Trade as the Engine of Growth in Developing Countries
A Reappraisal

James Riedel

WITHDRAWN
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Abstract

This paper is a critique of the thesis propounded in W.A. Lewis' Nobel lecture that economic growth in developed countries is the main driving force of exports and growth in developing countries. The trade engine theory is shown to rest on highly restrictive assumptions which, it is argued, have become increasingly inappropriate as a consequence of far-reaching changes in the composition of LDC exports. Empirical analysis is undertaken to show that the main gear of the trade engine, the linkage between economic prosperity in developed countries and export growth of developing countries, is highly unstable and hence mechanically inefficient. The trade engine theory, it is argued, is no more applicable in recent decades than Kravis showed it was in the nineteenth century.

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TRADE AS THE ENGINE OF GROWTH IN DEVELOPING COUNTRIES: A REAPPRAISAL

INTRODUCTION

In his 1979 Nobel lecture, W. Arthur Lewis (1980) analyzed the consequences of a slowdown of the engine of growth in developing countries (LDCs) and proposed a strategy to revive it. The engine, according to Lewis, is trade, which in the past was fueled by industrial growth in developed countries. The slowdown is attributed to what some believe is a secular decline in the rate of economic growth in developed countries since the mid-1970s. The only way to keep the engine of LDC growth going at a satisfactory rate, so the argument goes, is to turn to an alternative source of fuel. This, Lewis argues, lies in trade among the developing countries, which he asserts can "take up the slack left by MDCs (more developed countries) as MDCs slow down" (1980, p. 560).

Pessimism about demand for LDC exports in developed countries' markets is a recurrent theme in the development literature. Also familiar is the approach taken by Lewis to dismiss past successes of LDCs in world trade by declaring the alleged engine of past growth to be no longer operating satisfactorily. The intellectual foundations of the import-substitution strategy laid in the 1950s by Prebisch, Myrdal and, most importantly, Nurkse rested on similar grounds. Arguing that the demand for "periphery" countries' exports in the 20th century is far weaker than it was in the 19th century, trade was dismissed as an engine of growth, a function Nurkse alleged it had served in the 19th century. The solution prescribed in the 1950s was to look inward, in effect, to scrap the trade engine altogether. Lewis' remedy, coming two decades later when most import-substitution possibilities in many LDCs have been all but exhausted, retains the trade engine but seeks an alternative source of fuel to drive it.
The classic critique by Irving Kravis (1970) of Nurkse's thesis of trade as a faltering engine of growth showed that "Export expansion did not serve in the nineteenth century to differentiate successful from unsuccessful countries" (p. 850). This followed from two findings: first, that successful 19th century countries showed few signs of export dominated growth; second, that unsuccessful periphery countries enjoyed export expansion in the second half of the 19th century of the same order of magnitude as the temperate regions of recent settlement. This led Kravis to conclude that "A more warranted metaphor that would be more generally applicable would be to describe trade expansion as a handmaiden of successful growth rather than as an autonomous engine of growth" (p. 850).

The critique of Lewis' thesis of trade as an engine of growth presented in this paper follows a different tack. The principal focus is not the proposition that LDC growth in recent decades was driven by trade. Rather, since Lewis' point of departure is the economic slowdown in developed countries, the focus is the proposition that LDC exports are fueled by prosperity in developed countries. It should be noted, however, that if one rejects the notion that LDC exports are externally driven, it is difficult to maintain any longer the notion of trade as an engine, for it then becomes impossible to distinguish that which is input to the engine from that which is output.

This paper is divided into two major parts. The first part examines the theoretical foundations of the trade engine theory. While the focus is on Lewis' contributions, the work of his main precursors as well as the more recent attempts to model Lewis' theory more rigorously are also discussed. The main objective of the theoretical review is to identify the assumptions which establish developed country growth as the main driving force of LDC
exports and growth. The mechanics of the trade engine are shown to hinge on extreme assumptions about LDC export supply and demand parameters.

The second part of the paper assesses the empirical relevance of the trade engine theory, considering in particular the implications of far-reaching changes in the composition of LDC exports over the last two decades. These changes, it is argued, have significantly weakened any mechanical link that might once have existed between the export growth of many LDCs and prosperity in the developed countries. The quantitative relationship which Lewis believes to have remained the same over a hundred years and takes as the cornerstone of this thesis is shown to be largely a statistical artifact, applicable if at all only to a limited number of developing countries which primarily export raw materials.

A final point deserves mention before proceeding. Since this paper stresses the implications of LDC export diversification, mainly into manufactures, the charge could be made that it talks past Lewis, Findlay and those whose theories assume a division of the world into an industrialized North and a primary producing South. Lewis' empirical analysis, for that matter, uses world trade in primary products as a proxy for LDC exports. It would be too easy and perhaps unfair simply to take issue with this obviously imprecise proxy, even though in drawing his conclusions Lewis is not careful to limit their applicability by the extent to which LDCs individually or as a whole are dependent on exports of primary products. In fact, the view that LDC export prospects in general (i.e., not just of primary products) are tied to economic prosperity in developed countries is held widely, if not by Lewis himself. ¹/ ¹/ A typical expression of this view is contained in the World Development Report, 1978 (p. 13): "Since the industrialized countries' demand for imports depends on their income their economic growth is very important to the export and growth prospects of developing countries."
For those reasons, it is useful to assess the trade engine theory broadly, and not just in terms of its applicability to primary exports. By looking at the issues more broadly one can see very clearly how misleading it has become to falsely dichotomize the world into developed countries as producers and exporters of industrial goods and LDCs as producers and exporters of primary products.

PART I: THEORETICAL FOUNDATIONS

Lewis' Precursors

It is useful to begin the analysis of Lewis' theory of trade as an engine of growth by contrasting it to its principal precursors. Like Nurkse, Lewis bases his appeal for a new strategy of development on grounds of deteriorating demand for LDC exports in the developed countries. However, Lewis and his precursors differ in fundamental ways.

The first important difference is the source of deterioration of demand for LDC exports. Nurkse (1959) listed six factors, summarized by Cairncross (1960, p. 548) as:

1. the change in industrial structure in favor of heavy industries with a low content of imported raw-materials;
2. the rising share of services in total output of advanced countries;
3. the low income elasticity of consumer demand for many agricultural products;
4. agricultural protectionism;
5. economies in the use of raw materials, e.g., through reprocessing of scrap; and,
6. the introduction of synthetic materials.
With the exception perhaps of the fourth, all of the factors cited by Nurkse involve substitution either in production or consumption of domestic products in developed countries for LDC exports of primary products. Lewis, by comparison, attributes the deterioration of demand mainly to a reduction in the growth rate of the general level of expenditure in developed countries. Lewis' thesis is, therefore, less tied to LDC specialization in primary products and avoids the question of substitutability between LDC exports and domestically produced goods in LDC export markets. Indeed, a critical and, as we will argue later, vulnerable assumption of Lewis' theory is the lack of substitutability. Lewis' empirical finding of a constant, hundred-year relationship between industrial growth in developed countries and export growth in developing countries would seem to undermine Nurkse's explanation of deteriorating demand. However, Lewis' quantitative relationship itself will later be called into question.

A second issue on which Lewis stands apart from his precursors is the terms of trade. Nurkse's analysis of the inadequacy of demand dealt mainly with its impact on the volume of imports from LDCs. Indeed, the major criticism leveled at Nurkse by Cairncross (1960) was his failure to take into account "the price factor." The terms of trade issue was introduced primarily by Prebisch and Myrdal who, Kravis (1970, p. 852) points out, "went beyond Nurkse's pessimism about the adequacy of markets and claimed that free trade would be an impediment to economic advance in the poor countries."

Lewis, like Nurkse, does not give much weight to price effects. "The main link between MDC and LDC economies has been MDC demand for LDC primary commodities. This has been a link in terms of physical volume not much affected by price" (Lewis, 1980, p. 559). Nevertheless, the terms of trade are an element in Lewis' theory, working primarily to reinforce the
inexorable mechanics of the trade engine. However, whereas Prebisch and Myrdal attribute the secular decline of LDC terms of trade to more ad hoc factors such as monopolistic markets for goods and factors in developed countries and inferior income elasticities for LDC goods, Lewis offers a determinant model from which the implication of declining LDC terms of trade derives.

