantage--i.e., those that are within the reach of their technical capability--do not exhibit very significant scale economies. However, for very small developing countries, the importance of an extended export market may be great even for commodities that are characterized by moderate or even low scale economies.

Most of the products with higher economies of scale effect are highly sophisticated ones in whose production and trade the advanced countries are already highly competitive. Therefore, even if preferences are granted to the developing countries for such products, they will not be able to compete with the developed countries and may actually further distort their own resource allocation. The generalized preferences may, however, help the developing countries to get out of the straight-jacket of domestic institutional rigidities that are only indirectly related to the scale effects. The rigidities are the outcome of extensive import-substituting industrialization in the highly insulated and protected developing economies. A small domestic market and monopolistic structure of industries did not allow the "infant" industries to become competitive. The generalized preferences may improve the situation by increasing competition among developing countries for the markets in the developed countries besides competing with the domestic producers of developed countries. This argument apparently lies behind Dr. Prebisch's plan for preferences though he seems to have confused the scale economies with the "infant" industry argument, because the infant industry argument assumes a fixed market which is gradually taken over by the infant industry as it becomes competitive through improved efficiency.[17]

NOTES TO CHAPTER VII

[1]Harry G. Johnson, Comparative Cost and Commercial Policy Theory for a Developing World Economy, Wicksell Lectures 1968, (Stockholm: Almquist & Wiksell, 1968); "The Theory of International Trade," International Economic Relations (Paul E. Samuelson, ed.), International Economic Association (New York: MacMillan, 1969), pp. 55-66.

[2]Donald Keesing, "The Impact of Research and Development on United States Trade," Journal of Political Economy, Vol. 75, No. 1, 1967, pp. 38-48, reprinted in The Open Economy (New York: Columbia University Press, 1968), pp. 175-89. W. Gruber, D. Mehta, and R. Vernon, "The R & D Factor in International Investment of United States Industries," Journal of Political Economy, Vol. 75, February, 1967. R. E. Baldwin, Determinants of the Commodity Structure of U. S. Trade (mimeographed), Social Systems Research Institute, University of Wisconsin, 1969.

The data on R & D for the correlation tests in the text was drawn from the following table.

R & D INDEXES FOR U. S. INDUSTRIES

SITC	Description of Commodities	Percentage of Scientists and Engineers in the Total Employment of the Industry
266,551, 599	Chemicals	9.5
629	Rubber Products	2.1
641,642	Paper and Allied Products	2.0
651,653, 655-657	Textile Products	0.7
631,632	Lumber and Wood Products	0.5
664-666	Stone, Clay and Glass Products	2.0
671	Iron and Steel	2.5
695,696	Fabricated Metal Products	2.4
711	Other Non-electrical Machinery	4.3
729	Electrical Equipment, n.e.s.	8.2

The table was taken from Donald Keesing, "The Impact of Research and Development on United States Trade," The Open Economy, Appendix Table I, pp. 186-87; Table 2, Appendix I.

[3]The market-scale model is in its early stages of development and an extensive research is still required. For details, see, however: H. G. Johnson, op. cit.; R. E. Caves, "Comments on Professor Johnson's Paper: I," International Economics Relations, pp. 66-70.

[4]The product-cycle doctrine has many champions. For detailed analysis of the background, see: R. Vernon, "International Investment and International Trade in the Product Cycle," Quarterly Journal of Economics, May, 1966; Seev Hirsch, Location of Industry and International Competitiveness (Oxford, Clarendon Press, 1967); and G. C. Hufbauer, Synthetic Materials and the Theory of International Trade (London: Duckworth, 1966).

[5]See Table 8, Appendix II.

[6]G. C. Hufbauer, "The Commodity Composition of Trade in Manufactured Goods," The Technology Factor in Trade, Universities-NBER Conference Series No. 22 (New York: Columbia University Press, 1970), pp. 250-90.

[7]The case for tariff preferences based upon the so-called economies of scale has many proponents. For an extensive, though somewhat misleading formulation, see: Raul Prebisch, Towards A New Trade Policy for Development, Report by the Secretary General of UNCTAD (New York: U. N., 1964).

For a critical evaluation of this argument, see: S. Weintraub, Trade Preferences for Less Developed Countries, Praeger Special Studies in International Economics and Development, 1966, Ch. 3, pp. 55-90. Harry B. Johnson, Economic Policies Toward Less-Developed Countries (Brooking Institution, 1967), Chapters I, VI.

[8]R. Prebisch, op. cit.

[9]E. E. Hagen, The Economics of Development (Homewood, Ill.: Irwin, Inc., 1968), Chapter 11, pp. 236-46. The model presented in this chapter is a modified and extended version of Hagen's model.

[10]H. B. Chenery, "Patterns of Industrial Growth," American Economic Review, September, 1960, pp. 624-54.

[11]A. Maizels, Industrial Growth and World Trade: An Empirical Study of Trends in Production, Consumption and Trade in Manufactures from 1899-1959 with a Discussion of Probable Future Trends (Cambridge: Cambridge University Press, 1963).

[12]Donald Keesing, _op. cit._, also especially Table 4 column 7.

[13]Seev Hirsch, _op. cit._, Chapter III, especially pp. 52-58.

[14]G. C. Hufbauer, _Synthetic Materials and the Theory of International Trade_, pp. 73-78; _Commodity Composition of Trade in Manufactured Goods_, _op. cit._

[15]A somewhat similar formulation of economies of scale was presented by Baldwin, _op. cit._

[16]For further elaboration on this point, see: S. Weintraub, _op. cit._, pp. 63-69; H. G. Johnson, _op. cit._, Chapter VI.

[17]For a detailed interpretation, see: Hla Mynt, "International Trade and the Developing Countries," _International Economic Relations_ (Paul E. Samuelson, ed.), International Economic Association, pp. 15-35, especially section III.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

Economic development calls for a substantial volume of imports of materials, capital goods and technical services in addition to a substantial increase in national investment. If exports are insufficient to finance required imports--i.e., a trade gap exists--and/or domestic savings are insufficient to finance an increased volume of investment--i.e., a savings gap exists--rapid economic development cannot take place. Since most of the developing countries have a "dominant" trade gap, it is not possible to attain a target growth rate without filling this gap. One way to fill the trade gap is through economic aid from the developed countries. However, even if developed countries contribute one per cent of their respective GNP's in public capital flows and about $4 billion in private capital movements, a residual gap of over $7.5 billion will still exist if an annual average growth rate of 6.1% is to be maintained in the developing countries. This residual trade gap can be met by increased import substitution and export acceleration in the developing countries. Import stustitution as a development strategy has certain well known structural limitations, reference to which has already been made, such as the size of the domestic market and the technical requirements for efficiency. Export acceleration appears to be the only means available to fill the residual trade gap. There is little chance for the developing countries to generate a dramatic expansion in their primary goods exports because of low-income elasticity of demand and the development of synthetic substitutes for natural materials in the developed countries. Thus there remains the expansion of manufactured exports to the developed world as an alternative method to accelerate the growth process.

One of the main obstacles in the way of manufactured exports of developing countries to the developed countries is the effective protective tariff barriers in the latter countries against manufactured imports. The structure of effective protection in developed countries tends to discriminate against the manufactured products of special interest to the developing countries as potential or actual exports. A general preference system eliminating tariffs in developed countries on manufactured imports from developing countries will grant the greatest preference to the commodities that are subject to the highest effective protection. This will give the developing countries a maximum incentive to establish those industries which are subject to the highest effective protective duties in the developed countries. General preferences will be useful only if these are the industries in which developing countries have relatively greater and developed countries relatively lower, comparative advantage.

This is what the present study sought to find out. To do this, we compared the structure of effective protection rates in the developed countries with the comparative advantage schedules of developing and developed countries in manufactured products.

There is no single determinant of a country's comparative advantage. It was, therefore, necessary to consider various theoretical models to determine a ranking of manufactured commodities in developing and developed countries in the order of their comparative advantage. In Chapter II, we considered many alternative formulations to approximate comparative advantage. One could apply various criteria for resource allocation in developing countries to rank commodities, but due to serious data problems and analytical limitations, we were unable to use any of these criteria in our analysis. Instead we drew upon the factor proportions, human skills, research and development (R & D), and scale economies models, in addition to Balassa's "revealed" comparative advantage to rank the manufacturing industries by the degree of their comparative advantage.

We selected six developing countries--Taiwan, Hong Kong, Pakistan, India, Brazil and Mexico--two developed countries--the United States and United Kingdom--and thirty-five manufactured commodities to conduct our investigation. The selection was aimed at having a set of countries and commodities that covers the bulk of manufactured exports of the developing countries. It was hoped that the conclusions derived from the study of these countries will also apply to other countries.

The input-output technique was used to obtain total requirements of capital, labor and human skills in order to estimate the input ratios for the ranking of industries. Capital/labor ratios in the developed countries and labor/capital ratios in the developing countries were used to rank the manufactured commodities according to the factor proportions model. Similarly, ratios of total requirements of skilled to unskilled labor in the developed countries and ratios of unskilled to skilled labor in the developing countries were used to rank the industries according to the human skills model. Accordingly, the higher the input ratio, the greater is the comparative advantage. We also used the Keesing Skill and the Productivity indexes to represent the skills model. No detailed information was available on R & D and economies of scale in the developing countries, therefore, most of the analysis involving R & D and scale effects was carried out in theoretical terms.

The effective protection rates in the developed countries were obtained from the estimates prepared by Professor Balassa. These rates were "normalized" by obtaining a weighted average of the effective rates of EEC, Japan, the U. K. and the U. S. A. with the rate of each developed region weighted by the value of its total trade in the product to which the rate applies.

Linear regression and rank correlation tests were used to determine the nature and significance of correlation between the structure of effective protection rates in the developed countries and the schedules of manufactured commodities in the developing and developed countries ranked by the various indexes developed in this study. We found significant and positive correlation for the developing countries, and significant and negative correlation for the developed countries under the factor proportions and the human skills models.

The R & D factor in the context of general preferences was analyzed by considering three alternative formulations of R & D--neo-factor proportions,market scale, and the product cycle models. The neo-factor proportions model indicated a negative correlation between tariff rates in the advanced countries and the R & D index of the U. S. industries. Since no such information was available for the developing countries, it was not possible to determine the impact of general preferences on the developing countries according to the R & D factor. The analysis of the product cycle model suggested that generalized preferences for the manufactured exports of developing countries will be in keeping with an efficient system of trade structure. No conclusions could be drawn from the market scale model.

A theoretical model was developed to bring market, technology, and growth together in order to explain the economies of scale effect. It was found that the scale effects are not equally important for all countries and commodities; they are, however, of great significance for the developing countries of relatively small size at the intermediate level of industrialization and growth. In order to determine the importance of economies of scale in the context of general preferences, estimates of the scale effect in manufacturing industries by Chenery, Maizels, Keesing and Hufbauer were drawn upon. These studies indicate that most of the industries subject to a higher scale effect are highly sophisticated and are beyond the technical capability of the developing countries. Moreover, they are subject to relatively lower effective protection in the developed countries. Therefore generalized preferences may not be in conformity with the comparative advantage of the developing countries. However, these estimates of scale effect are essentially partial and very crude approximations; therefore no definite conclusions could be derived.

