Volume Title: The Role of Agriculture in Economic Development

Volume Author/Editor: Erik Thorbecke, ed.

Volume Publisher: UMI

Volume ISBN: 0-87014-203-8

Volume URL: http://www.nber.org/books/thor70-1

Publication Date: 1970

Chapter Title: Prospects for Agricultural Trade of Developing Countries

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Chapter URL: http://www.nber.org/chapters/c3361

Chapter pages in book: (p. 13 - 74)

Agriculture in the World Economy

Prospects for Agricultural Trade of Developing Countries

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IN THE *first* section of this paper the methodology followed in the FAO projections is summarized, and some of the problems arising from the introduction of prices in the projection model are discussed with particular attention to tree crops. In the *second* section, the trade prospects of the lesser-developed countries (LDC) are reviewed for a number of commodities. A broad distinction is made between the commodities for which the major limiting factor is export outlets and those for which the main limiting factor is the expansion of production in the LDC. In the *third* section the export outlets of the LDC are considered by destination: developed, socialist, and LDC.[1] Emphasis is placed on the limited scope

NOTE: This paper is based mainly on work carried out by the author during the preparation of the agricultural projections for 1970 and 1975 published by FAO in 1962 and 1967. (The author was the main compiler of the FAO projections for 1970 published in 1962 and a major contributor to the projections for 1975 published in 1967.) The results of the UNCTAD projections for 1975 are utilized to provide an over-all trade perspective for the agricultural export prospects of the lesser developed countries. The paper was written while the author was with the IBRD. The views expressed herein are the sole responsibility of the author; they do not commit any of the agencies mentioned above.

The author benefitted greatly from the thoughtful comments made by Bela Balassa on an earlier version of this paper at the time of the U-NBER conference. Many of the points raised by Balassa are incorporated in this version. [Editor's note: Balassa's comments do not appear in this volume since they have been largely taken into account in the present revision of the original paper.]

[1] Following the usage of the UN the nations of the world have been classified in three groups: (1) Developed countries with market economies—North America,

for expanding the net agricultural exports from LDC to developed countries and on the need to investigate more fully the scope for expanding trade between developing countries in future decades. In the *fourth* section, the prospects for LDC exports are compared for agricultural and nonagricultural products. This section is concluded by an analysis of the effect of the sharp decline in agricultural exports' share of the distribution of export earnings between the LDC. The increasing factor of unequality in the distribution of export earnings among LDC is illustrated by Lorenz curves for 1950, 1955, 1960, and 1965.

Annex I deals with sectoral demand projections in countries with rapid urbanization. It analyzes the conditions under which projections based on national averages lead to biased estimates. The method is based on the covariance analysis of stratified household surveys and is illustrated by data for the USA and for Madagascar. Annex II analyzes the relation between growth of exports and gross domestic product (GDP) in a number of developing countries. Within countries the direct elasticity between GDP and export earnings is generally significant, but once the time trend is eliminated, the relation between the deviations from the trend is weak. Between countries the correlation between the average rates of growth of GDP and of exports is low. To reach a better understanding a distinction is drawn between the "accounting" effect of an increase of export earnings on GDP and the "induced" effect, the first being felt immediately and the second with a time lag. The hypothesis of an "induced" lagged effect appears consistent with the data available in several countries.

METHODOLOGY

The methodology followed in the FAO projections for 1975 [2] does not differ basically from the one used five years earlier in the projections for 1970; [3] however, the analysis was carried out more systematically

Western Europe (including Yugoslavia and Turkey), Japan, Australia, New Zealand and South Africa; (2) Countries with centrally planned economies—(European) Eastern Europe and U.S.S.R.; (Asiatic) mainland China, Outer Mongolia, North Korea, and North Vietnam; (3) Developing countries with market economies. These three groups are often referred to as follows: Group 1, "Developed"; Group 2, "Socialist"; Group 3, "LDC." The nations of the world may also be classified by income groups: Group 1 together with Group 2 European comprise the "high-income countries"; Group 2 Asiatic together with Group 3, the "low-income countries."