Lewis' model (worked out in greatest detail in the 1969 Wicksell lecture) is comprised of two regions, the temperate and the tropical, and three goods, steel, coffee and food, each of which is the product of labor alone used in fixed proportions to output. The temperate countries produce steel (S) and food (F); the tropics produce coffee (C) and food (F'). The linear transformation curves in each region establish the relative prices of steel and coffee, respectively, to food. Lewis defines the terms of trade as the rate of international exchange between steel and coffee, which through arbitrage in the one commonly produced, homogenous good (food) is determined by the opportunity cost of each in terms of food. Thus, an expression for the tropics' terms of trade (so defined) may be written:

$$\frac{P_C}{P_S} = \frac{\frac{a_S}{a_F}}{\frac{a_C}{a_F'}}$$

where the P's are prices and the a's are labor productivity coefficients. With food serving as the numeraire in the system we have what Findlay (1981, p. 431) terms a "food theory of value."

Lewis' model is clearly Ricardian, but the terms of trade theory that is derived from it is decidedly non-classical, for reciprocal demand plays no role at all. Instead, the terms of trade depend only on relative
factor productivities, improving for the tropics when productivity change in
tropical food outpaces coffee and when productivity change in temperate food
is below that in steel. Unlike orthodox classical and neo-classical theory,
growth affects the barter terms of trade only when it results from
technological changes that alter labor productivity in coffee and steel
relative to food; changes in resource endowment leave the terms of trade
unaffected. However, since it is well established that technological change
is the predominant source of growth especially in developed countries, the
potential for secular bias in LDC terms of trade exists when productivity in
industry and agriculture advance at uneven rates. Lewis (1969, p. 20) cites
evidence that over the long run, agricultural productivity in developed
countries has grown more rapidly than industrial productivity, which from his
model implies a deterioration of LDC terms of trade. This has been
reinforced, he argues, by the tendency for productivity in commercial
agriculture (e.g., coffee) in the tropics to grow somewhat faster than in
traditional agriculture.

Lewis' terms of trade theory also differs from that of Singer,
Prebisch and Myrdal in that it does not rest on a division of world trade
between rich and poor countries on the basis of specialization in agriculture
versus manufacturing. "The terms of trade," Lewis (1977, p. 37) writes, "are
bad only for tropical products, whether agricultural or industrial, and are
bad because the market pays tropical unskilled labor, whatever it may be
producing, a wage that is based on an unlimited reservoir of low-productivity
food producers."
The terms of trade and relative prices are of second-order importance in the trade-engine theory, and are viewed primarily as a reinforcement to the principal linkage between physical volumes of output in developed countries and exports and output in developing countries. An explicit model of the physical volume linkages was not provided by Lewis or his precursors. Although Lewis' terms of trade model offers a theoretical framework for analyzing the volume linkages, Lewis himself has been content to describe them in strictly empirical terms:

The growth rate of world trade in primary products over the period of 1873 to 1913 was 0.87 times the growth rate of industrial production in the developed countries; and just about the same relationship, about 0.87, also ruled in the two decades to 1973. We need no elaborate statistical proof that trade depends on prosperity in the industrial countries. (Lewis, 1980, p. 556)

Later we will in fact seek a more elaborate statistical proof that trade of developing countries depends on prosperity in the industrialized countries. First, however, we consider the theoretical foundations of this proposition, starting with an examination of the volume linkages implicit in Lewis' terms of trade model. Also discussed is a recent paper by Findlay (1980) which attempts to model rigorously trade as the engine of growth in developing countries.

Lewis' three-good model, with labor assumed to be the only factor of production, is fully determinant only if the supply of labor is given exogenously. However, in this case growth effects are transmitted from the temperate countries only to the extent that the terms of trade are affected.

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1/ Lewis (1980, p. 556) states that "World trade in primary products is a wider concept than exports from developing countries, but the two are sufficiently closely related for it to serve as a proxy."
If growth in the temperate region occurs without altering relative labor productivities (and hence terms of trade), any resulting increase in the demand for coffee must be satisfied at the expense of tropical food production. Since tropical income is unchanged, the tropics' demand for manufactures is unchanged; hence the expansion of coffee exports generated by growth in the temperate region must be accompanied by either an increase in food imports or a reduction in food exports depending on whether the tropics are food importers or exporters initially. Growth in temperate countries, in this case, drives the tropics toward greater international specialization, but without compensating gains from trade.

The assumption of exogenously given labor supply is of course alien to Lewis. Unfortunately, the model is indeterminant unless an additional factor is introduced which determines the level of employment in the non-traditional sector. However, this solution runs the risk of complicating (if not undermining altogether) Lewis' ingeniously simple food theory of value.

The indeterminancy problem has been resolved in a recent paper by Findlay (1980-b) marrying a neo-classical model of growth in the "North" to a Lewis-type model with unlimited labor supply at a fixed real wage in the South. 1/ In Findlay's model both regions are completely specialized, the North in manufactures (which serve as both investment goods and consumption goods), the South in primary products (which are only for consumption). Following neo-classical analysis, steady-state growth in the North is constrained by the rate of growth of "effective" labor, 2/ while in the South

---

1/ Production functions in both regions are neo-classical with constant returns to scale and capital (accumulated stock of manufacturers) and labor as inputs.

2/ Effective labor growth being the sum of population growth and Harrod neutral technical change.
(with an infinite supply of labor) the constraint is the rate of capital accumulation, which in turn depends on the level of profit and rate of saving. However, since capital can be obtained only by exporting primary goods, of central importance are the terms of trade. As Johnson (1961) has shown, in the long run the terms of trade must settle at a level that equates the rates of growth of output in the two regions (assuming as Findlay does that income elasticities of demand for both goods are unity). Therefore, while growth in the North is exogenously determined, in the South by virtue of the assumptions of complete specialization and unlimited labor supply, it is completely endogenous.

In the asymmetrical world of Findlay's model the South can do little to better its lot. Attempts to raise the savings rate or increase productivity in primary production only worsen the terms of trade. On the other hand, an increase in the savings rate in the North has no lasting effect on the terms of trade since it leaves the North's steady-state growth rate unchanged. It will, however, cause the capital-labor ratio in the North to rise, thereby shifting demand away from primary goods and temporarily worsening the South's terms of trade. Increases in the productivity of capital in the North also leave the long-run terms of trade unchanged and hence transfer no permanent gain to the South, although in the short run the South may enjoy a terms of trade improvement.

In the lexicon of development economics the Findlay model is what might be called a no-gap model. Neither domestic savings nor foreign exchange availability constrain growth in the South; rather, in the context of this model, the South is merely dragged along at the growth rate of effective labor in the North. To the extent that this growth is due to Harrod neutral technical change, the gap between per capita incomes in the North and South
widens. The model is consistent, however, with Lewis' empirical observation of a long-run constant relationship between industrial growth in the temperate region and export growth in the tropics, and trade does serve as the engine of growth.

The dependence of LDCs on growth in developed countries that is deduced from these simple theoretical models rests on several crucial assumptions. One is complete specialization which serves to bind the economies of the North and South inextricably together through international trade and establishes that relative prices are set in international markets regardless of the relative size of the two economies. Further assumptions about the pattern of specialization establish the North in the position of dominating economic activity in the South. For example, in Findlay's model this relationship is built in by making the North the exclusive producer of investment goods, thereby conditioning growth in the South on the willingness of the North to accept its exports. This aspect of the model is reminiscent of the two-gap theory in which at an early stage of development foreign exchange availability rather than the capacity to save constrains growth. (Chenery and Bruno, 1962; McKinnon, 1964).

The South's dependence is further reinforced by the assumption of perfectly elastic export supply, a condition that all but guarantees a secular bias against its terms of trade and insures that attempts to generate growth internally will be negated by adverse movement of the terms of trade. Perfectly elastic export supply in the South derives from the assumption of unlimited labor, the source of which (in Findlay) is the "hinterland, which is otherwise outside the model" or (in Lewis) the traditional, non-commercial agricultural sector. Structural dualism, epitomized by the colonial economy
of mining and plantation agriculture enclaves, is a crucial ingredient of these models. 1/

These assumptions are of course extreme, and purposely so since they serve to make rigorous theoretical modeling tractable. That they perfectly reflect reality is certainly not necessary for the theory to be useful either for understanding historical processes or for analyzing contemporary policy issues. Everything, of course, is a matter of degree, and the empirical questions addressed in the second part of this paper are mainly to determine to what degree these assumptions and the theory built on them are relevant.