In Appendix I we estimated the "revealed" comparative advantage of developing countries by ranking the manufactured products according to their export performance indexes. Unlike the factor proportions and human skills models, the results of country-by-country studies show rather weak positive rank correlation between the structure of effective protection in the developed countries and the "revealed" comparative advantage of the developing countries in manufactures. However, these results should be interpreted with caution because revealed comparative advantage is not an "explanatory" model as are the factor proportions and human skills models.

Our investigation appears to show that, in general, the structure of effective protection rates in the developed countries is significantly and positively correlated with the comparative advantage schedules of developed countries and negatively correlated with the comparative advantage schedules of developed countries. Therefore a generalized preference system will give the greatest incentive to the establishment of industries in the developing countries in which they have the greatest comparative advantage. Furthermore, preferences will encourage the developed countries to import those commodities from the developing countries in which the former have least comparative advantage. Hence, the trade diversion will be minimized.

APPENDIX I

APPENDIX I

"REVEALED" COMPARATIVE ADVANTAGE AND GENERALIZED PREFERENCES

INTRODUCTION

Comparative advantage in manufactured products appears to be the outcome of a number of factors such as factor proportions, human skills, level of technology and the extent of scale economies in production and distribution besides a host of other price and non-price variables.[1] Moreover, some of the assumptions underlying these explanations of trade structure are very limiting; some of the explanations involve factors that are not easily measurable. Therefore, instead of enunciating general principles and trying to apply these to explain actual trade flows, it may be desirable to take the observed pattern of trade flows as a point of departure, and subsequently use them to find the main influences that have determined the pattern and performance of trade for a country.[2] In other words, the trade performance of a country in regard to manufactured goods can be drawn upon to determine what Professor Balassa calls the "revealed" comparative advantage of that country in manufactures.[3] This is possible because the commodity pattern of trade is expected to reflect relative costs as well as differences in non-price factors. It is possible, therefore, to rank commodities by their trade performance over a period of time that will be consistent with the "revealed" comparative advantage of the country.

In this appendix we rank the commodities according to their "revealed" comparative advantage in the developing countries included in our investigation. Simple Spearman rank correlation tests are used to compare the structure of effective protection rates in the developed countries with the "revealed" comparative advantage schedules of developing countries included in this study to determine the desirability of generalized tariff preferences for the manufactured exports of the developing countries.

ESTIMATION OF "REVEALED" COMPARATIVE ADVANTAGE

Various indexes have been used to estimate the comparative advantage as revealed by trade flows. Liesner has used relative export performance as an indicator of comparative advantage.[4] A similar method was adopted by Balassa in order to indicate the possible consequences of trade liberalization among OECD countries.[5] Kreinin used the Balassa index to analyze the restrictive effect of the tariffs in the OECD countries.[6] One could also use the changes in export/import ratios to reflect the relative advantages.[7] There is a possibility of extending the market-share analysis of export growth to determine the "competitiveness effect" and rank the commodities by using their respective competitiveness effect indexes.[8] We have chosen export performance as the index by which to rank commodities. It was found necessary to concentrate on export performance rather than export/import ratios because most of the developing countries are net importers of many of the manufactured products incorporated in our study, and because imports are subject to restrictions.

THE EXPORT PERFORMANCE INDEX

The export performance of an individual industry in a particular market can be evaluated by (a) comparing the relative shares of a country in the world exports of individual commodities, (b) indicating changes in relative shares over time, and (c) a combination of (a) and (b). Following Balassa, export performance indexes are estimated by combining (a) and (b).[9] This was done by dividing a developing country's share in the exports of a given manufactured commodity by its share in the combined exports of manufactured goods of all the developing countries to the developed countries, and expressing the results in index number form. The higher the index number for an export commodity, the greater is the revealed comparative advantage of the country in that export product.

The export performance index is developed in symbols below:

Definitions:

Vi. = Value of developing country A's exports of manufactured commodity i in period 1 (1960-61)[10] to the developed countries.[11]

V'i.= Value of A's exports of commodity i in period 2 (1967-68)[10] to the developed countries.

V.j = Value of A's manufactured exports to developed country j, in period 1.

V.'j = Value of A's manufactured exports to the developed country, j, in period 2.

Vij = Value of A's exports of manufactured commodity, i, to the developed country, j, in period 1.

V'ij = Value of A's exports of manufactured commodity, i, to the developed country, j, in period 2.

Then:

(1) $$\sum_j Vij = Vi.$$

(2) $$\sum_j V'ij = V'i.$$

(3) $$\sum_i Vij = V.j$$

(4) $$\sum_i V'ij = V.'j$$

(5) $$\sum_i \sum_j Vij = \sum_i Vi. = \sum_j V.j = V..$$

V.. = Total manufactured exports of A to developed market economy countries in period 1.

(6) $$\sum_i \sum_j V'ij = \sum_i V'i. = \sum_j V.'j = V'..$$

V'.. = Total manufactured exports of A to the developed countries in period 2.

(7) $\sum_A Vi.$ = Total export of i-th commodity from all the developing countries of the world to the developed countries in period 1.

(8) $\sum_A Vi'.$ = Total exports of i-th commodity from all the developing countries of the world to the developed countries in period 2.

(9) $$\sum_A \sum_i Vi. = \sum_A V..$$

$\sum_A V..$ = Total manufactured exports of all developing countries to all the developed countries in period 1.

$$(10) \quad \sum_A \sum_i V'i. = \sum_A V'..$$

$\sum_A V'..$ = Total manufactured exports of all developing countries to all the developed countries in period 2.

$$(11) \quad \frac{Vi.}{\sum_A Vi.} \div \frac{V..}{\sum_A V..} =$$ Relative share of A's export of i-th commodity to the developed countries in period 1.

$$(12) \quad \frac{Vi.'}{\sum_A V'i.} \div \frac{V'..}{\sum_A V'..} =$$ Relative share of A's export of i-th commodity to the developed countries in period 2.

$$(13) \quad \frac{V'i.}{\sum_A V'i.} \Big/ \frac{V'..}{\sum_A V..} \div \frac{Vi.}{\sum_A Vi} \Big/ \frac{V..}{\sum_A V..} =$$ Growth rate of A's export of i-th manufactured commodity to the developed countries.

Equations (11) and (12) represent approach (a) to the estimation of the export performance index while equation (13) represents approach (b). A combination of the two approaches, approach (c), assumes "that while past trends in relative shares of exports can be expected to continue, this will take place at a declining pace as compared to the past."[12] Such a combination can be approximated by the following:

$$(14) \quad \frac{1}{2}\left[\frac{v'i.}{\sum_A v'i.} \div \frac{v'..}{\sum_A v'..} + \left(\frac{v'i.}{\sum_A v'i.} \div \frac{v'..}{\sum_A v'..}\right)^2 \Big/ \frac{vi.}{\sum_A vi.} \div \frac{v..}{\sum_A v..}\right] = X,$$

X = Export Performance Index

where,

$i = 1 \ldots, n$ = all manufactured goods as defined by UNCTAD (see Chapter III),

$j = 1 \ldots, m$ = all the developed countries (see Chapter III).

This export performance index was estimated for each commodity and for each of the six developing countries included in our investigation. The results are presented in Table 16, Appendix II. The export performance index was used to rank the commodities in terms of their comparative advantage.

EMPIRICAL RESULTS

Rank correlation coefficients were calculated between the structure of effective tariff protection in the developed countries and the "revealed" comparative advantage schedules of the six developing countries. The results are presented in Table 1. The usefulness of generalized preferences for a developing country will depend upon how strongly the "revealed" comparative advantage schedule is positively correlated with the schedule of effective protection rates.

The investigation was carried out on two levels:

(a) All commodities with positive export performance indexes were included in the correlation test.

(b) If the results failed to show a significantly positive correlation coefficient in (a), then some commodities with the highest divergence between ranks of the export performance index and effective tariff rates were dropped and

TABLE 1

RESULTS OF COUNTRY-BY-COUNTRY TESTS FOR CORRELATION BETWEEN EFFECTIVE TARIFF RATES IN DEVELOPED COUNTRIES AND EXPORT PERFORMANCE INDEXES OF DEVELOPING COUNTRIES

Country	Commodities Excluded (SITC)	Spearman Rank Correlation Coefficients (r)	t-Statistic Value	Significance Level
Taiwan	None	-0.3437	-1.89747	.10
	055,653, 711,724	0.3214	1.72101	.10
Hong Kong	None	0.110	0.06384	Not Significant at .10
	642,653, 655,666	0.3711	1.94101	.10
Pakistan	None	0.3110	1.34849	Not Significant at .10
	656,711	0.3891	1.75592	.10
India	None	0.0561	0.29148	Not Significant at .10
	655,666, 892,894	0.3520	1.73201	.10
Brazil	None	-0.2070	-0.9257	Not Significant at .10
	641,652, 711,851, 599,729	0.3010	1.1340	Not Significant at .10
Mexico	None	0.1670	0.972274	Not Significant at .10
	551,642, 653,657	0.4080	2.3207	.05

Source: Table 1, Chapter IV, Table 16, Appendix II.

correlation coefficients were recomputed. The commodities with relatively high divergence between the ranks of the export performance index and effective tariff rates are, either the ones in which a developing country has relatively higher revealed comparative advantage but subject to very low duty in the developed countries, or vice versa.

When all commodities with a positive export performance index were included in the test, no country showed a significantly positive correlation coefficient. In fact, Taiwan and Brazil showed negative correlation. This rather surprising result implies that the best performing manufactured exports of Taiwan and Brazil are not hampered by the tariff system of the developed countries.

Five out of six developing countries investigated showed significantly positive correlation coefficients when up to four commodities with the highest divergence between the ranks of export performance index and effective tariff rates were excluded from the test. Brazil failed to show a significantly positive correlation even when six commodities were excluded. In the case of Pakistan only two commodities had to be dropped to obtain a significantly positive correlation coefficient.

CONCLUSION

The results of country-by-country studies show that, unlike other models we have used in this investigation, there is weak positive correlation between the structure of effective protection in the developed countries and the "revealed" comparative advantage of the developing countries in manufactured goods. These results may be used to infer that there is not a very significant relationship between the structure of effective protection rates of developed, and the comparative advantage of developing, countries in manufactures, implying that generalized preferences for the manufactured exports of developing countries to developed countries may not be so productive after all! However, these results should be interpreted with caution because "revealed" comparative advantage is not an "explanatory" model that depends upon the structure of the economy to explain the pattern of production and trade.

Moreover, the existence of differential effective tariff rates in developed countries may have affected adversely the export performance of some of the commodities in which developing countries may have relatively higher (potential) comparative advantage. However, our investigation in this appendix appears to show that generalized preferences in developing countries for the manufactured exports of developing countries may not be as productive as indicated by other models used in this study. Instead, preferences for specific commodities and countries may be more productive.