[2] United Nations Food and Agriculture Organization [FAO] *Agricultural Commodities Projections* for 1975 and 1985, Rome, 1967.

[3] United Nations FAO, *Agricultural Commodities Projections* for 1970, Rome, 1962.

and in greater depth. Demand, production, and trade were projected to 1975. The demand projections were extended to 1985 to provide a basis for the subregional studies of FAO's Indicative World Plan (IWP).

The main steps may be summarized as follows: formulation of population and income assumptions; demand projections by commodity (and commodity groups), with consistency checks by country regarding nutritional intakes; projections of production by commodities, with consistency checks by country between the growth of total agricultural production and GDP; confrontation of world exportable supplies and world import demand by commodities.

FAO intends to proceed at a later stage to the reconciliation of the commodity approach at the world level with the subregional approach, in which the emphasis is on production problems. This reconciliation is an important step in the formulation of an indicative plan for agricultural development.

The UNCTAD projections,[4] on the other hand, result from the combination of the country and commodity approaches. Detailed country studies based on an econometric model were conducted for about twenty-five developing countries, while estimates were made for the remaining LDC. World commodity studies were undertaken in various degrees of depth for the major LDC exports. For agricultural commodities the UNCTAD projections drew heavily on the FAO study. For petrol, iron ore, nonferrous metals, and textiles original studies were made. Their results are presented as provisional, pending more detailed analysis by the UNCTAD Commodity Division. Adjustments were made between the results obtained in the country and commodity approaches so as to reach consistent projections of exports and imports leading to an estimation of the LDC trade gap.

Population and Income Assumptions

The FAO and UNCTAD assumptions are about the same for population but differ somewhat for GDP. First, the range between the high and the low GDP assumptions is twice as large in the FAO as in the UNCTAD study. Second, the average growth rate for the LDC is higher in the UNCTAD than in the FAO assumptions (see Table 1).

The comparison between the assumptions selected in 1961 in the FAO projections for 1970 are compared with actual developments up to 1965 in Table 2. Population growth appears to have been underesti-

[4] United Nations Conference on Trade and Development [UNCTAD] *General Survey of Trade Prospects and Capital Needs for Developing Countries.* To be published.

TABLE 1

Population and GDP; Assumptions for 1965-75 Compared With past Trends
(in percentage per annum compounded)

	Developed Countries With Market Economies	LDC
Population		
1950-62	1.3	2.3
1965-75	1.1	2.6
GDP		
1950-65	4.1	4.5
1965-75		
FAO	3.5 – 4.8	3.6 – 5.5
UNCTAD	4.2 – 4.7	5.2 – 6.1

mated by 0.1 per cent a year in both developed and developing countries. The GDP growth up to 1965 fell within the range assumed. But for the LDC, actual growth was closer to the low assumption than for the developed countries. For the period 1958–65 a country-by-country comparison between GDP assumptions and actual performances shows that the dispersion between country rates was greater than assumed. Under the high FAO assumption to 1975 the rate of GDP growth falls between 4 and 7 per cent a year for 90 per cent of the countries, but actual dispersion will probably be much wider.

Demand Projections

Per capita demand was projected at constant prices on the basis of the assumed growth in per capita private consumption. The growth rates of private consumption and GDP were assumed to be the same as those under the low assumption. But in the LDC the former rate was taken as lower than the latter so that the high assumption would reflect the rising share of investment in GDP associated with an acceleration of the rate of economic growth. Thus, for all LDC for which the assumption of growth in per capita private consumption was high, the average growth rate of total private consumption was only 5.2 per cent a year, compared with 5.5 per cent for GDP.