A Walrasian Framework

Before proceeding to empirical analysis, however, it is useful to consider an alternative theoretical framework within which the issues of concern in Lewis' Nobel lecture can be examined. Obviously, by choosing the right assumptions, one can produce a consistent model to yield very different results from those obtained by Lewis and Findlay. However, it might instead be more helpful, given that our objective is to reach an understanding of the empirical relevance of Lewis' thesis, to eschew hard theoretical results in favor of a looser framework which allows the focus to shift to matters of degree -- that is, where specialization is a matter of degree, product differentiation is a matter of degree and where supply elasticities are a matter of degree. Since the point of departure of Lewis' thesis is the observed economic slowdown of developed countries, matters can be greatly simplified by narrowing our focus to the theoretical issues concerning the trade link between developed and developing countries. Leaving aside whether LDC growth is tied to the rate of export expansion, the question addressed is

1/ The dynamics of the colonial economy are described by Birnberg and Resnick (1975), Paauw and Fei (1973) and Reynolds (1977).
what determines the extent to which the growth of LDC exports is tied to income growth in developed countries?

It has been suggested (Rhomberg, 1973), that the "ideal" framework for analyzing trade linkages between countries or regions is a Walrasian model of the world economy. In such a model there exists for each country or region (hereafter for convenience we speak simply of regions) supply and demand functions for each good (say there are n goods) which when summed over all regions (m in number, say) and simultaneously equated establish the equilibrium price of each good and its global output and consumption. A region is either an importer or an exporter of a given good depending on whether at the equilibrium price the quantity supplied domestically is greater or less than the quantity demanded domestically.

A version of this model that has been found useful in empirical modeling exercises regards a given good produced in one region as different from that produced in another region (Armington, 1969). If we follow the convention of referring to a "good" as a particular class of commodities (e.g., shoes) and use the term "product" to refer to the output of a good in a particular region (e.g., LDC shoes as distinct from DC shoes) then for each region there are nm product demand functions which when summed over all regions and simultaneously equated to nm product supply equations establish equilibrium prices and global output and consumption. This version allows a country to be both an importer and exporter of the same good, a phenomenon observed even at the most disaggregated levels of statistical classification.

Solving such a system of simultaneous equations to derive an empirically quantifiable relationship between, for instance, income growth in one region (e.g., developed countries) and export growth in another (e.g., developing countries) is a formidable task, for each product demand function
contains nm price terms in addition to whatever exogenous variables may be specified, such as regional income. The problem can be made more manageable, as Armington has shown, by making two simplifying assumptions -- one, that buyers' preference for a given good produced in one region versus that produced in another region is independent of their purchases of all other classes of goods and, two, that elasticities of substitution in any market between products belonging to a given good are constant and uniform for all products competing in that market. The first assumption allows one to derive the demand for competing products separately from the demand for the good as a whole. The second assumption permits the demand for a given product (e.g., LDC shoes) to be expressed as a function of the product's market share and a relative price term (the product price relative to a weighted average price of the good) raised to a power representing the elasticity of substitution. This formulation, as Rhomberg points out, leads to the market shares approach to world trade modeling, such as employed by the IMF (Deppler and Ripley, 1978) and the OECD (Samuelson, 1973).

Employing Armington's simplifying assumptions to solve a system of supply and demand functions yields a set of reduced-form equations defining the relationship between the market clearing price and quantity of each traded product and each of the exogenous variables that enter into determination of supply and demand. The reduced-form coefficients for the DC income variable in the price-quantity equations of LDC products defines the relationship at issue in Lewis' first proposition. These coefficients are of course complex expressions of supply and demand parameters which vary in magnitude from one product to another. It can easily be shown that the value of the coefficient measuring the impact of a given change in DC income on the quantity exported of a given LDC product will be greater, other things equal:
- the greater the LDC share of the DC market for the good;
- the lower the elasticity of substitution between competing products in the market;
- the lower the elasticity of substitution between goods of different kinds in DC markets;
- the greater the income elasticity of demand;
- the lower the elasticity of supply of competing products; and
- the greater the elasticity of supply of the LDC product.

The mechanics of the Lewis-Findlay models hinge on extreme assumptions about these parameters; supply of LDC exports is assumed to be perfectly elastic, demand, by virtue of complete specialization, to be relatively inelastic. Under these assumptions, the quantity exported is determined primarily by the level of demand, while export price is determined primarily by the cost of production in developing countries. The Walrasian framework, on the other hand, allows the relevant supply and demand parameters to vary and thus the issues become mainly empirical rather than theoretical. Furthermore, the Walrasian approach allows one to take cognizance of changes in the value of these parameters that occur as a matter of course in the development process. Constancy in the relationship between income growth in developed countries and export growth in developing countries which Lewis observes over a hundred year span and takes as the cornerstone of his thesis would in this framework appear as an empirical anomaly. Explaining this apparent anomaly and analyzing how the last three decades of economic change in LDCs have altered the relationship is the aim of the next part of this paper.
PART II: EMPIRICAL EVIDENCE

Structural Changes in LDC Exports

A look at the aggregate data on LDC trade would seem to dispel very quickly concerns based on the notion that LDCs are dependent on exports of agricultural products. As Table 1 shows, two dramatic changes have occurred in the structure of LDC exports to reduce the share of agricultural products (food and raw materials) to something only slightly greater than 20 percent of total exports. One is the doubling of the share of fuels from 25 percent of exports in 1955 to 53 percent in 1978, a phenomenon largely attributable to OPEC-administered oil price increases since 1973. The other change, far more profound in terms of the issues addressed in this paper, is the rise of manufactured exports. The three-fold increase in the share of manufactures in LDC exports is not, as in the case of fuel, mainly a price phenomenon, but rather is the fundamental consequence of three decades of sometimes painful and costly industrialization efforts in developing countries. Moreover, although heretofore the largest part of the expansion of manufactured exports has been accounted for by a relatively small number of relatively small countries, the potential for all developing countries to share in the expansion of manufactures trade distinguishes it from the oil boom which because of the inequities of nature can only be enjoyed by a limited number. For these reasons, and because major oil exporting LDCs can no longer be considered to be constrained by their ability to export, whatever other problems they face, the following analysis focuses on non-fuel exports and countries other than those that earn the majority of their foreign exchange from oil. (Hereafter reference to total exports should be understood to mean total non-fuel exports.)
Table 1: THE STRUCTURE OF LDC EXPORTS: SELECTED YEARS 1955-1978
(Percentages)

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<tr>
<td>Total Non-Fuel Exports</td>
<td>76.3</td>
<td>74.3</td>
<td>71.9</td>
<td>65.4</td>
</tr>
<tr>
<td>Food</td>
<td>79.0</td>
<td>77.7</td>
<td>74.0</td>
<td>65.6</td>
</tr>
<tr>
<td>Agricultural Raw Materials</td>
<td>74.3</td>
<td>67.8</td>
<td>64.4</td>
<td>61.8</td>
</tr>
<tr>
<td>Minerals, Ores</td>
<td>94.5</td>
<td>92.0</td>
<td>89.2</td>
<td>78.0</td>
</tr>
<tr>
<td>Manufactures 1/</td>
<td>45.9</td>
<td>54.0</td>
<td>61.2</td>
<td>63.3</td>
</tr>
</tbody>
</table>

1/ Manufactures = SITC 5 to 8 less 68.


Were LDCs a homogenous group of countries sharing similar production and trade structures, the aggregate data alone might allow one to dismiss as unrealistic the models discussed above. In fact, LDCs share few common economic characteristics other than per capita income below some arbitrarily set level. 1/ Not surprisingly, therefore, the aggregate data mask a wide diversity of export structures among LDCs. Four political entities in East Asia (South Korea, Taiwan, Hong Kong and Singapore) alone in 1978 accounted

1/ The World Bank, judging from the World Development Report, 1980, set it in 1978 at $3,500, though apparently other factors are involved since Ireland with per capita income of $3,470 is considered developed while Israel with $3,500 is not.
for more than 60 percent of total LDC manufactured exports, but alas only about 3 percent of the total population of developing countries. 1/ These four entities, together with Lebanon and Macao, are the only LDCs in which manufactures account for as much as 75 percent of exports.

In the rest of the developing world, primary products, the traditional mainstay, are still the predominant export. However, as shown in Figure 1, even among countries relying heavily on primary exports, manufactures are claiming an ever larger share. Among the 54 sample countries represented in Figure 1, the average share of manufactures in non-fuel exports rose from 7.4 percent in 1960 to 18 percent in 1978. Moreover, it is particularly important to note that the increased share of manufactures was claimed totally from the share of the single largest primary commodity in total exports, thereby gaining the maximum in export diversification from the expansion of manufactures.