NOTES TO APPENDIX I

[1]See W. M. Corden, Recent Developments in the Theory of International Trade, Special Papers in International Economics, No. 7, International Finance Section, Princeton University, 1965.

[2]B. Balassa, "Trade Liberalization and 'Revealed' Comparative Advantage," The Manchester School Economic Papers, May, 1965, pp. 99-117.

[3]Ibid., p. 103.

[4]H. H. Liesner, "The European Common Market and British Industry," Economic Journal, June, 1958, pp. 302-16.

[5]B. Balassa, op. cit., p. 100.

[6]Mordechai E. Kreinin, "On the Restrictive Effect of the Tariff-A Note on the Use of the Balassa Index," The Manchester School Economic Papers, January, 1966, pp. 75-80.

[7]B. Balassa, op. cit., p. 104.

[8]E. E. Leamer, and R. M. Stern, Quantitative International Economics (Boston: Allyn & Bacon, Inc., 1970), Chapter 7.

[9]B. Balassa, op. cit., pp. 103-104.

[10]The year 1960-61 was selected as the base year in our study due to the fact that it was the first year of the First Decade of Development. 1967-68 was considered the current year as it was the latest year for which detailed data on commodity trade is available.

[11]The developed countries included in this investigation and the E.E.C., EFTA, U.S.A. and Canada, Japan, New Zealand and Australia.

[12]B. Balassa, op. cit., pp. 106-107.

APPENDIX II

NOTES TO TABLE A-II-1

Table A-II-1 shows the projections of the export/import gap for thirty-seven and savings gap for thirty-five major developing countries. These gaps as defined here are comparable in terms of national income accounting concepts. The export/import gap is defined as the excess of projected imports of goods, services over the corresponding projection of export earnings. The savings gap is the excess of investment requirements over domestic savings at the indicated projected growth rate. Actual estimates for the two gaps were available for 1963, the base year, while the gaps were projected for 1975 under the assumptions of "low" and the "high" target rates of growth. Whereas the "low" target rate (5.2%) is based upon the previous development experience of the developing countries, the "high" target rate (6.1%) is based on the assumption that requisite domestic and external resources will be mobilized, and that the developed countries will experience rapid growth during 1965-75.

TABLE A-II-1

PROJECTIONS OF SAVINGS AND EXPORT/IMPORT GAPS OF DEVELOPING COUNTRIES[a]
(Millions of Dollars at 1960 Prices)

	Country	Savings Gap[b]			Export/Import Gap[c]		
		1963	1975		1963	1975	
		(Actual)	Low	High	(Actual)	Low	High
LATIN AMERICA							
1	Argentina	-127.0	-416.0	260.0	-127.0	83.0	465.0
2	Bolivia	48.0	82.0	130.0	48.0	128.0	160.0
3	Brazil	-23.0	-497.0	688.0	-23.0	-100.0	429.0
4	Central America	74.0	99.0	210.0	74.0	204.0	261.0
5	Chile	93.0	31.0	354.0	93.0	395.0	624.0
6	Colombia	23.0	154.0	523.0	23.0	53.0	371.0
7	Ecuador	-28.0	39.0	110.0	-28.0	65.0	86.0
8	Jamaica	.0	1.0	52.0	7.0	17.0	58.0
9	Mexico	109.0	-369.0	358.0	109.0	336.0	883.0
10	Panama	49.0	23.0	53.0	49.0	182.0	219.0
11	Paraguay	6.0	25.0	34.0	6.0	60.0	64.0
12	Peru	21.0	244.0	376.0	21.0	488.0	671.0
13	Uruguay	-3.0	47.0	137.0	-3.0	139.0	224.0
14	Venezuela	-1367.0	-1228.0	-516.0	-1367.0	-1863.0	-1690.0
AFRICA							
15	Ethiopia	22.0	-0.1	69.1	22.0	-26.0	6.0
16	Ghana	25.0	-145.9	4.9	12.8	95.5	385.9
17	Ivory Coast	------	------	------	-129.0	-218.0	-218.0
18	Kenya	-28.0	27.0	120.0	-33.0	-30.0	-68.0
19	Nigeria	229.0	468.7	928.2	191.0	-119.0	372.0
20	Senegal	------	------	------	27.5	50.2	157.3

TABLE A-II-1 (Continued)

	Country	Savings Gap			Export/Import Gap		
		1963	1975		1963	1975	
		(Actual)	Low	High	(Actual)	Low	High
21	Sudan	84.0	-3.8	79.2	84.0	64.0	72.0
22	Tanzania	-22.0	-24.0	29.0	-4.0	-3.0	-19.0
23	Tunisia	------	------	------	89.0	192.0	192.0
24	United Arab Republic	300.0	20.0	353.0	300.0	-38.0	444.0
25	Uganda	-26.0	-32.0	14.0	-30.0	-59.0	22.0
ASIA							
26	Ceylon	22.9	13.1	182.9	2.2	100.7	198.0
27	China (Taiwan)	79.6	69.7	85.8	76.3	63.9	80.0
28	India	700.0	-1330.0	-800.0	740.0	2130.9	2500.0
29	Indonesia	546.0	906.0	1250.0	66.0	189.0	416.0
30	Iran	-482.0	-1993.4	-2158.2	-482.0	-1139.9	-1423.5
31	Iraq	-369.6	-767.2	-506.8	-389.2	-862.4	-422.8
32	Israel	514.7	941.8	1266.8	382.8	240.4	536.3
33	Jordan	122.9	59.4	91.0	122.7	138.6	98.6
34	Malaysia	-62.3	-311.6	-241.2	-62.5	48.8	381.0
35	Pakistan	552.3	90.9	442.0	552.3	1212.5	1465.8
36	Philippines	-304.0	-349.3	32.2	-147.4	-282.8	75.3
37	Thailand	106.7	216.2	415.1	105.5	211.9	406.8

Table obtained from Trade Prospects and Capital Needs of Developing Countries, UNCTAD Secretariat (New York: U. N., 1968), Table 20, p. 41.

a) Minus sign indicates excess of savings over investment, or exports over imports.
b) Investment less domestic savings.
c) Imports less exports of goods and services exclusive of factor income payments.

NOTES TO TABLES A-II-2-6

Tables A-II-2 to A-II-6 demonstrate the economic indicators used in order to select the developing countries for our investigation. Economic indicators like gross domestic product (GDP) per capita, the size of the manufacturing sector, the share of manufactures in total exports, and the growth rate of the manufactured exports, can be drawn upon to determine the extent of an economy's development. GDP per capita is the output of goods and services per person within the geographical limits of the country. The U. N. classification system was followed to define manufacturing activities and exports. The competitiveness of a country in manufactured exports is approximated by the annual trend rate of growth of its manufactured exports to developed countries between 1960 and 1966. The annual trend rate indicates the percentage rate at which the manufactured exports grew from one year to another over the period 1960-66.

TABLE A-II-2

PER CAPITA GDP AT FACTOR COSTS 1967

Countries		GDP Per Capita at Factor Cost in $	Countries		GDP Per Capita at Factor Cost in U.S. $
1	Argentina	758	20	Senegal	195
2	Bolivia	176	21	Sudan	91
3	Brazil	273	22	Tanzania	66
4	Cen. America	251	23	Tunisia	186
5	Chile	539	24	U.A.R.	167
6	Columbia	313	25	Uganda	87
7	Ecuador	218	26	Ceylon	140
8	Jamaica	493	27	China(Taiwan)	238
9	Mexico	520	28	Hong Kong	351
10	Panama	553	29	India	81
11	Paraguay	211	30	Indonesia	94
12	Peru	263	31	Iran	287
13	Uruguay	551	32	Iraq	292
14	Venezuela	935	33	Israel	1344
15	Ethiopia	61	34	Jordan	230
16	Ghana	231	35	Malaysia	280
17	Ivory Coast	223	36	Pakistan	123
18	Kenya	111	37	Philippines	259
19	Nigeria	75	38	Thailand	140

Source: Handbook of International Trade and Development Statistics, UNCTAD (New York: U. N., 1969), Table 6-2, pp. 168-70.

TABLE A-II-3

SIZE OF THE MANUFACTURING SECTOR IN THE DEVELOPING COUNTRIES

Countries	Percentage Value of Income Originating in Manufacturing / GDP	
1. Argentina	34.2	(1967)
2. Bolivia	14.7	(1966)
3. Brazil	18.1	(1966)
4. Central America	16.0*	(1967)
5. Chile	27.1	(1967)
6. Columbia	17.4	(1967)
7. Ecuador	17.0	(1967)
8. Jamaica	14.9	(1967)
9. Mexico	29.7	(1967)
10. Panama	16.3	(1967)
11. Paraguay	15.4	(1966)
12. Peru	18.4	(1965)
13. Uruguay	17.0	(1965)
14. Venezuela	14.6	(1967)
15. Ethiopia	7.7	(1966)
16. Ghana	Not available	
17. Ivory Coast	9.2	(1966)
18. Kenya	11.0	(1967)
19. Nigeria	6.1	(1966)
20. Senegal	9.0	(1966)
21. Sudan	5.8	(1964)
22. Tanzania	4.6	(1967)
23. Tunisia	15.0	(1967)
24. U.A.R.	18.8	(1967)
25. Uganda	8.5	(1967)
26. Ceylon	7.6	(1967)
27. China (Taiwan)	20.8	(1967)
28. Hong Kong	39.5	(1966)
29. India	15.0	(1967)
30. Indonesia	12.4	(1967)
31. Iran(1)	35.6	(1967)
32. Iraq	7.1	(1967)
33. Israel	20.5	(1966)
34. Jordan	8.8	(1967)
35. Malaysia	11.1	(1967)
36. Pakistan	12.1	(1967)
37. Philippines	17.2	(1967)
38. Thailand	13.0	(1967)

Source: Year Book of National Accounts Statistics 1968, Vol. I, Individual Country Data, U. N.

* Obtained from Economic Survey of Latin America, 1967 (New York: U. N., 1968).

(1) Extraction of Oil (crude) included.

TABLE A-II-4

PERCENTAGE SHARE OF MANUFACTURING EXPORTS
TO DMEC IN TOTAL EXPORTS

Countries	$\frac{Xm(DMEC)^{*}}{X}$ (100)
1. Argentina	8.0%
2. Bolivia	0.8
3. Brazil	9.2
4. Central America	Negligible
5. Chile	3.8
6. Columbia	4.3
7. Ecuador	3.8
8. Jamaica	20.9
9. Mexico	19.1
10. Panama	18.8
11. Paraguay	4.0
12. Peru	3.8
13. Uruguay	11.1
14. Venezuela	0.2
15. Ethiopia	2.5
16. Ghana	12.5
17. Ivory Coast	10.9
18. Kenya	7.8
19. Nigeria	2.1
20. Senegal	4.3
21. Sudan	0.2
22. Tanzania	Not available
23. Tunisia	20.7
24. U.A.R.	3.3
25. Uganda	0.3
26. Ceylon	0.6
27. China (Taiwan)	34.7
28. Hong Kong	50.5
29. India	28.6
30. Indonesia	3.3
31. Iran	8.1
32. Iraq	0.9
33. Israel	18.1
34. Jordan	0.1
35. Malaysia	5.5
36. Pakistan	20.1
37. Philippines	11.2
38. Thailand	4.9

Sources: Commodity Trade Statistics, Series D, U.N.; Foreign Trade Statistics, Series C, OECD; Year Book of International Trade Statistics, 1967, U.N.