TABLE 2

FAO Growth Assumptions, 1958-70, Compared With Actual Growth, 1958-65
(in percentage per annum compounded)

	Developed Countries With Market Economies	LDC
Population		
1958-65	1.3	2.5
1958-70	1.2	2.4
GDP		
1958-65	4.5	4.3
1958-70	3.9 – 5.0	4.1 – 5.2

Four types of demand functions were used: log-log, semilog, log-inverse ($\log y = a - \frac{b}{x}$) for commodities likely to reach a saturation level, and log-log-inverse ($\log y = a - \frac{b}{x} - c \log x$) for cereals and roots in the LDC to allow for an increase in per capita consumption in a first stage and for a decline in a second stage. For each country per capita demand was projected by commodity and for aggregates, e.g., demand for all food valued at farm prices, total caloric intake, total protein intake. Since the accuracy of the projection was generally higher for aggregates (e.g., consumption of total calories in the U.S.) than for individual commodities (consumption of calories from pork, beef, etc.), consistency was reached mainly by adjusting projections for certain individual commodities downward.

The values of the elasticity coefficients and the type of demand function were originally selected mainly on the basis of a survey-analysis of households, using time-series analysis as a check whenever possible. A number of adjustments were made on the basis of nutritional considerations. For example, in the demand for all caloric intake, the average caloric requirement in a given country was used to check the value of the parameter of the log-inverse function characterizing the level of the horizontal asymptote, i.e., the saturation level in terms of calories. Nutritional factors were taken into account for checking the values of the parameters characterizing the maximum level reached, for example, for all cereals, with the log-log-inverse function.

For major changes in the food consumption pattern the relationships between the principal classes of those nutrients that reflect physiological needs are generally more stable than the relationships between the classes of foods that reflect consumer tastes. One of the original features of these demand projections is the systematic combination of the statistical analysis of the nutrients contained in the food items with the classical econometric analysis by Engel curves. This combined approach proved particularly fruitful in providing an econometric basis for the analysis of nutritional policies.

With commodities such as coffee, cocoa, tea, and sugar, the emphasis was placed on time-series analysis, because fairly reliable data are available for the postwar period. The estimation of the price elasticity permitted assessment of the impact of a price change on demand. For the agricultural raw materials no uniform method was followed. Whenever possible, the analysis was made by end-uses.

During the preparation of the projections for 1975, those made in 1961 for cocoa, coffee, tea, sugar, and oils were compared with actual developments during the last five years. Using the demand function selected in 1961 for the various countries, consumption was calculated on the basis of actual changes in population, GDP, and prices. The relative difference between calculated and actual consumption for the five-year period is shown on Table 3. For the developed countries as a group as well as for the developed and developing countries together, the accuracy of the demand projections was good, especially if account is taken of the amplitude of the price changes (-37 per cent for cocoa, -12 per cent for coffee, and -10 per cent for tea).[5] As might be expected, the accuracy was lower for developing than for developed countries. The small differences for broad groups conceal, however, substantial differences for a number of countries.

It can be argued that projections of demand based on national averages are not very meaningful for developing countries. National averages conceal major differences between the rural population living mainly in a subsistence economy and the urban population living in a market economy. In a country with rapid urbanization projections based on national averages could therefore be misleading. Since data for sectoral projections are not often available, it was considered worth-

[5] Average import unit value for importing countries, and retail price for producers. The price elasticity coefficients used for cocoa were those given in *Agricultural Commodities Projections for 1970;* for coffee and tea, those given in *Agricultural Commodities in the UN Development Decade,* 1963, were used. No price adjustments were made for sugar and oils.

TABLE 3

LDC and Developed Market Economies: Comparison between Consumption Growth as Projected by FAO for 1970[a] and Actual Growth over a Five-Year Period.
(in average percentage per annum compounded)

	Coffee	Cocoa	Tea	Sugar	Fats and Oils
Developed Market Economies					
Projected[a] – increase	3.8	4.7	2.1	2.4	1.5
Actual increase	3.7	5.3	1.6	2.1	2.2
Difference	0.1	–.6	0.5	0.3	–.7
LDC					
Projected[a] – increase	5.2	6.9	4.7	4.3	4.4
Actual increase	7.4	3.9	5.3	3.9	3.3
Difference	1.8	3.0	–.6	0.4	1.1
Totals					
Projected[a] – increase	4.1	5.1	2.7	3.4	2.6
Actual increase	4.5	5.0	2.4	2.9	2.6
Difference	–.4	0.1	0.3	0.5	0

Source: United Nations Food and Agriculture Organization, *Agricultural Commodoties Projections 1975-85,* Vol. I, table 8, p. 176; Vol. II, tables I.22-I.25, pp. 51-54, Rome, 1967.