The picture presented in Figure 1 is, however, also misleading because even within this group of countries, success in diversifying exports has been widely different. Among the 54 countries, eleven managed to raise the share of manufactures from an average of 15 percent in 1960 to almost 40 percent in 1978. 2/ This group of "balanced exporters", which includes most of South Asia, Egypt, Brazil, Mexico and some smaller Latin American countries (see appendix 1) and accounts for about two-thirds of the population of the developing world, appears to have severed dependence on the single largest traditional primary export. As shown in Figure 2, the average decline in the

---

1/ The unavailability of data prevents us from including the People's Republic of China within the group LDCs.

2/ A trade weighted average for the eleven would put the share of manufactures above 50 per cent.
Fig. 1: Average Export Structure for Total Sample of LDC (54 countries)

<table>
<thead>
<tr>
<th></th>
<th>1960</th>
<th>1976-78</th>
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<tbody>
<tr>
<td>7</td>
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<tr>
<td>28</td>
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<td>18</td>
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<tr>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufactures</td>
<td>18</td>
<td>39</td>
</tr>
<tr>
<td>Other Primaries</td>
<td>30</td>
<td>13</td>
</tr>
<tr>
<td>2nd and 3rd Largest Export</td>
<td>16</td>
<td>29</td>
</tr>
<tr>
<td>Largest Single Primary Export</td>
<td>36</td>
<td>10</td>
</tr>
</tbody>
</table>

Fig. 2: Average Export Structure for Balanced Exporters (11 countries)

<table>
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<tr>
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<td></td>
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<tr>
<td>49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufactures</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Other Primaries</td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td>2nd and 3rd Largest Export</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>Largest Single Primary Export</td>
<td>46</td>
<td>20</td>
</tr>
</tbody>
</table>

Fig. 3: Average Export Structure for African Primary Exports (20 countries)

<table>
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<tr>
<th></th>
<th>1960</th>
<th>1976-78</th>
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<tbody>
<tr>
<td>4</td>
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<tr>
<td>49</td>
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<td></td>
</tr>
<tr>
<td>Manufactures</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Other Primaries</td>
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<td>32</td>
</tr>
<tr>
<td>2nd and 3rd Largest Export</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>Largest Single Primary Export</td>
<td>46</td>
<td>20</td>
</tr>
</tbody>
</table>

Fig. 4: Average Export Structure for Non-African Primary Exporters (23 countries)

<table>
<thead>
<tr>
<th></th>
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<th>1976-78</th>
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<tr>
<td>4</td>
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<td>49</td>
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<tr>
<td>Manufactures</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Other Primaries</td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td>2nd and 3rd Largest Export</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>Largest Single Primary Export</td>
<td>46</td>
<td>20</td>
</tr>
</tbody>
</table>

Note: Country groupings are given in Appendix I.

percentage share of primary exports was almost totally accounted for by the
decline of the single largest commodity export.

Developing countries in which primary exports continue to account for 80 percent or more of the total exports are large in number but relatively small in size, and together account for only about one-third of the population of developing countries. However, even among these countries important differences regarding export diversification deserve mention. Among the countries still exporting predominantly primary products, only the African countries appear to have been unable to make much headway toward breaking dependence on the traditional, single largest primary export (see Figure 3). As shown in Figure 4, non-African primary exporters have reduced the share of the single largest export from 46 percent to 32 percent, both by expansion of manufactures and by diversification within the primary exports, most of which occurred in the 1970s.

In summary, significant changes have occurred in the structure of exports in developing countries, particularly those outside of Africa. Dependence on a single primary export, a key characteristic of the pre-war colonial economy, has been greatly eroded. Secondly, manufactures are rapidly claiming an ever larger share of exports in most developing countries, and already have a share in exports almost equal to primary products in countries representing the majority of the population in the developing world.

Market Shares of LDC Exports

Export diversification in developing countries has many implications, but how has it affected the link between the LDC exports and economic prosperity in developed countries? One thing it has not changed is LDC dependence on DC markets, for as shown in Table 1, LDCs have come to

---

1/ Reminder: excluding China.
depend on DC markets as much for manufactures as for primary exports. Although much has been made about a supposed bias against trade among developing countries, a thorough examination of the empirical evidence finds that "developing countries" exports to one another of all non-fuel commodities of manufactures and of non-fuel primary commodities all exceed what might be expected on the basis of their weight in the world economy" (Havrylyshyn and Wolf, 1980, p. 85). The DC share in LDC exports is, in other words, no more (and perhaps less) than proportionate to their share in world income. Moreover, since the income of developed countries, even under the most optimistic scenario, is projected to exceed that of developing countries in the year 2000 by a factor greater than 2 to 1, DCs will likely remain the major market for LDC exports in the foreseeable future. 1/

How then has the link been altered, if despite a significant restructuring LDC exports remain highly dependent on DC markets? The answer lies not in shifting markets but in analysis of the competitive position of different LDC exports within the DC market. A crucial assumption of the trade engine theory, it will be recalled, is that of complete specialization, which implies limited substitutability between the goods LDCs supply and those produced domestically in developed countries. Under this assumption, as long as tastes and preferences remain fairly constant, LDC exports can expand only in proportion, more or less, to the size of the market; little scope is afforded for LDCs to expand exports simply by out-competing DC producers for a larger share of the market. Obviously, under these circumstances, demand rather than supply mainly determines the upper limit to exports. Of course, if the assumption is relaxed then the higher the elasticity of substitution between LDC and DC products and the lower the LDC share of the market the less

important is the level or rate of growth of income in developed countries. Under these circumstances, it is supply rather than demand that would be expected to mainly constrain LDC exports.

Lewis, it will be recalled, chose coffee to illustrate the dependence of LDC exports on the level of DC income. Coffee, a product for which no close substitute is produced in developed countries, was traditionally, and is still today, the single largest non-fuel export of developing countries. But how important are coffee and other "broadly non-competing" commodities in total non-fuel exports? The classification of LDC primary exports into "directly competing" and "broadly non-competing" categories is not easily done, for some important tropical products (e.g. natural rubber) have close substitutes in developed countries. The procedure in Table 2 was to classify as broadly non-competing those products for which the LDC share of world exports exceeds 80 percent. This criterion is obviously arbitrary and in some important instances is very misleading. For example, exception had to be made for sugar, in which LDCs dominate world exports but account for less than half of DC consumption. The figures reported in Table 2, therefore, are intended only to give a rough indication of the relative importance of "tropical products" in LDC exports. 1/

Tropical products, as shown in Table 2, have long been of secondary importance in LDC primary exports to developed countries. 2/ In 1962, the share of non-competing products was little more than one-third of total

---

1/ See Appendix 2 for a listing of products classified as broadly non-competing. The terms "tropical" and "broadly non-competing" are used interchangeably.

2/ Because of the unavailability of disaggregated LDC export data over the entire period covered in Table 2, it was necessary to use DC import data. Since DCs account for about two-thirds of LDC primary commodity exports, the figures in Table 2 can be considered to broadly reflect the structure of total LDC non-fuel primary commodity exports.
primary exports and only about one-fourth of total non-fuel exports. Measured
in current prices, the share of non-competing products rose to almost 40
percent of total primary exports in 1978; however, due to the expansion of
manufactures, non-competing products fell to less than 20 percent of total
non-fuel exports in 1978. The rising share in primary exports is shown in
Table 2 to have been due to an increase in the relative price of non-competing
products; for in constant 1970 prices the share of non-competing products in
1978 was 7 percentage points below the 1962 level.

The experience of African LDCs is again shown, in Table 2, to
diverge from that of other LDCs. Whereas the volume share of non-competing
primary exports in total primary and total non-fuel exports has fallen for the
aggregate of all LDCs, it has steadily increased for African LDCs. Indeed,
the very category accounting for the largest part of the incremental decline
in the share of non-competing exports for LDC total, beverages, accounts for
the largest part of the incremental increase in the share of non-competing
products in primary exports of African LDCs. This suggests that African LDCs,
while failing to share in the expansion of manufactures exports, have begun to
take over the commodities being abandoned by more successful developing
countries that have made or are making the transition.