*Xm(DMEC): Manufactured exports to developed market economy countries (U.S.; EFTA; EEC: Japan, Canada--19 in all). Xm (Total A) includes all exports of manufactures minus SITC 667, 711, 735, 332 (petroleum) and 682.1, 683.1, 685.1, 686.1, 687.1, 689.

TABLE A-II-5

VALUE OF MANUFACTURED EXPORTS (TOTAL - A) OF DEVELOPING COUNTRIES TO DMEC

Countries		Value of Exports of Developing Countries (Total - A)* in $ Millions	
		1960	1966
1.	Argentina	93.5	121.6
2.	Bolivia	0.11	0.93
3.	Brazil	98.7	160.4
4.	Central America	---	---
5.	Chile	13.4	34.8
6.	Columbia	3.6	21.8
7.	Ecuador	3.0	7.0
8.	Jamaica	25.0	48.1
9.	Mexico	99.6	229.8
10.	Panama	3.2	16.7
11.	Paraguay	13.3	19.8
12.	Peru	21.3	29.4
13.	Uruguay	12.1	20.8
14.	Venezuela	3.7	5.0
15.	Ethiopia	1.2	2.7
16.	Ghana	17.7	40.4
17.	Ivory Coast	3.7	34.1
18.	Kenya	6.1	13.6
19.	Nigeria	10.3	17.7
20.	Senegal	3.5	6.5
21.	Sudan	0.5	0.4
22.	Tanzania	5.2	12.8
23.	Tunisia	33.1	29.2
24.	U.A.R.	24.1	20.3
25.	Uganda	---	0.5
26.	Ceylon	1.5	2.0
27.	China (Taiwan)	26.3	185.9
28.	Hong Kong	319.0	859.0
29.	India	353.5	451.6
30.	Indonesia	12.0	22.6
31.	Iran	57.6	106.5
32.	Iraq	7.2	8.9
33.	Israel	38.1	80.9
34.	Jordan	0.1	0.3
35.	Malaysia	41.7	69.8
36.	Pakistan	39.6	120.7
37.	Philippines	41.4	97.1
38.	Thailand	31.3	32.8

Sources: Commodity Trade Statistics, Series D, U.N.; Foreign Trade Statistics, Series C, OECD.

*Total - A excludes petroleum and certain other products as indicated in the previous table.

TABLE A-II-6

ANNUAL TREND RATE OF GROWTH OF MANUFACTURED EXPORTS OF DEVELOPING COUNTRIES TO DMEC

	Countries	Trend Rate of Growth of Manufactured Exports 1960-66 in %
1.	Argentina	2.6
2.	Bolivia	32.0
3.	Brazil	8.5
4.	Central America	----
5.	Chile	29.7
6.	Columbia	31.5
7.	Ecuador	14.9
8.	Jamaica	13.7
9.	Mexico	14.4
10.	Panama	25.4
11.	Paraguay	4.8
12.	Peru	6.3
13.	Uruguay	12.7
14.	Venezuela	7.8
15.	Ethiopia	13.5
16.	Ghana	13.5
17.	Ivory Coast	30.1
18.	Kenya	13.9
19.	Nigeria	8.6
20.	Senegal	13.7
21.	Sudan	-4.5
22.	Tanzania	14.0
23.	Tunisia	-8.7
24.	U.A.R.	0.9
25.	Uganda	----
26.	Ceylon	4.6
27.	China (Taiwan)	38.8
28.	Hong Kong	19.7
29.	India	4.8
30.	Indonesia	11.4
31.	Iran	11.6
32.	Iraq	3.9
33.	Israel	15.5
34.	Jordan	----
35.	Malaysia	8.5
36.	Pakistan	17.9
37.	Philippines	14.1
38.	Thailand	5.9

Source: Table A-II-5.

NOTES TO TABLE A-II-7

Table A-II-7 lists the value and the annual average growth rates of major manufactured imports of developed market economy countries (DMEC) from the developing countries and the rest of the world in 1966. The manufactured commodities were defined according to the SITC system of classification as followed by the United Nations and the UNCTAD. The growth rate of imports and the value of imports in million dollars and in percentages of the total, served as the two basic economic indicators used in the selection of manufactured commodities for our investigation. The annual average growth rate of imports indicates the change in imports of a commodity from one year to the next over the period 1960-66.

TABLE A-II-7

IMPORTS OF SELECTED MANUFACTURED PRODUCTS BY DEVELOPED MARKET ECONOMY COUNTRIES

		Imports by DMEC in 1966			Annual Average % Change in Imports 1961-1966 (Growth Rate)	
SITC No.	Description of Commodity	From World in Millions	From Developing Countries in Millions	Percentage From Developing Countries	From Developing Countries	From World
013	Meat, Tinned or Prepared	597.9	156.2	26.1	1.8	7.8
032	Fish, Tinned or Prepared	396.9	64.3	16.2	6.9	5.6
052	Dried Fruit	171.7	17.9	10.4	-3.2	3.6
053	Fruit, Preserved or Prepared	599.4	176.7	29.5	12.2	8.1
055	Vegetables, Preserved	352.1	97.1	27.6	12.0	11.7
071.3	Coffee Extract	43.1	12.7	29.5	15.4	7.5
072.3	Cocoa Butter and Paste	121.2	53.4	44.0	18.5	6.3
112	Alcoholic Beverages	1277.1	206.7	16.2	5.3	6.7
122	Tobacco Manufactures	131.0	9.0	6.9	2.6	14.3
243	Shaped Wood	1814.7	222.4	12.3	7.9	4.8
266	Synthetic Fiber	1595.5	16.8	1.1	30.7	6.8
431	Processed Animal and Vegetable Oils	94.9	16.6	17.5	-5.7	7.7
513	Inorganic Chemicals	653.7	125.0	19.1	21.9	13.3
532	Dyeing and Tanning Extracts	45.6	15.6	34.2	-1.4	2.3

TABLE A-II-7 (Continued)

SITC No.	Description of Commodity	Imports by DMEC in 1966: From World in Millions	From Developing Countries in Millions	Percentage From Developing Countries	Annual Average % Change in Imports 1961-1966 (Growth Rate): From Developing Countries	From World
541	Medicinal and Pharmaceutical Products	825.2	55.0	6.7	25.2	13.6
551	Essential Oils	228.7	30.2	21.9	2.3	10.2
599	Chemicals,n.e.s.	1020.8	26.3	2.6	-3.0	6.0
611	Leather	474.8	137.6	29.0	14.3	9.1
612	Leather Manufactures,n.e.s.	56.8	4.1	7.1	6.9	8.0*
629	Rubber Products	700.1	5.2	0.6	3.2	6.9
631	Veneer and Plywood	607.8	143.4	23.6	35.4	14.6
632	Wood Manufactures, n.e.s.	233.5	20.0	8.6	11.9	6.5
641	Paper and Paperboard	2469.0	8.1	0.3	-0.7	8.2
651	Textile Yard and Thread	1306.9	77.4	5.9	13.7	10.3
652	Woven Cotton Fabrics	823.2	201.9	24.5	11.4	2.3
653	Woven Non-Cotton Fabrics	1918.9	283.5	14.8	10.2	15.5
655	Felt, Rope, Cordage, etc.	435.2	25.8	5.9	0.2	11.9
656	Bags, Sacks, Linen, etc.	334.5	99.4	29.7	7.5	8.5

TABLE A-II-7 (Continued)

SITC No.	Description of Commodity	Imports by DMEC in 1966: From World in Millions	Imports by DMEC in 1966: From Developing Countries in Millions	Imports by DMEC in 1966: Percentage From Developing Countries	Annual Average % Change in Imports 1961-1966 (Growth Rate): From Developing Countries	Annual Average % Change in Imports 1961-1966 (Growth Rate): From World
657	Floor Covering	508.7	145.4	28.6	13.5	12.9
671	Pig Iron, etc.	640.7	55.0	8.6	8.7	11.7
673	Iron and Steel Bars, Rods, etc.	1351.8	5.9	0.4	29.8	8.7
674	Other Iron and Steel Prod.	1924.3	16.3	0.8	100.0	15.4
682.2	Copper & Alloys	590.3	36.7	6.2	68.4	23.4
684	Aluminum, Worked Unworked	1141.4	42.3	3.6	12.9	16.2
711	Non-electrical Machinery	2116.0	89 .5	4.2	19.8	14.5
724	Telecommunications Apparatus	1420.7	68.3	4.8	46.9	15.9
729	Electrical Goods n.e.s.	990.5	61.0	6.1	32.1	20.9
821	Furniture	485.6	31.3	6.4	11.7	22.7
831	Travel Goods, Handbags	158.4	22.9	14.5	47.4	17.2
841	Clothing excluding fur clothing	2393.1	522.3	21.8	24.1	18.3
851	Footwear	650.7	58.8	9.0	20.1	13.9
893	Plastic Products	384.2	24.4	6.4	60.3	26.2
894	Toys, Sporting Goods	629.9	78.9	12.5	30.6	19.2

TABLE A-II-7 (Continued)

SITC No.	Description of Commodity	Imports by DMEC in 1966: From World in Millions	From Developing Countries in Millions	Percentage From Developing Countries	Annual Average % Change in Imports 1961-1966 (Growth Rate): From Developing Countries	From World
897	Jewelry Articles	481.6	98.2	20.4	13.3	8.9
**	Other Manufactures	1080	295.5	----	----	----
	TOTAL	75934.6	4115.1	5.4	11.6	11.9

Source: U. N. Commodity Trade Statistics, Series D; OECD, Foreign Trade Statistics, Series C.

* 1965.

** Other manufactures include SITC Nos.: 512, 521, 561, 661, 678, 681, 698, 861, 892, 896, 898, 899, 961.

NOTES TO TABLE A-II-8

Table A-II-8 lists the nominal and effective tariff rates on manufactured products in the developed countries (and regions) before and after the Kennedy Round (KR) talks for mutual tariff cuts. These rates were obtained from the calculations made by Professor Balassa for the Atlantic Trade Project and the UNCTAD. According to him, the effective rate of duty indicates the degree of protection of value added in the manufacturing process due to the nominal tariff structure, given international immobility of labor and capital. If input coefficients are constant in the relevant range, the effective rate of duty (g) for any commodity can be expressed in the framework of an input-output system. Let t denote the nominal rate of tariff, M the material input coefficients, and V the proportion of value added to output, all measured at world market prices. For commodity j we have,

$$g_j = \frac{t_j - M_{ij} t_i}{V_j}$$

In order to calculate the effective rates of protection, Balassa obtained comparable data on nominal tariff rates and input-output coefficients net of duties. For this purpose "standardized" input-output coefficients (1959) for the Common Market countries were used. With regard to tariffs, Balassa used the Brussels Tariff Nomenclature, as it was followed by all the developed countries.