In DC markets for manufactures there is no question that LDCs play a
minor role despite growth in the volume of manufactures exports to developed
countries in excess of 12 percent per year over the last two decades. Table 3
shows the shares of LDC exports in apparent consumption of developed countries
aggregated at the ISIC 2-digit level. For 1979, the average share was only
3.4 percent, up from a mere 1.7 percent in 1970. Disaggregating to the 5-
digit ISIC level, Hughes and Waelbroeck found only four categories (leather,
knitted apparel, furs and jewelery) out of a total of more than 150 in which
Table 2: THE SHARES OF BROADLY NON-COMPETING AND DIRECTLY COMPETING LDC EXPORTS OF NON-FUEL PRIMARY COMMODITIES TO DCs: 1962, 1970, 1978
(figures in parentheses are shares in 1970 prices) 3/

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Broadly Non Competing 1/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Stuffs</td>
<td>22.0 (27.6)</td>
<td>14.6 (17.4)</td>
<td>18.4 (21.6)</td>
<td>27.5 (32.6)</td>
<td>32.8 (32.6)</td>
<td></td>
</tr>
<tr>
<td>of which beverage</td>
<td>17.0 (21.0)</td>
<td>12.4 (12.1)</td>
<td>15.3 (14.6)</td>
<td>21.4 (30.0)</td>
<td>30.1 (20.0)</td>
<td></td>
</tr>
<tr>
<td>Ag Raw Material</td>
<td>9.3 (8.0)</td>
<td>5.6 (4.8)</td>
<td>3.4 (5.7)</td>
<td>7.8 (2.0)</td>
<td>3.1 (2.0)</td>
<td></td>
</tr>
<tr>
<td>Metals &amp; Minerals</td>
<td>2.9 (4.2)</td>
<td>5.7 (3.7)</td>
<td>4.4 (5.0)</td>
<td>4.0 (6.0)</td>
<td>7.4 (6.0)</td>
<td></td>
</tr>
<tr>
<td>Directly Competing 2/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Stuffs</td>
<td>32.5 (60.2)</td>
<td>39.3 (74.1)</td>
<td>29.4 (66.4)</td>
<td>22.2 (73.3)</td>
<td>33.3 (60.8)</td>
<td>21.8 (56.8)</td>
</tr>
<tr>
<td>Ag Raw Materials</td>
<td>14.6 (10.8)</td>
<td>9.5 (9.5)</td>
<td>8.6 (8.6)</td>
<td>9.1 (9.1)</td>
<td>9.4 (9.4)</td>
<td></td>
</tr>
<tr>
<td>Metals &amp; Minerals</td>
<td>18.6 (24.0)</td>
<td>27.5 (24.0)</td>
<td>42.5 (42.5)</td>
<td>18.4 (25.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Non-Fuel Primary</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

1/ A list of commodities classified as broadly non-competing is given in Appendix 2. 
2/ The values of directly competing exports were computed as the residual difference between the total and the sum of commodities defined as non-competing. 
3/ In computing constant price shares, individual price indexes for each non-competing product were used to derive 1970 dollar values of LDC exports of each non-competing product. The aggregate non-fuel primary export deflator was used to obtain total non-fuel primary exports in 1970 dollar prices. The constant price shares for total directly competing exports were derived residually. Since individual price indexes were not available for directly competing products, constant price shares could not be derived.

Table 3: LDC shares in apparent consumption of manufactured goods in industrialized countries by major product groups: 1970, 1975, 1979

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Food, Beverages and Tobacco (31)</td>
<td>3.4</td>
<td>3.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Clothing, Textiles and Leather (32)</td>
<td>2.7</td>
<td>6.0</td>
<td>9.6</td>
</tr>
<tr>
<td>Wood Products (33)</td>
<td>1.8</td>
<td>2.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Paper and Printing (34)</td>
<td>0.1</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Chemicals (35)</td>
<td>2.0</td>
<td>3.0</td>
<td>3.4</td>
</tr>
<tr>
<td>Non-Metallic Minerals (36)</td>
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<td>1.0</td>
</tr>
<tr>
<td>Basic Metal (37)</td>
<td>3.2</td>
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<td>2.0</td>
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<td>Machinery (38)</td>
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<td>0.9</td>
<td>2.0</td>
</tr>
<tr>
<td>Miscellaneous (39)</td>
<td>3.0</td>
<td>10.3</td>
<td>18.2</td>
</tr>
<tr>
<td>Total Manufacturing (3)</td>
<td>1.7</td>
<td>2.4</td>
<td>3.4</td>
</tr>
</tbody>
</table>


the LDC share of the DC market exceeded 25 percent. In clothing and electrical machinery, the fastest growing categories, LDC market shares in 1979 were 14.1 and 4.1 percent respectively.

It might be argued, that although LDC market shares are low in manufactures, the developed countries’ threshold of tolerance for LDC penetration of their markets is equally low. Such arguments surfaced in the mid-1970s during a period of resurgence of industrial protectionism. However, a recent study sponsored by the World Bank on the political economy of protectionism in developed countries has failed to find any significant correlation between the level or rate of change of market penetration and the
incidence of protectionism. Moreover, the continuation of LDC market penetration since 1974 suggests that "The actual impact of the new protectionism of the 1970s... [was] not as large as was initially thought probable" (Hughes and Waelbroeck, 1981, p. 143.).

To summarize, the elasticity assumptions on which the trade engine theory is based apply best to traditional LDC exports of broadly non-competing, tropical commodities. Such products, however, have been shown to constitute a relatively small and declining share of exports in most developing countries. Although reliable estimates of demand elasticities for LDC manufactures in developed countries are not available, given the present small share of the market claimed by LDCs, one can reasonably assume that demand elasticities are extremely high for most LDC manufactures. The changing composition of LDC exports should, therefore, have weakened the external constraint on LDC export growth. Yet, as Lewis measures it, the link appears remarkably stable over time, in fact, "quantitatively the same over a hundred years" (1980, p. 556).

The Statistical Link

The appropriate procedure for measuring the link between DC income growth and LDC export growth, as suggested in the earlier theoretical discussion, is simultaneous estimation of supply and demand equations for LDC exports. The enormous complexity of demand and supply relationships, however, makes this approach methodologically infeasible and generally restricts analysis to highly reduced-form relationships. Lewis first measured the link, for example, by regressing the logarithm of the quantum index of world trade in primary products ($X_A$), which he takes as a proxy for LDC exports, on the

---

1/ Evidence in support of this assumption is found in Grossman (1978) and Riedel (1980).
logarithm of an index of world production of manufactures (I_M), which he takes as a proxy of developed countries prosperity. Using data for the period 1881 to 1929, Lewis obtained a regression coefficient of 0.87. This coefficient may be interpreted as a measure of the income elasticity of demand, only if one assumes, as he does, that relative price changes are unimportant and export supply is infinitely elastic. If these assumptions prove invalid then the meaning of the coefficient is problematic and its value may be expected to be unstable.

Lewis (1980, p. 556) states that "just about the same relationship, about 0.87, also ruled in the two decades to 1973," and the evidence he cites (1978, p. 175) is the ratio (.864) of the average annual growth rate from 1950/52 to 1969/71 of quantum trade in primary products (5.1 percent) to world production of manufactures (5.9 percent). A similar coefficient is obtained using regression techniques to estimate the relationship for the recent period. Using data for the period 1953 to 1977 yields the following result (t-statistics in parentheses):

\[
\log X_F = -1.179 + 0.832 \log I_M \\
(7.822) \quad (36.541)
\]

\[ R^2 = .982 \quad \text{SEE} = .043 \quad \text{DW} = 0.467 \]

where \( X_F \) = volume index of world exports of primary products \(^2\)

and \( I_M \) = index of production of manufactures in developed countries \(^3\)

---

\(^1\) This result was first reported in Lewis, 1952, p. 111. Log \( X_A = 0.1238 + 0.8702 \log I_M \) No regression test statistics accompanied this result. The U.S. and U.S.S.R. were excluded from \( I_M \) so as to improve the fit.


Remarkable as the similarity is between the slope coefficient Lewis obtained for the period 1881 to 1929 and that which we obtain for the period 1953 to 1977, evidence of highly significant autocorrelation in the latter results suggests caution in concluding, as Lewis has, that the relationship was quantitatively the same over a hundred year period. An inspection of the residuals of the regression equation reveals that primary exports were generally underestimated by the regression equation in the 1950s and 1970s and overestimated in the 1960s.