TABLE A-II-8

NOMINAL AND EFFECTIVE TARIFFS IN THE MAJOR INDUSTRIAL COUNTRIES ON SELECTED COMMODITIES BEFORE AND AFTER THE KENNEDY ROUND (KR)

COMMODITY	PERIOD	SITC No.	UNITED STATES Nominal	UNITED STATES Effective	UNITED KINGDOM Nominal	UNITED KINGDOM Effective	EUROPEAN ECONOMIC COMMUNITY Nominal	EUROPEAN ECONOMIC COMMUNITY Effective	SWEDEN Nominal	SWEDEN Effective	JAPAN Nominal	JAPAN Effective
LEATHER 1) Hides and skins	Pre-KR		1.1	----	5.4	----	0	----	0	----	0	----
	Post-KR	211	1.1	----	0.0	----	0	----	0	----	0	----
	Ratio		100	0	0	----	----	----	----	----	----	----
2) Leather	Pre-KR		9.6	25.7	14.9	34.3	7.3	18.3	7.0	21.7	19.9	59.0
	Post-KR	611	4.7	12.0	11.4	30.3	4.8	12.3	1.7	4.3	11.6	34.7
	Ratio		49	47	76	88	66	67	24	20	58	59
3) Leather goods other than shoes	Pre-KR	612	15.5	24.5	18.7	26.4	14.7	24.3	12.2	20.7	23.6	33.6
	Post-KR	831	7.7	11.4	9.3	8.1	7.3	10.4	10.4	22.1	11.8	15.0
	Ratio		50	46	50	31	50	43	85	107	50	45
4) Shoes	Pre-KR		16.6	25.3	24.0	36.2	19.9	33.0	14.0	22.8	29.5	45.1
	Post-KR	851	14.9	26.3	20.4	32.7	11.9	19.3	11.9	22.8	22.9	36.5
	Ratio		90	104	85	90	60	58	85	100	78	81
WOOD 1) Wood in the rough	Pre-KR		3.0	----	2.3	----	2.1	----	0	----	2.3	----
	Post-KR	242.2	0	----	1.4	----	1.0	----	0	----	0	----
	Ratio		----	----	61	----	48	----	----	----	----	----
2) Wood simply worked	Pre-KR		0.7	1.1	7.9	21.5	3.2	4.5	0	----	5.9	13.3
	Post-KR	243	0.3	0	6.3	18.8	1.6	4.0	0	----	2.9	8.5
	Ratio		43	0	80	87	50	89	----	----	49	64
3) Plywood	Pre-KR		17.1	43.7	17.5	38.7	15.0	32.5	7.0	17.0	20.0	44.2
	Post-KR	631.2	8.5	13.8	8.7	12.7	11.3	19.6	3.5	2.9	14.0	25.4
	Ratio		50	31	50	33	75	60	50	17	70	57
4) Wood Manufactures	Pre-KR		12.8	26.4	14.8	25.5	15.1	28.6	6.8	14.5	19.5	33.9
	Post-KR	632	6.7	13.6	8.1	13.2	8.7	16.3	6.9	15.0	11.5	23.2
	Ratio		52	51	54	52	58	57	101	103	59	68

TABLE A-II-8 (Continued)

COMMODITY	PERIOD	SITC No.	UNITED STATES Nomi-nal	UNITED STATES Effec-tive	UNITED KINGDOM Nomi-nal	UNITED KINGDOM Effec-tive	EUROPEAN ECONOMIC COMMUNITY Nomi nal	EUROPEAN ECONOMIC COMMUNITY Effec-tive	SWEDEN Nomi-nal	SWEDEN Effec-tive	JAPAN Nomi-nal	JAPAN Effec-tive
PULP AND PAPER												
1)Pulpwood	Pre-KR		0	----	0	----	2.1	----	0	----	0	----
	Post-KR	242.1	0	----	0	----	0	----	0	----	0	----
	Ratio		----	----	----	----	0	----	----	----	----	----
2)Woodpulp	Pre-KR		0	-1.8	0	-4.3	4.7	5.4	0	-0.9	5.0	6.3
	Post-KR	251	0	-1.1	0	-2.4	3.3	5.0	0	-0.5	5.0	75.
	Ratio		----	61	----	56	70	92	----	55	100	119
3)Paper and paper articles	Pre-KR	641	3.1	5.6	6.6	13.5	10.3	19.0	2.0	4.2	10.5	18.5
	Post-KR	642	2.5	5.0	5.8	12.7	6.1	13.0	1.0	2.0	7.7	17.2
	Ratio		81	89	88	94	59	68	50	48	73	93
WOOL												
1)Wool,raw	Pre-KR		11.4	----	0	----	0	----	0	----	0	----
	Post-KR	262.1	9.7	----	0	----	0	----	0	----	0	----
	Ratio		85	----	----	----	----	----	----	----	----	----
2)Wool, yarn	Pre-KR	651.2	23.0	53.2	10.0	31.8	5.7	16.1	5.8	19.6	10.0	29.6
	Post-KR		20.7	49.5	7.7	25.0	5.7	17.5	2.9	9.6	5.0	14.7
	Ratio		90	93	77	79	100	109	50	49	50	50
3)Wool fabrics, woven	Pre-KR	653.2	50.1	119.1	17.5	36.3	16.0	36.9	12.8	29.1	20.0	43.1
	Post-KR		20.7	60.9	14.0	27.7	16.0	38.1	11.1	28.4	10.0	21.3
	Ratio		41	51	80	76	100	103	87	97	50	49
4)Wool clothing	Pre-KR	ex 841.1(2)	22.1	-5.4	20.0	29.7	20.5	32.4	14.0	20.8	22.0	30.8
	Post-KR		16.6	2.4	16.0	25.4	15.4	19.2	11.9	17.6	15.4	26.7
	Ratio		75	e	80	85	75	59	85	85	70	87
COTTON												
1)Cotton, raw	Pre-KR	263.1	6.2	----	0	----	0	----	0	----	0	----
	Post-KR		6.2	----	0	----	0	----	0	----	0	----
	Ratio		100	----	----	----	----	----	----	----	----	----

TABLE A-II-8 (Continued)

COMMODITY	PERIOD	SITC No.	UNITED STATES Nominal	UNITED STATES Effective	UNITED KINGDOM Nominal	UNITED KINGDOM Effective	EUROPEAN ECONOMIC COMMUNITY Nominal	EUROPEAN ECONOMIC COMMUNITY Effective	SWEDEN Nominal	SWEDEN Effective	JAPAN Nominal	JAPAN Effective
2)Cotton, yarn and thread	Pre-KR	651.3	13.1	32.8	7.5	22.8	10.0	31.4	10.0	34.6	5.6	13.9
	Post-KR		10.5	25.0	6.1	16.3	10.0	32.9	8.7	30.4	2.8	6.8
	Ratio		80	76	81	85	100	105	87	88	50	49
3)Cotton fabrics worn	Pre-KR	652	17.5	31.2	19.7	46.9	15.0	27.5	13.1	23.8	10.5	20.0
	Post-KR		13.8	24.6	18.7	46.6	12.0	19.1	10.5	18.1	7.9	17.8
	Ratio		79	79	95	99	80	69	80	76	75	89
4)Cotton clothing	Pre-KR	ex 841.1(2)	26.6	48.1	25.0	40.3	18.5	28.1	14.6	21.9	21.0	40.3
	Post-KR		20.0	35.4	20.0	28.6	14.0	20.8	12.4	19.7	14.7	27.5
	Ratio		75	73	80	71	76	74	85	90	70	68.1
5)Clothing accessories, knitted	Pre-KR	841.4	25.6	48.7	25.4	49.7	18.6	41.3	17.6	42.4	26.0	60.8
	Post-KR		17.9	35.2	21.1	47.1	12.1	27.6	15.0	37.1	19.5	47.1
	Ratio		70	72	83	95	65	67	85	87	75	77
JUTE												
1)Raw jute	Pre-KR	264	0	----	0	----	0	----	0	----	0	----
	Post-KR		0	----	0	----	0	----	0	----	0	----
	Ratio		----	----	----	----	----	----	----	----	----	----
2)Jute fabrics, woven	Pre-KR	653.4	2.8	7.0	20.0	54.2	23.0	62.2	11.0	30.3	25.0	67.5
	Post-KR		0	-0.6	20.0	54.7	19.6	53.3	7.9	21.6	20.0	54.4
	Ratio		0	e	100	101	85	86	72	71	80	80
3)Jute sacks and bags	Pre-KR	656.1	7.5	16.6	20.0	27.2	19.4	19.2	11.0	14.9	25.0	34.5
	Post-KR		36	10.7	20.0	28.0	15.5	14.0	8.8	14.3	12.5	2.7
	Ratio		48	64	100	103	80	75	80	96	50	8
OTHER COMMODITIES												
1)Paper and Paper Products	Pre-KR		3.1	0.7	6.6	8.1	10.3	13.3	2.0	-0.7	10.5	12.9

TABLE A-II-8 (Continued)

COMMODITY	PERIOD	SITC no.	UNITED STATES Nominal	UNITED STATES Effective	UNITED KINGDOM Nominal	UNITED KINGDOM Effective	EUROPEAN ECONOMIC COMMUNITY Nominal	EUROPEAN ECONOMIC COMMUNITY Effective	SWEDEN Nominal	SWEDEN Effective	JAPAN Nominal	JAPAN Effective
2)Printed matter	Pre-KR		2.5	2.2	2.7	0.2	3.3	-0.7	0.7	0.0	1.6	-4.2
3)Plastic Articles	Pre-KR		21.0	27.0	17.9	30.1	20.6	30.0	15.0	25.5	24.9	35.5
4)Synthetic Materials	Pre-KR		18.6	33.5	12.7	17.1	12.0	17.6	7.2	12.9	19.1	32.1
5)Other Chemical Prod.	Pre-KR		12.3	26.6	19.4	39.2	11.3	20.5	4.5	9.7	12.2	22.6
6)Cleaning Agents, Perfumes	Pre-KR		11.2	18.8	11.1	11.2	13.8	26.7	10.0	27.9	26.2	61.5
7)Misc. Chemical Products	Pre-KR		12.6	15.6	15.4	16.7	11.6	13.1	2.5	0.0	16.8	22.9
8)Non-metallic Mineral Products	Pre-KR		18.2	30.4	13.6	20.9	13.3	19.8	6.0	10.0	13.5	20.8
9)Glass, glass Products	Pre-KR		18.8	29.3	18.5	26.2	14.4	20.0	13.8	22.6	19.5	27.4
10)Rolling mill Prod.	Pre-KR		7.1	-2.2	9.5	7.4	7.2	10.5	5.2	13.2	15.4	29.5
11)Other steel Products	Pre-KR		5.1	0.5	17.0	46.8	9.9	20.9	5.4	9.5	13.4	14.1
12)Metal Castings	Pre-KR		6.6	10.0	16.0	26.9	12.4	21.0	8.0	34.7	20.0	32.5
13)Metal Manufactures	Pre-KR		14.4	28.5	19.0	35.9	14.0	25.6	8.4	16.2	18.1	27.7

TABLE A-II-8 (Continued)

COMMODITY	PERIOD	SITC No.	UNITED STATES Nominal	UNITED STATES Effective	UNITED KINGDOM Nominal	UNITED KINGDOM Effective	EUROPEAN ECONOMIC COMMUNITY Nominal	EUROPEAN ECONOMIC COMMUNITY Effective	SWEDEN Nominal	SWEDEN Effective	JAPAN Nominal	JAPAN Effective
14) Agricultural Machinery	Pre-KR		0.4	-6.9	15.4	21.3	13.4	19.6	10.0	16.0	20.0	29.2
15) Non-electrical Machinery	Pre-KR		11.0	16.1	16.1	21.2	10.3	12.2	8.8	11.6	16.8	21.4
16) Electrical Machinery	Pre-KR		12.2	18.1	19.7	30.0	14.5	21.5	10.7	17.7	18.1	25.3
17) Electrical Appliances and Goods	Pre-KR		16.3	26.07	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
18) Precision Instruments	Pre-KR		21.4	32.3	25.7	44.2	13.5	24.2	6.6	14.9	23.2	38.5
19) Sporting goods, toys, jewelry, etc.	Pre-KR		25.0	41.8	22.3	35.6	17.9	26.6	10.6	16.6	21.6	31.2

Sources: B. A. Balassa, "Tariff Protection in Industrial Countries: An Evaluation," Journal of Political Economy, December, 1965; "The Structure of Protection in the Industrial Countires and Its Effects on Processed Goods from Developing Nations," Programs for the Liberalization and Expansion of Trade in Manufactures and Semi-manufactures of Interest to Developing Countries, UNCTAD, (New York: U. N., 1967); The Kennedy Round, Estimated Effects on Tariff Barriers, Part II, UNCTAD, TD/6/Rev. 1, (New York: U. N., 1968), Table A, pp. 209-13.

NOTES TO TABLES A-II-9-13

Tables A-II-9-13 list the capital and labor coefficients per one million dollars (or pounds sterling) for industries in Japan, the U. S. and U. K. The capital coefficients as presented here are computed in the net form by dividing the net book value of capital stock and inventories by the current value added of the respective industries and multiplied by one million. Similarly the labor coefficients were computed in man years as the ratio of the number of workers employed in an industry and its value added, multiplied by one million, i.e., the number of man years required to produce one million dollars (or pound sterling) worth of value added.

The occupational structure of the labor force was divided into two major groups of skilled and unskilled labor in order to define the human skills coefficients in the same way as the capital and labor coefficients defined above.

TABLE A-II-9

JAPAN'S CAPITAL AND LABOR COEFFICIENTS, 1954
(Per Million Dollars Worth of Output)

No.	Description of Industry	Labor/ Output (man years)	Capital/ Output in Thousands of $
1	Agriculture	5600	1430
2	Forestry	2100	433
3	Fishing	2400	691
4	Coal Mining	860	563
5	Crude Oil	468	960
6	Other Mining	524	535
7	Processed Foods	841	140
8	Textiles	1545.6	174
9	Lumber & Wood Products	1645.5	282
10	Paper & Paper Products	701.2	195
11	Printing	728.8	179
12	Chemicals	493	284
13	Coal Products	415.2	287
14	Petroleum Products	415.2	287
15	Rubber & Plastic Products	664	162
16	Leather, Leather Products including Footwear	1139	93
17	Non-metallic Mineral Products	807	409
18	Glass & Glass Products	777	421
19	Iron and Steel	649	203
20	Non-ferrous Metal Products	641	203
21	Metal Goods Industries	1289	362
22	Non-electrical Machinery	1280	298
23	Electrical Mach. & Equipment	994	346
24	Precision Tools	843	229
25	Transport Equipment	714	324
26	Other Industry	1506	89
27	Transportation, Communication & Public Utilities	714	2610
28	Land Transportation	747	2698
29	Water Transportation	575	2078
30	Trade and Services	5542	2217
31	Financial Services	699	774
32	Electricity & Water	438	3304
33	Trade	1390	556
34	Other Services	2760	1736

Sources: National Income Accounts (Japan), 1957; National Wealth Survey; Economic Bulletin No. 1, February, 1959; Capital Structure of Japanese Economy, Economic Planning Agency and Council for Industrial Planning, Tokyo, Japan; T. Watanabe, "Approaches to the Problem of Inter-Country Comparison of Input-Output Relations: A Survey,: International Comparison of Interindustry Data, (New York: U.N., 1969), pp. 187-210.

TABLE A-II-10

CAPITAL COEFFICIENTS (K/O) PER $1 MILLION OUTPUT (IN THOUSANDS OF U. S. DOLLARS) AND THE LABOR COEFFICIENT (L/O) PER $1 MILLION OUTPUT (IN MAN YEARS) IN THE U.S.

No.	Description of Industry	Capital Coefficients	Labor Coefficients
1	Livestock and Livestock Products	2552.570	76.410
2	Other Agricultural Products	2729.980	48.700
3	Forestry and Fishery Products	2424.650	89.350
4	Agricultural, Forestry and Fishery Services	1070.000	118.360
5	Iron and Ferro-Alloy Ores Mining	1587.890	45.470
6	Non-ferrous Metal Ores Mining	1573.680	67.220
7	Coal Mining	2087.500	1035.620
8	Crude Petroleum and Natural Gas	1796.150	31.700
9	Stone and Clay Mining	1583.870	64.720
10	Chemical and Fertilizer Mineral Mining	1603.830	41.540
11	Food and Kindred Products	792.110	82.140
12	Tobacco Manufactures	1647.530	52.940
13	Broad & Narrow Fabrics, Yarn and Thread Mills	955.690	153.280
14	Misc. Textile Goods and Floor Coverings	968.530	103.440
15	Apparrel	398.980	167.350
16	Misc. Fabricated Textile Products	812.490	140.98
17	Lumber & Wood Products, Except Containers	939.740	167.140
18	Wooden Containers	1119.740	229.880
19	Household Furniture	647.440	143.62
20	Other Furniture and Fixtures	671.700	116.660
21	Paper and Allied Products Except Containers	1252.890	78.840
22	Paperboard Containers and Boxes	1320.450	97.880
23	Printing and Publishing	505.050	96.400
24	Chemicals and Selected Chemical Products	922.200	51.110
25	Plastic and Synthetic Materials	934.930	61.080
26	Drugs, Cleaning and Toilet Preparations	899.700	38.950
27	Paints and Allied Products	1110.890	56.650

TABLE A-II-10 (Continued)

No.	Description of Industry	Capital Coefficients	Labor Coefficients
28	Petroleum Refining and Related Industries	2048.480	50.900
29	Rubber and Misc. Plastic Products	917.880	90.240
30	Leather Tanning & Industrial Leather Products	686.440	111.110
31	Footwear and Other Leather Products	466.730	179.350
32	Glass and Glass Products	1032.460	91.210
33	Stone and Clay Products	990.290	86.540
34	Primary Iron and Steel Manufacturing	1478.460	75.420
35	Primary Nonferrous Metal Manufacturing	1561.860	82.270
36	Metal Containers	984.890	73.600
37	Heating, Plumbing and Structural Metal Prod.	1004.050	106.230
38	Stamping, Screw Machine Products and Bolts	859.420	118.440
39	Other Fabricated Metal Products	931.610	100.180
40	Engines and Turbines	852.980	76.300
41	Farm Machinery and Equipment	948.120	92.620
42	Construction, Mining and Oil Field Machinery	944.550	79.410
43	Materials Handling Machinery and Equipment	758.450	71.970
44	Metal Working Machinery	622.550	92.540
45	Special Industry Machinery	869.430	91.280
46	General Industrial Machinery	1126.101	85.310
47	Machine Shop Products	625.060	139.820
48	Office, Computing and Accounting Machinery	982.270	99.750
49	Service Industry Machinery	889.520	74.500
50	Electrical Industrial Equipment & Apparatus	687.900	96.190
51	Household Appliances	712.270	74.350
52	Electric Lighting and Wire Equipment	641.410	98.070
53	Radio, T.V. and Communication Equipment	694.660	86.070
54	Electric Components and Accessories	634.480	104.460
55	Misc. Electrical Machinery, Equipment	619.810	95.000
56	Motor Vehicles and Equipment	567.210	58.050
57	Aircraft and Parts	790.950	81.350

TABLE A-II-10 (Continued)

No.	Description of Industry	Capital Coefficients	Labor Coefficients
58	Other Transportation Equipment	979.410	109.110
59	Scientific and Controlling Instruments	1084.510	99.800
60	Optical, Ophthalmic and Photographic Equipment	1036.070	72.780
61	Miscellaneous Manufacturing	793.640	116.360
62	Transportation and Warehousing	1900.860	123.005
63	Communication, Except Radio and T.V.	3762.770	101.128
64	Radio, T.V. Broadcasting	4560.400	98.890
65	Electric, Gas, Water Services	1566.930	65.161
66	Wholesale and Retail Trade	1181.880	51.450
67	Finance and Insurance	37.280	83.669
68	Real Estate and Rental	4625.000	21.831
69	Hotels; Personal and Repair Services	899.000	185.680
70	Business Services	1855.600	121.650
71	Medical, Educational Services	2798.570	123.020

Sources: Censuses of Manufacturing (1962), Agriculture (1964), Mining (1963) and Business (1963); Bureau of Labor Statistics, O.B.E. - (Jack Alterman); M. Gort and Boddy (forthcoming, See Appendix II); John W. Kendrick, Industrial Composition of Income and Product, Brookings, 1968, pp. 151-75.