To test whether the relationship was significantly different in the three decades, the regression was re-estimated with intercept and slope dummy variables for the 1950s and 1970s included. The following result was obtained (t-statistics in parentheses):

\[
\log X_F = 2.697 + 0.599 \log I_M + 0.423 (D_{50} \log I_M) + 0.477 (D_{70} \log I_M) \\
- 2.673 D_{50} - 3.213 D_{70} \\
(-4.125) (-4.411)
\]

\[R^2 = .996 \quad \text{SEE} = .022 \quad \text{DW} = 1.968\]

where \(D_{50} = 1\) for observations 1953 to 1959 and zero otherwise.

\(D_{70} = 1\) for observations 1970 to 1977 and zero otherwise.

Note the coefficient for (\(\log I_M\)) is that which would obtain were the regression estimated for the period 1960 to 1969 alone, and the coefficients for (\(D_{50} \log I_M\)) and (\(D_{70} \log I_M\)) measure differences in the slope estimates for the 1950s and 1970s, respectively, relative to the 1960s. \(^1/\)

These results indicate that the relationship was statistically significantly different in the three decades. In the 1950s and 1970s a close

\(^1/\) The intercept dummies, \(D_{50}\) and \(D_{70}\), have no particular economic interpretation.
to one-to-one relationship held, while in the 1960s the coefficient (0.599) was significantly lower. Instability of this magnitude clearly belies any simple mechanical relationship. However, given the proxies used for DC prosperity and LDC exports, chosen one suspects on grounds of data availability back to the 19th century, it is difficult to discern what underlies the observed shifts in the coefficient, much less what the coefficient indeed measures.

Focusing on the last two decades, available data allow the link to be defined more precisely. In Table 4 are reported the results of similar regression analyses of the relationship between DC real GDP and the volume of LDC non-fuel exports, disaggregated by major commodity groups (manufactures, raw materials and food). As before, dummy variables are included to test the statistical significance of shifts in the regression coefficients over time. The coefficient of \( \Delta \log Y \) measures the difference between the coefficient for the 1970s and the 1960s, the associated t-statistics indicating the statistical significance of the difference.

Consider first the results for total non-fuel exports. Regression 1 indicates that over the entire period total exports grew more than proportionately to DC income. Again, however, positive autocorrelation of the error terms suggests the relationship was not uniform over the estimation period. As regression 2 shows the slope coefficient more than doubled in the 1970s.  

\[ 1/ \]

That this shift is attributable to the rapid expansion of manufactures exports in the 1970s is revealed in regressions 3 and 4. Even in the 1960s, LDC exports of manufactures grew almost twice as fast as DC

\[ 1/ \] Additional tests, not reported here, found no significant shift in the slope coefficient after 1973; rather the break in the relationship for total non-fuel exports and manufactures occurred about 1970.
Table 4: REGRESSION OF LDC EXPORT VOLUMES (X) ON DC REAL GDP (Y): 1960 TO 1978

\[
\log X_t = a_0 + a_1 \log Y_t + a_2 D\log Y_t + a_3 D + \varepsilon_t
\]

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE</th>
<th>INDEPENDENT VARIABLES a/</th>
<th>Const.</th>
<th>LogY c/</th>
<th>D b/ logY</th>
<th>D b/</th>
<th>R2</th>
<th>D.W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Volume of Total Non-Fuel Exports (SITC 0-9 Minus 3)</td>
<td></td>
<td>-1.354</td>
<td>1.272</td>
<td>.964</td>
<td>0.286</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(-4.664)</td>
<td>(22.060)</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td></td>
<td>-0.609</td>
<td>0.863</td>
<td>0.884</td>
<td>-4.441</td>
<td>.996</td>
<td>1.876</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-2.755)</td>
<td>(18.857)</td>
<td>(9.260)</td>
<td>(-9.019)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Volume of Manufactures Exports (SITC 5-9 less 68)</td>
<td></td>
<td>-8.827</td>
<td>2.877</td>
<td>.956</td>
<td>0.240</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12.097)</td>
<td>(19.849)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>-4.011</td>
<td>1.873</td>
<td>2.210</td>
<td>-11.111</td>
<td>.993</td>
<td>1.753</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-6.422)</td>
<td>(14.503)</td>
<td>(8.201)</td>
<td>(-7.966)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Volume of Raw Materials Exports (SITC 2 + 4 + 68)</td>
<td></td>
<td>0.974</td>
<td>.788</td>
<td>.888</td>
<td>0.701</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12.097)</td>
<td>(11.998)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>0.181</td>
<td>.951</td>
<td>-0.883</td>
<td>4.573</td>
<td>.935</td>
<td>1.667</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.334)</td>
<td>(8.490)</td>
<td>(-3.776)</td>
<td>(3.792)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Volume of Food Exports (SITC 0 + 1)</td>
<td></td>
<td>1.681</td>
<td>.627</td>
<td>.958</td>
<td>1.937</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.855)</td>
<td>(20.390)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td></td>
<td>2.311</td>
<td>0.495</td>
<td>0.152</td>
<td>-0.729</td>
<td>.965</td>
<td>2.354</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7.593)</td>
<td>(7.868)</td>
<td>(1.158)</td>
<td>(-1.077)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a/ t = statistics in parenthesis.

b/ D = 1 for observation 1970-1978 and zero otherwise.

c/ Y = Index of Real US Dollar GDP of "OECD-North" countries; i.e. OECD excluding Greece, Portugal, Spain and Turkey.

real GDP, but in the 1970s, despite a general slowdown of growth after 1973, LDC exports maintained their rapid pace, growing more than four times ($4.08 = 1.87 + 2.21$) as fast as DC real GDP.

The thesis that prosperity in developed countries fuels exports of developing countries clearly cannot be applied to manufactures, that is unless one is prepared to argue that a radical shift in preferences favoring LDC manufactures occurred in the 1970s. $^1/$ Since manufactures' share in DC consumption is declining secularly, and further since the mid-1970s witnessed a rise of protectionism against developing countries' exports, if anything, the opposite would seem to be the case. Nor can it be argued that the growth of exports in the 1970s was maintained by finding markets outside the developed countries, since as shown in Table 1 the share of DCs in LDC exports has been steadily increasing. The evidence, therefore, suggests that supply rather than demand factors have principally determined LDC export performance in manufactures. $^2/$

The relationship between DC income and LDC exports of raw materials (regressions 5 and 6) is also found to be unstable, but the shift is in the opposite direction to that of manufactures. While a one-to-one relationship is observed in the 1960s, virtually no relationship between DC income and LDC raw materials exports is found in the 1970s. As shown in Table 5, however, this shift can be traced in part to a change in underlying demand parameters.

$^1/$ This is not to imply that Lewis believes that LDC exports of manufactures bear a fixed relationship to DC income. Lewis simply ruled out rapid manufactures export growth on grounds, first, that "The main link between MDC and LDC economies has been the MDC demand for LDC primary commodities (1980, p. 59) and, second, that protectionism would halt LDC manufactures export growth if DCs go into recession.

$^2/$ This is the main conclusion reached in numerous case studies of individual countries' experience in the 1960's and 1970's. See Little, Scitovsky and Scott (1970); Bhagwati (1978); Krueger (1978); Donges and Riedel (1977).
as well as to a change in LDC supply of raw materials to the world market. Columns 1 and 2 of Table 5 show that DC consumption of cotton and iron ore, two of the LDCs' most important raw material exports, has declined at a far faster rate than can be explained by the general slowdown of economic growth. The failure of DC consumption of these commodities to keep up with the slowing pace of economic activity is clearly attributable to the decline of the cotton textile and steel industries in developed countries, which in turn is in part the consequence of increased competition from developing countries. At the same time, rapid industrial expansion in developing countries has accelerated internal consumption of key raw material exports (as shown in columns 3 and 4). In addition to shifts in the pattern of global consumption of raw materials, however, LDC production, especially cotton and iron ore, declined in the 1970s. The combined effect of these changes has therefore been to weaken the link between the level of economic activity in developed countries and export performance of LDCs.