TABLE A-II-11

CAPITAL, LABOR, AND SKILLS COEFFICIENTS FOR THE UNITED KINGDOM (1960)
(Per One Million £ Worth of Output)

No.	Industry	Labor/ Output (man years)	Capital/ Output (Pounds)	Skilled Labor/ Output (manyears)	Unskilled Labor/ Output (man years)
1	Agriculture, Forestry and Fishing	1347.30	508.046	184.58	1162.72
2	Coal Mining	703.45	1,035,849	50.48	652.97
3	Mining and Quarrying, n.e.s.	1421.05	1,487,180	108.00	1313.05
4	Food Processing	1471.82	1,367,063	387.09	1084.73
5	Drink and Tobacco	946.50	1,142,850	261.24	685.26
6	Coke Ovens, etc.	678.60	4,294,110	208.33	470.27
7	Mineral Oil Refining	854.17	11,884,615	262.23	591.94
8	Iron & Steel (m.r. & c.)	1084.60	2,071,111	185.47	899.13
9	Chemicals n.e.s.	789.21	1,822,727	281.75	507.46
10	Iron & Steel (t. & t.)	943.66	1,195,880	161.36	782.30
11	Non-ferrous Metals	1080.90	1,155,700	232.39	848.51
12	Engineering and Electrical Goods	1280.52	835,300	412.33	868.19
13	Shipbuilding and Marine Engineering	1775.00	835,402	417.13	1357.87
14	Motors and Cycles	1006.26	1,135,154	250.56	755.70
15	Aircraft	1095.59	975,000	283.76	811.83
16	Railway Locos and Rolling Stock	3500.00	1,328,125	822.50	2677.50
17	Metal Goods, n.e.s.	1326.87	822,034	258.74	1068.13
18	Textiles	1605.07	1,572,300	203.84	1401.23
19	Leather, Clothing and Footwear	1854.04	591,100	221.58	1632.46
20	Building Materials	1360.25	1,170,000	231.24	1129.01

TABLE A-II-11 (Continued)

No.	Industry	Labor/ Output (man years)	Capital/ Output (Pounds)	Skilled Labor/ Output (man years)	Unskilled Labor/ Output (man years)
21	Pottery, Glass	1433.23	882,600	246.52	1186.71
22	Timber, Furniture, etc.	1761.90	655,211	267.81	1494.09
23	Paper, Printing	1123.84	1,180,000	301.19	822.65
24	Other Manufactures including Rubber	1440.76	1,200,000	344.42	1096.34
25	Construction	1523.25	412,500	266.57	1256.68
26	Gas	1451.61	6,183,010	478.13	973.48
27	Electricity	661.80	13,388,000	217.07	344.73
28	Water	775.51	20,710,100	254.36	521.15
29	Transport and Communications	1311.92	4,221,500	631.35	679.57
30	Distributive Trades	1376.63	901,431	1039.48	339.15
31	Services, n.e.s.	1881.48	895,206	865.48	1016.00

Sources: "A Program for Growth," Production, Capital and Labor, Department of Applied Economics, Cambridge University, MIT Press, 1966; M. Horowitz, M. Zymelman, and I. L. Herrenstadt, Manpower Requirements for Planning, An International Comparison Approach, Vol. 2 (Boston: Northeastern University, 1967), pp. 41-42.

TABLE A-II-12

JAPAN'S SKILL COEFFICIENTS (MAN YEARS) 1950
(Per One Million Dollars Worth of Output)

No.	Description of Industry	Skilled Labor Coefficients	Unskilled Labor Coefficients
1	Agriculture, Forestry and Fisheries	452.2	3347.8
2	Agriculture	772.8	4927.2
3	Forestry	134.4	1965.6
4	Fisheries	84.0	2316.0
5	Mining and Quarrying	101.03	590.97
6	Coal	122.12	737.88
7	Metal Ores	104.8	419.2
8	Petroleum, Natural Gas	115.128	352.872
9	Quarrying and Others	57.096	466.904
10	Food, Beverages	162.313	678.687
11	Tobacco and Products	313.693	527.307
12	Textile Mill Products	173.097	1372.503
13	Clothing, Other Fabricated Textiles	199.382	1346.218
14	Footwear	125.29	1013.71
15	Leather and Leather Products	227.8	911.2
16	Furniture and Fixtures	106.96	1538.54
17	Lumber and Wood Products	208.98	143 .52
18	Wood Products and Furniture	175.71	1469.79
19	Paper, Paper Products	129.72	571.48
20	Printing and Publishing	306.096	422.704
21	Rubber and Products	147.07	516.93
22	Chemicals, Products	154.31	338.69
23	Petroleum and Coal Products	126.22	288.98
24	Stone and Clay Products	96.03	710.97
25	Glass, Stone and Clay Products	123.47	683.53

TABLE A-II-12 (Continued)

No.	Description of Industry	Skilled Labor Coefficients	Unskilled Labor Coefficients
26	Metal and Metal Products	116.564	527.44
27	Primary Metals	133.95	510.05
28	Fabricated Metal Products (Excluding Machinery)	189.48	1099.52
29	Non-electrical Machinery	318.72	961.28
30	Electrical Machinery and Equipment	329.01	664.99
31	Transport Equipment	152.08	561.92
32	Professional and Scientific Instruments	217.49	625.51
33	Miscellaneous Manufacturing	225.90	1280.10
34	Transportation Warehousing	234.91	479.09
35	Communications	287.74	426.26
36	Utilities	357.71	356.29
37	Trade	1103.66	289.34
38	Trade, Insurance, Financial Services, etc.	4156.50	1386.50
39	Electricity and Water	219.438	218.562

Source: M. A. Horowitz, M. Zymelman and I. L. Herrnstadt, Manpower Requirements for Planning: An International Comparison Approach (Boston: Northeastern University Press, 1966), pp. 30-31.

TABLE A-II-13

SKILLED AND UNSKILLED LABOR COEFFICIENTS FOR U.S. INDUSTRIES PER MILLION DOLLARS OUTPUT (1960) IN MAN YEARS

No.*	Unskilled Labor Coefficients (Man years)	Skilled Labor Coefficients (Man years)	No.	Unskilled Labor Coefficients (Man years)	Skilled Labor Coefficients (Man years)
1	53.710	22.700	26	27.450	11.500
2	29.700	19.000	27	32.650	24.000
3	76.250	13.100	28	30.000	20.900
4	75.860	42.500	29	62.340	27.900
5	37.270	8.200	30	92.210	18.900
6	56.200	10.800	31	152.450	26.900
7	931.320	104.300	32	70.510	20.700
8	19.600	12.100	33	66.240	20.300
9	53.220	11.500	34	62.120	13.300
10	30.040	11.500	35	61.870	20.400
11	60.340	21.800	36	53.500	20.100
12	40.060	10.900	37	73.630	32.600
13	143.780	18.500	38	81.940	36.500
14	90.040	14.500	39	70.180	30.000
15	143.450	23.900	40	53.500	22.800
16	120.480	20.500	41	61.820	30.800
17	142.040	25.100	42	52.910	26.500
18	193.180	36.700	43	48.070	23.900
19	116.420	27.200	44	61.740	30.800
20	95.460	21.200	45	60.880	30.400
21	57.640	21.200	46	57.210	38.100
22	73.880	24.000	47	94.820	45.000
23	42.900	53.500	48	69.750	30.000
24	30.010	21.100	49	51.300	23.200
25	35.980	25.100	50	66.190	30.000

TABLE A-II-13 (Continued)

No.	Unskilled Labor Coefficient (Man years)	Skilled Labor Coefficient (Man years)	No.	Unskilled Labor Coefficient (Man years)	Skilled Labor Coefficient (Man years)
51	50.250	24.100	62	89.800	33.200
52	65.970	32.100	63	29.730	71.400
53	57.370	28.700	64	29.090	69.800
54	70.460	34.000	65	43.160	22.000
55	63.900	31.100	66	18.250	33.200
56	40.350	17.700	67	9.170	74.400
57	58.850	22.500	68	2.530	19.300
58	78.910	30.200	69	139.680	46.000
59	57.500	42.300	70	23.850	97.8
60	48.680	24.100	71	39.700	83.3
61	83.260	33.100			

Source: M. Horowitz, M. Zymelman and I. L. Herrnstadt, Manpower Requirements for Planning: An International Comparison Approach, Vol. 2 (Boston: Northeastern University, 1967), pp. 46-47.

* The serial numbers are defined the same as in Table A-II-10.

TABLE A-II-14

U.S. OCCUPATIONAL SKILL REQUIREMENTS BY INDUSTRY IN 1960 FOR MANUFACTURING INDUSTRIES WITH EMPLOYMENT WEIGHTS TO CORRESPOND

SITC No.	Type of Commodity	OCCUPATIONAL SKILL DISTRIBUTION (1960) (% OF TOTAL LABOR FORCE)								KEESING INDEX S $\frac{2(I+II+III)+V}{VIII}$
		I	II	III	IV	V	VI	VII	VIII	
013	Meat, tinned or prepared	0.569	0.194	1.026	5.584	0.482	7.117	14.374	70.654	0.0574
032	Fish, Tinned or prepared	0.872	0.694	1.726	6.362	1.035	11.211	13.346	64.754	0.1176
053	Fruit, Preserved	0.872	0.694	1.726	6.362	1.035	11.211	13.346	64.754	0.1176
055	Vegetables, "	0.872	0.694	1.726	6.362	1.035	11.211	13.346	64.754	0.1176
266	Synthetic Fibres	4.518	4.384	2.422	1.600	2.823	19.230	7.830	57.193	0.4454
551	Essential Oil & Perfumes	7.943	4.794	3.218	6.737	2.455	15.620	19.422	39.811	0.8632
599	Chemical Materials and Products	7.943	4.794	3.218	6.737	2.455	15.620	19.422	39.811	1.2841
611	Leather, prepared	0.565	0.401	01565	5.121	0.912	10.008	8.779	73.649	0.0539
612	Manufactures of Leather	0.451	0.175	0.763	6.241	1.179	6.734	11.719	72.738	0.0544
629	Rubber Products	2.608	1.476	1.964	4.449	2.321	11.545	14.881	60.756	0.2372
632	Wood Manufactures, n.e.s.	0.396	0.335	0.798	6.601	1.366	14.274	9.333	66.897	0.0661
641	Paper and paper-board	1.838	2.054	2.318	3.701	2.879	16.038	11.244	59.928	0.2552
642	Paper Products	1.136	0.601	2.161	5.076	2.375	13.150	16.389	59.112	0.1720
651	Textile Yarn & Thread	0.552	0.498	0.988	3.239	1.176	11.014	9.152	73.381	0.0715
652	Cotton Fabrics	0.552	0.498	0.988	3.239	1.176	11.014	9.152	73.381	0.0715
653	Woven non-cotton fabrics	0.552	0.498	0.988	3.239	1.176	11.014	9.152	73.381	0.0715
655	Special Textile fabrics	0.552	0.498	0.988	3.239	1.176	11.014	9.152	73.381	0.0715
656	Bags, sacks, linen, n.e.s.	0.552	0.498	0.988	3.239	1.176	11.014	9.152	73.381	0.0715
657	Floor coverings	0.878	0.591	1.626	4.845	1.391	10.505	14.002	66.162	0.1145

TABLE A-II-14 (Continued)

SITC No.	Type of Commodity	OCCUPATIONAL SKILL DISTRIBUTION (1960) (% OF TOTAL LABOR FORCE) I	II	III	IV	V	VI	VII	VIII	KEESING INDEX S $\frac{2(I+II+III)+V}{VIII}$
664	Glass	1.569	1.131	2.711	3.598	3.231	12.199	11.428	64.133	0.2191
665	Glassware	1.569	1.131	2.711	3.598	3.231	12.199	11.428	64.133	0.2191
666	Pottery products	1.406	1.221	1.813	3.511	2.130	8.664	9.921	71.334	0.1543
671	Pig Iron & Steel	2.275	1.238	1.498	2.287	4.421	27.206	10.683	50.392	0.2866
696	Cutlery, etc.	1.564	0.776	1.531	4.626	8.432	13.017	15.430	54.624	0.2960
711	Non-electrical machinery	4.030	2.495	2.047	5.744	16.372	13.736	14.982	40.594	0.8256
729	Electrical goods, n.e.s.	7.229	4.660	3.340	4.249	4.490	12.158	16.035	47.839	0.7305
821	Furniture	0.482	0.572	0.909	5.377	1.427	20.965	12.027	58.241	0.0919
831	Travel goods, etc.	0.451	0.175	0.763	6.241	1.179	6.734	11.719	72.738	0.0544
841	Clothing	0.109	0.079	0.839	3.604	0.405	5.114	9.090	80.760	0.0304
851	Footwear	0.116	0.071	0.478	2.718	0.883	5.409	10.706	79.619	0.0277
892	Printed Matter	0.144	0.193	8.819	7.454	0.345	27.801	38.799	16.445	1.1345
893	Plastic Products									N.A.
894	Toys, sporting goods, etc.									N.A.
897	Jewelry & Goldsmith products									N.A.

Source: "Labor Skills and the Structure of Trade in Manufactures," The Open Economy.

NOTES TO TABLE A-II-15

This table lists the Scale Economy Index (d) as developed by Hufbauer. The scale economies were equated with the exponent in the regression equation, $v = kn^d$, where v is the 1963 ratio between the value added in plants employing n persons and average value added for the four-digit U. S. Census Bureau industries (1966), and k is a constant. Four-digit industries were reclassified according to the three-digit SITC prior to running the regression analysis.

TABLE A-II-15

HUFBAUER'S SCALE ECONOMIES INDICES FOR MANUFACTURING INDUSTRIES ACCORDING TO SITC CLASSIFICATION SYSTEM

SITC No.	Description of Commodities	Scale Economy Index (d)
*013	Canned and Prepared Meat	0.027
*032	Canned and Prepared Fish	0.081
*053	Preserved Food	0.121
*055	Preserved Vegetables	0.119
111	Non-alcoholic Beverages	0.089
251	Pulp, Waste Paper	n.a.
*266	Synthetic, Regenerated Fibers	0.491
512	Organic Chemicals	0.086
513	Inorganic Chemicals	-0.074
521	Mineral Tar and Crude Chemicals	0.027
531	Synthetic Organic Dyestuffs	0.086
532	Dyeing & Tanning Extracts	0.047
541	Medicinal & Pharmaceutical Products	0.083
*551	Essential Oils, Perfumes, etc.	0.194
553	Perfumery and Cosmetics	0.240
561	Manufactured Fertilizers	0.076
*599	Chemical Materials,n.e.s.	0.059
*611	Leather	-0.058
*612	Manufactures of Leather	0.060
621	Materials of Rubber	0.011
*629	Articles of Rubber	0.011
*631	Veneers, Plywood Boards	0.029
*632	Wood Manufacturing, n.e.s	0.006
633	Cork Manufactures	0.006
*641	Paper & Paperboard	0.101
*642	Articles of Paper Pulp, Paper	0.018
*651	Textile Yarn & Thread	0.066
*652	Cotton, Fabrics, Woven	-0.052
*653	Other Textile Fabrics, Woven	-0.034
654	Tulle, Lace, Embroidery	-0.004
*655	Special Textile Fabrics	0.011
*656	Made-up Textile Articles	-0.014
*657	Floor Coverings, etc.	0.052
*664	Glass	0.039
*665	Glassware	0.112
*666	Pottery	0.034
*671	Pig Iron, etc.	0.082

TABLE A-II-15 (Continued)

SITC No.	Description of Commodities	Scale Economy Index (d)	SITC No.	Description Commodities	Scale Economy Index (d)
673	Bars, Rods, Angles, Shapes	0.058	812	Sanitary, Heating, Lighting Fixtures	0.065
677	Wire, Excluding Wire Rod	0.019	*821	Furniture	0.032
679	Castings and Forgings	-0.004	*831	Travel Goods, Handbooks, etc.	0.031
681	Non-ferrous Metals	-0.079	*841	Clothing, except fur	0.097
691	Finished Structural Parts	0.005	*851	Footwear	0.052
694	Nails, Screws, Nuts, etc.	0.334	861	Scientific, Medical, Optical Instruments	0.034
*695	Tools for Hand or Machine	0.334	*892	Printed Matter	0.034
*696	Cutlery	0.334	*893	Plastic Articles	0.078
697	Household Equipment	0.334	*894	Perambulators, Toys, Sporting Goods	0.090
*711	Power Generating Machinery	0.039	895	Office, Stationery, Supplies	0.066
712	Agricultural Machinery	0.039	*897	Jewelry, Goldsmith's Wares	0.032
714	Office Machines	0.004	899	Manufactured Articles n.e.s.	0.055
719	Machinery & Appliances, n.e.s	0.267			
722	Electric Power Machinery	0.033			
723	Equipment for Distributing Electricity	0.033			
*724	Telecommunications Apparatus	0.527			
725	Domestic Electrical Equipment	0.096			
*729	Electrical Machinery, n.e.s.	0.064			
730	Transport Equipment	0.137			

Source: G. C. Hufbauer, "The Commodity Composition of Trade in Manufactured Goods," prepared for Conference on Technology and Competition in International Trade, National Bureau of Economic Research, New York, Oct. 11-12, 1968, Table 3.

* Commodities included in the correlation tests.

NOTES TO TABLE A-II-16

Estimates of the "revealed" comparative advantage index (X) are listed in this table. The revealed comparative advantage index is approximated by the export performance of a developing country in a particular manufactured commodity in the market of developed countries. The export performance could be evaluated by (a) comparing the relative share of a country in the world export of individual commodities, (b) indicating changes in relative shares over time, and (c) a combination of (a) and (b). The revealed comparative advantage index as demonstrated in Table A-II-16 was developed by combining (a) and (b). This was done by dividing a developing country's share in the exports of a given manufactured commodity by its share in the combined exports of manufactured goods of all developing countries to developed countries, and expressing the results in index number form.

TABLE A-II-16

"REVEALED" COMPARATIVE ADVANTAGE INDEX[ψ] ESTIMATES FOR SELECTED DEVELOPING COUNTRIES
(1960-61--1967-68), 1960-61 = 100

SITC NO.	DESCRIPTION OF COMMODITIES	HONG KONG	TAIWAN	PAKISTAN	MEXICO	INDIA	BRAZIL
				X			
013	Canned and Prepared Meat	0.658	-	1.287	-	-	101.492
032	Canned and Prepared Fish	14.012	** 6.344	957.709	670.886	2540.964	-
053	Preserved Food	5.479	115.833	-	107.820	0.963	194.483
055	Preserved Vegetables	2.309	1054.640	38.458	23.708	6.096	* 75.032
266	Synthetic, Regenerated Fibers	201.410	160.809	-	2.887	25.570	-
551	Essential Oils, Perfumes,etc.	55.612	38.908	-	319.146	114.837	254.059
599	Chemical Materials,n.e.s.	-	-	-	29.663	251.190	219.515
611	Leather	-	-	2890.245	22.638	617.130	116.673
612	Manufactures of Leather	122.349	**204.691	*499.227	366.668	**108.278	14.306
629	Articles of Rubber	-	**126.877	-	-	43.147	-
631	Veneers, plywood boards	-	287.329	-	45.140	-	210.211
632	Wood Manufacturing, n.e.s.	26.335	964.228	-	380.717	-	-
641	Paper & Paperboard	5.993	-	-	5.970	-	3083.534
642	Articles of Paper Pulp, Paper	284.398	50.815	-	**329.253	238.453	-
651	Textile Yarn & Thread	37.754	39.474	3342.817	902.066	269.951	221.607
652	Cotton, Fabrics, woven	233.829	60.923	419.662	94.744	398.221	8.833
653	Other Textile Fabrics, woven	3.268	* 4.981	925.423	0.802	1102.484	-
655	Special Textile Fabrics	9.341	47.519	-	304.089	2.900	2001.293
656	Made-up Textile Articles	593.560	43.034	504.152	1.157	502.859	15.739
657	Floor Coverings, etc.	15.718	8.225	263.816	0.919	185.656	-
664	Glass	65.270	506.217	-	24.105	-	**48.945
665	Glassware	956.318	**27.600	-	319.215	-	-
666	Pottery	411.871	66.991	-	**115.258	**73.968	-
671	Pig Iron, etc.	-	-	**3.415	0.713	493.358	88.277
711	Power Generating Machinery	1571.636	2192.392	479.569	172.598	157.913	14638.265
724	Telecommunications Apparatus	100.969	*1410.472	2.817	**217.902	7.033	-
729	Electrical Machinery, n.e.s.	537.031	**149.801	*1.307	**156.159	6.480	**1.953
821	Furniture	82.412	*81.707	-	250.267	*18.176	*23.621
831	Travel goods, handbooks, etc.	1239.529	*68.336	-	25.488	*5.157	-
841	Clothing except fur	215.910	169.146	17.257	43.612	18.559	-
851	Footwear	341.757	756.581	*140.148	40.109	108.022	6.346
892	Printed Matter	101.051	-	-	63.001	250.091	9.213
893	Plastic articles	1290.658	**417.528	**2.638	*5.434	-	-
894	Perambulators, toys, sporting goods	668.216	*342.355	128.819	*406.384	1.867	-
897	Jewelry, goldsmith's wares	649.267	* 58.404	-	31.487	512.998	**67.443

666	Pottery	[illegible]	–	**1.415	[illegible]	[illegible]	[illegible]
671	Pig Iron, etc.	1571.636	2192.392	479.569	172.598	157.913	14638.265
711	Power Generating Machinery	100.969	*1410.472	2.817	**217.902	7.033	–
724	Telecommunications Apparatus	537.031	**149.801	*1.307	**156.159	6.480	**1.953
729	Electrical Machinery, n.e.s.	82.412	*81.707	–	250.267	*18.176	*23.621
821	Furniture	1239.529	*68.136	–	25.488	*5.157	–
831	Travel goods, handbooks, etc.	215.910	169.146	17.252	43.612	18.559	–
841	Clothing except fur	[illegible]	[illegible]	[illegible]	60.109	108.022	6.346
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE A-II-16 (Continued)

Sources: U.N., "Commodity Trade Statistics, Series D," OECD, "Foreign Trade Statistics, Series C."

ψ = The formula used for the index is:

$$X = \frac{1}{2}\left[\frac{V'i.}{\sum_A V'i.} \div \frac{V'..}{\sum_A V'..} + \left(\frac{Vi.}{\sum_A V'i.} \div \frac{V'..}{\sum_A V'..}\right)^2 \Big/ \frac{Vi.}{\sum_A Vi.} \div \frac{V..}{\sum_A V..}\right]$$

* The base year is 1961-62.

** The base year is 1962-63.

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