The one major commodity group for which a stable export relationship to DC real GDP is observed is food. Food, in particular beverages (coffee, tea and cocoa), were traditionally the mainstay of LDC exports and not accidentally are central to Lewis' theorizing about the trade engine. Even though the coefficient measuring the link to DC income (regression 7, table 4) is somewhat lower (i.e., 0.65) than Lewis computes using total world agricultural exports as a proxy, it does appear exceptionally stable over time.
Table 5: COMPOUND ANNUAL GROWTH RATES OF THE VOLUME OF DC AND LDC CONSUMPTION AND LDC PRODUCTION OF SELECTED RAW MATERIALS: 1960 - 1978 (PERCENTAGES)

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Consumption</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DCs 1960-70</td>
<td>LDCs 1960-70</td>
</tr>
<tr>
<td>Cotton</td>
<td>-1.3</td>
<td>3.4</td>
</tr>
<tr>
<td>Rubber</td>
<td>2.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Copper</td>
<td>4.1</td>
<td>5.6</td>
</tr>
<tr>
<td>Iron Ore</td>
<td>3.8</td>
<td>6.0</td>
</tr>
</tbody>
</table>


Stability of the link proves deceptive, however, when one examines the behavior of individual commodity exports within the food aggregate. 1/ Table 6 presents the results of regression analysis of the relationship between DC real GDP and the volume of major LDC food exports (coffee, cocoa, tea, sugar, copra and groundnuts). Of the six commodities, only tea and sugar exports bear the hypothesized relationship to income in developed countries. Cocoa exports exhibit no relationship to DC income, while for copra and groundnuts the relationship is negative and hence inexplicable in terms of the engine theory.

Coffee, the single most important LDC food export, is also found to bear a weak relationship to DC real GDP. This observation is consistent with the evidence from econometric studies of the world coffee market which

1/ The constancy of the aggregate coefficient for food could be more than fortuitous were it the result of a gross expenditure constraint. However, since LDC exports account for a small share of food consumption, in DCs the gross expenditure presumably does not constitute the binding constraint on aggregate LDC food exports.
Table 6: REGRESSIONS OF THE VOLUME OF SELECTED LDC FOOD EXPORTS (X) ON DC REAL GDP (Y): 1960 TO 1978

\[
(\log X_t = a_0 + a_1 \log Y_t + a_2 D \log Y_t + a_3 D + \epsilon_t)
\]

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE</th>
<th>INDEPENDENT VARIABLES a/</th>
<th>Const.</th>
<th>LogYt/</th>
<th>Db/logYt</th>
<th>Db/</th>
<th>R²</th>
<th>D.W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Volume of Coffee Exports</td>
<td></td>
<td>6.703</td>
<td>0.262</td>
<td>-0.648</td>
<td>3.322</td>
<td>.368</td>
<td>1.571</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.654)</td>
<td>(3.301)</td>
<td>(2.604)</td>
<td>(1.948)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>5.703</td>
<td>0.469</td>
<td>-0.648</td>
<td>3.322</td>
<td>.431</td>
<td>2.072</td>
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<tr>
<td></td>
<td></td>
<td>(6.521)</td>
<td>(2.604)</td>
<td>(-1.948)</td>
<td>(1.930)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Volume of Cocoa Exports</td>
<td></td>
<td>6.810</td>
<td>0.036</td>
<td>-0.688</td>
<td>3.616</td>
<td>.052</td>
<td>1.552</td>
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<tr>
<td></td>
<td></td>
<td>(14.878)</td>
<td>(0.398)</td>
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<tr>
<td>4</td>
<td></td>
<td>6.619</td>
<td>0.073</td>
<td>-0.688</td>
<td>3.616</td>
<td>.097</td>
<td>1.906</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6.814)</td>
<td>(0.366)</td>
<td>(-1.849)</td>
<td>(1.891)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Volume of Tea Exports</td>
<td></td>
<td>4.374</td>
<td>0.407</td>
<td>-0.356</td>
<td>0.907</td>
<td>.910</td>
<td>2.156</td>
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<tr>
<td></td>
<td></td>
<td>(27.862)</td>
<td>(13.134)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>4.764</td>
<td>0.326</td>
<td>0.075</td>
<td>-3.630</td>
<td>.794</td>
<td>2.456</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(13.026)</td>
<td>(4.336)</td>
<td>(0.538)</td>
<td>(-1.817)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Volume of Sugar Exports</td>
<td></td>
<td>5.714</td>
<td>0.691</td>
<td>0.732</td>
<td>-3.630</td>
<td>.737</td>
<td>1.756</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(11.407)</td>
<td>(6.975)</td>
<td>(1.053)</td>
<td>(1.889)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>7.986</td>
<td>0.220</td>
<td>0.732</td>
<td>-3.630</td>
<td>.794</td>
<td>2.456</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7.865)</td>
<td>(1.053)</td>
<td>(1.889)</td>
<td>(1.817)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Volume of Copra Exports</td>
<td></td>
<td>12.225</td>
<td>-1.028</td>
<td>-0.075</td>
<td>0.399</td>
<td>.584</td>
<td>2.139</td>
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<tr>
<td></td>
<td></td>
<td>(11.707)</td>
<td>(-4.981)</td>
<td>(-1.954)</td>
<td>(0.794)</td>
<td></td>
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<tr>
<td>10</td>
<td></td>
<td>12.221</td>
<td>-1.027</td>
<td>-0.075</td>
<td>0.399</td>
<td>.524</td>
<td>2.143</td>
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<tr>
<td></td>
<td></td>
<td>(4.781)</td>
<td>(-1.954)</td>
<td>(-0.773)</td>
<td>(0.794)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Volume of Groundnuts Exports</td>
<td></td>
<td>15.125</td>
<td>-1.647</td>
<td>-2.215</td>
<td>10.916</td>
<td>.748</td>
<td>0.998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(13.037)</td>
<td>(-7.181)</td>
<td>(-3.232)</td>
<td>(3.092)</td>
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<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>7.769</td>
<td>-0.121</td>
<td>-2.215</td>
<td>10.916</td>
<td>.886</td>
<td>2.290</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.341)</td>
<td>(-3.232)</td>
<td>(3.092)</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

a/ t = Statistics in parenthesis.
b/ D = 1 for observations for 1970-78, zero otherwise.
c/ Y = Real GDP of OECD North.

Source: Y: Same as Table 4.
invariably come up with extremely low price and income elasticities of demand for coffee. 1/ For certain major markets, including the United States, the estimated income elasticity of demand approaches zero. Among the implications of this is that the slowdown of economic growth in developed countries will mean very little to the already relatively dismal growth prospects for coffee exports.

A further implication of the highly inelastic demand for coffee and other major food exports is that the export revenue fluctuations that occur presumably result primarily from supply shocks. Moreover, one would expect, contrary to the tenets of the trade engine theory, that adjustments to market disruptions would predominantly be in the form of price rather than quantity adjustment. These hypotheses are tested by analysing the variance and covariance of price and quantity for the major LDC food exports. The sign of the covariance of price and quantity is a common indicator of source (supply negative, demand positive) of instability. Export revenue (E) variations can be decomposed into price and quantity components from the identity:

\[ \text{var (log } E) = \text{var (log } P) + \text{var (log } X) + 2 \text{ cov (log } X, \text{ log } P) \]

where variance and covariance are measured around semi-logarithmic trend. 2/

Measures of variance and covariance of price and quantity for major LDC food exports are presented in Table 7. The hypothesis that supply shocks are the primary source of export revenue variations is supported in four of the six cases. In all cases price changes are found to dominate revenue variations.

1/ See Singh, et al. (1977); de Vries (1979); and Akiyama (1980).

2/ For example, \[ \text{var (log } E) = \sum_{t=1}^{T} e_t^2/T \]

where \( e_t \) is the residual of the regression \( \log E_t = a + bt + e_t \), \((t = 1...T)\).
Table 7: VARIANCE AND COVARIANCE OF PRICE (P) AND QUANTITY (X) OF SELECTED LDC FOOD EXPORTS: 1960 TO 1978 a/ b/ c/

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Var (logP)</th>
<th>Var (logX)</th>
<th>2Cov (logP, logX)</th>
<th>Corr (logP, log X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td>106.2</td>
<td>5.7</td>
<td>-39.3</td>
<td>-.799*</td>
</tr>
<tr>
<td>Cocoa</td>
<td>108.1</td>
<td>6.6</td>
<td>-44.3</td>
<td>-.829*</td>
</tr>
<tr>
<td>Tea</td>
<td>62.7</td>
<td>0.6</td>
<td>-0.5</td>
<td>-.043</td>
</tr>
<tr>
<td>Sugar</td>
<td>384.5</td>
<td>7.5</td>
<td>35.8</td>
<td>.332</td>
</tr>
<tr>
<td>Copra</td>
<td>80.2</td>
<td>35.3</td>
<td>-78.7</td>
<td>-.740*</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>43.9</td>
<td>34.8</td>
<td>-51.8</td>
<td>-.663*</td>
</tr>
</tbody>
</table>

a/ log P and log X are measured as deviations from their log-linear trend as limited for the period 1960-78.

b/ Variance and covariance estimates are multiplied by a factor of 1000 for the convenience of reading the table.

c/ Asterisks indicates that the correlation coefficient is significant at the 1% level.


variations. Only in the case of sugar exports is there evidence that demand shifts are the predominant source of export revenue instability. This finding is not surprising in view of the fact that among the six commodities only sugar exports face significant trade barriers in most developed countries behind which is sheltered a large and relatively volatile domestic industry. 1/

Finally, it should be noted that the results reported in Table 7 for individual commodities are consistent with those based on similar analysis of

1/ See de Vries (1980).
aggregate exports of individual developing countries. Murray (1978, p. 68) in analysing aggregate export price and quantity variations for some 25 countries concludes that "for a majority of underdeveloped countries, supply fluctuations have been a more important cause of export earnings instability than demand fluctuations." Furthermore, Murray shows that as LDC exports have become more diversified the level of instability has fallen and the relative importance of quantity (as opposed to price) as a source of instability has increased.

**SUMMARY**

The theory of trade as an engine of growth in developing countries is, as its name suggests, highly mechanistic. Trade, viewed as an engine, serves simply to transmit growth impulses from developed to developing countries. Mechanical efficiency of an engine requires that the gearing of interconnecting parts be tightly fitted. Lewis' observation of a stable hundred year link between growth in developed countries and primary exports of developing countries, geared at the ratio 0.87, is taken as evidence that the trade engine is mechanically efficient, and that therefore a slowdown of one part (developed country growth) leads mechanically to a slowdown of connecting parts (trade and connected to trade, LDC growth).

The theory that LDC exports are mechanically linked to DC growth is based on the assumption that LDCs export goods for which no close substitute is produced in developed countries. With the added assumption that supply of LDC exports is perfectly elastic, it follows that the quantity exported is uniquely determined by the level of expenditures in export markets. This paper has not taken issue with the assumption of perfectly elastic export supply, despite the fact that the existence of surplus labor in developing countries on which the assumption is based is widely disputed in the empirical
literature. Instead, this paper has challenged the assumption that LDCs specialize in non-competing products, which if proved invalid, by implication undermines the assumption of a perfectly elastic export supply.

However valid the assumption that LDCs specialize in non-competing products might once have been, it can no longer be considered relevant. Most countries still found to be mainly dependent on the traditional non-competing crops, principally coffee and cocoa, are located in Africa. Moreover, since the price and income elasticities of demand for coffee and cocoa have over time steadily fallen toward values approaching zero, little or no relationship is observed between DC growth and LDC exports of these commodities. The Lewis thesis, therefore, appears weak even in its application to the more backward developing countries.

In manufactures, which were the main source of export growth for most LDCs in the last two decades, LDC market shares in the developed countries are extremely low. Since LDC manufacturers are concentrated in highly standardized consumer and intermediate goods for which close substitutes are produced in developed countries, one can assume that demand elasticities are relatively high. Given these circumstances, LDC export growth may be judged to depend less on growth of the market than on the capacity of LDCs to supply manufactured exports at competitive prices.

Lewis rejects this logic, arguing that "The MDCs are willing to let in manufactured exports when they are prosperous, since they then have many growing industries that can take in people displaced by imports. Our assumption that the MDC growth rate is low rules out this possibility" (1986, p. 17).

---

1/ Theodore W. Schultz, who shared the 1979 Nobel prize with Lewis, is one who denies the validity of the surplus labor hypothesis (see Schultz, 1964). Among the empirical studies disputing the hypothesis are Paglin (1965), Turnham (1971) and Bertrand and Squire (1980).
p. 560). Even ignoring the non-sequitur of this argument, it is clearly disputed by the evidence presented in the preceding section. The average annual growth of LDC manufactured exports in the 1970s was as high as in the 1960s despite a fall by half in average annual real growth of developed countries in the 1970s. As shown in table 3, LDC penetration of the DC market for manufactures increased, indeed, at a faster rate after 1975 than before. Not surprisingly therefore the coefficient measuring the link to DC income doubled in the 1970s. This experience is consistent with the trade engine thesis only if one makes the doubtful argument that the gear ratio was doubled, perhaps as a result of a shift in tastes and preferences in favor of LDC manufactures. Income elasticities and the practices of protectionism in developed countries suggest that the opposite is more likely to be the case.

Measures of linkage obtained by regressing LDC exports on DC income prove, for manufactures as well as raw materials and foods, far too unstable to be interpreted as gears of an engine of growth. Highly-reduced form analysis which ignores the influence of relative price changes and shifts in supply, however convenient methodologically, cannot provide an adequate basis for explaining the impact of economic slowdown in developed countries on LDC trade, much less on LDC growth.

It is ironic that those who appeal to the notion of trade as an engine of growth invariably do so to justify a policy of reducing reliance on trade, arguing that the engine has broken down. This was the approach, in the 1950s, of Nurkse, Prebisch and Myrdal in laying the foundations of the import-substitution strategy. Their prognosis was proved wrong by the experience of the 1960s and 1970s in which countries pursuing outward-looking strategies of development uniformly out-performed those pursuing the prescribed inward-
looking strategy. 1/ Equally wrong, however, was their reading of history, which as Kravis convincingly argues, shows trade to have been the "handmaiden" rather than the engine of growth in the nineteenth century.

This paper has not taken up the question of whether trade, however propelled, served as the engine of LDC growth in recent decades. However, if one rejects the premise that LDC exports are externally driven, it is difficult to maintain any longer the notion of trade as an engine, for it then becomes impossible to distinguish that which is input to the engine from that which is output. No similar dilemma is encountered if one abandons mechanics in favor of a more organismic view of economic interrelationships in which trade and growth are more properly regarded as interdependent aspects of a single, evolutionary process. The metaphor of trade as a handmaiden of growth is, if one adapts such a view, more theoretically appealing and likely more applicable to the experience of the 1960s and 1970s than that of an engine.

1/ Bhagwati (1978), Balassa (1978), and Michaely (1978) show that a high positive correlation exists between export growth and economic growth across LDCs.
REFERENCES


APPENDIX 1

52 Sample Countries - Primary Commodities Exporters

<table>
<thead>
<tr>
<th>Balanced Exporters</th>
<th>Non-African Predominantly Primary Commodity Exporters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Afghanistan</td>
</tr>
<tr>
<td>Barbados</td>
<td>Argentina</td>
</tr>
<tr>
<td>Brazil</td>
<td>Bolivia</td>
</tr>
<tr>
<td>Egypt</td>
<td>Burma</td>
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<tr>
<td>Haiti</td>
<td>Chile</td>
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<td>India</td>
<td>Columbia</td>
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<td>Jordan</td>
<td>Costa Rica</td>
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<td>Mexico</td>
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<td>Tunisia</td>
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<td>Guyana</td>
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<td></td>
<td>Honduras</td>
</tr>
<tr>
<td></td>
<td>Jamaica</td>
</tr>
<tr>
<td>20 African Predominantly Primary Commodity Exporters</td>
<td></td>
</tr>
<tr>
<td>Central African Empire</td>
<td>Malaysia</td>
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<tr>
<td>Chad</td>
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APPENDIX 2

Broadly Non-Competing Non-Fuel Primary Commodities

Foodstuffs

Beverages
- Cocoa
- Coffee
- Tea
- Bananas
- Spices
- Copra
- Groundnuts
- Palm Oil
- Coconut Oil

Agricultural Raw Materials

- Jute
- Natural Rubber
- Sisal
- Silk
- Nonconiferous logs

Metals and Minerals

- Copper
- Bauxite
- Natural Phosphates
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E. Verreydt and J. Waelbroeck

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Barend A. de Vries

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LC 67-28942, 10 francs.

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J. M. Finger

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Bela Balassa and others
LC 77-147366. ISBN 0-8018-1257-7. $25.00 ($15.00) hardcover
Spanish: La estructura de la protección en países en desarrollo. CEMLA, Departamento de Publicaciones, Durango 54, Mexico 7, D.F., Mexico. 1972.

The Tokyo Round: Results and Implications for Developing Countries
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Jaime de Melo and Sherman Robinson
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