[a]On the basis of selected demand functions adjusted for actual population and income increase and–in the case of coffee, cocoa, and tea–for actual price change.

while to analyze the conditions under which the global projections lead to substantial bias. This analysis is presented in annex I.

Production Projections

Trends over the period 1950–63 were taken as the starting point. The historical analysis was carried out for about thirty-five individual commodities, for groups of commodities, and for all agricultural output. For crops, area yields and output were projected separately.

The systematic analysis of past trends was supplemented by a review of national development plans and projection studies carried out by

TABLE 4

All LDC: Growth Rates for the Agricultural and Nonagricultural Sectors, 1962-75, Projected Under Two Assumptions

(in percentage per annum compounded)

	Low Assumption	High Assumption
Agricultural sector	2.8	3.5
Nonagricultural sector	4.2	6.0
GDP	3.8	5.2

various institutions. The FAO production projections utilize information from various sources; the reasoning underlying the derivation and selection of the figures can best be shown on an ad hoc basis in the detailed commodity notes.

For developed countries a single projection of agricultural production was made. This seems justified in view of the tenuous link between the growth of the value added in the agricultural and in the nonagricultural sectors. This single projection was associated with each of the two GDP assumptions. Therefore, for the temperate zone products as well as for the noncompeting tropical food and beverages, the net import demand of the developed countries is systematically larger in the high-GDP-assumption category than in the low. In short, the projections of production in the developed countries reflect the expectations of the commodity specialists.

For the LDC two projections were made for agricultural production. The low-production projection was associated with the low-GDP assumption and the high projection with the high GDP assumption. A complementarity was assumed between the growth of the agricultural and nonagricultural sectors as shown in Table 4. Because of this assumption,[6] the net import demand for a number of commodities—cereals in particular—was lower under the high-GDP assumption than under the low.

In practice, two production projections were made for each commodity (except for some tree crops). The low projection was "conservative." The high projection was "optimistic," implying the success-

[6] A similar assumption of complementarity has been made between the growth of cereals production and GDP. See the recent USDA study on the LDC cereals gap, "World Food Situation," USDA FAER N.35 Washington, Sept., 1967.

ful implementation of a number of measures reviewed in the commodity notes. The projections by commodities (or commodity groups) were then aggregated for each country to measure the growth for the whole agricultural production and were then compared with the GDP assumptions. When the relative rates of growth implied for the agricultural and nonagricultural sectors were not considered compatible, the production projections were adjusted for the principal commodities.

Undoubtedly a substantial element of subjectivity is attached to the production projections. This margin of subjectivity can only be reduced by a systematic analysis of the factors influencing production. Time series in developing countries are generally not accurate enough for this type of analysis. It is therefore necessary to exploit more systematically the findings of cross-section studies. The field missions undertaken within the framework of the tripartite coffee study, as well as the subregional studies carried out for the IWP have shown that a substantial amount of material could be collected. But the systematic analysis of this material is a delicate and lengthy task.

Trade Projections

The growth coefficients projected for domestic production and utilization by country or country groups for the period 1962–75 were applied to the world commodity balance sheets established for the base period 1961–63. This led to a balancing item for 1975, which has to be interpreted as the first approximation of the potential net import requirement or net exportable supply for any given country and, of the tendency towards surplus or shortage for the world as a whole. This, together with the analysis of past trends in imports and exports, provided the basis for the analysis of the commodity prospects.

Obviously, if we ignore the effect of statistical inaccuracies, world imports and exports will ultimately balance each other for each commodity through a series of adjustments in production and consumption and eventually through changes in the levels of stocks. For the commodities produced mainly for exports, such as cocoa and coffee, such an adjustment could be made on a commodity basis. But, for the basic food items that loom large in the import bill of the LDC, it could not be made without reference to the balances of payment of the importing countries, since these will also ultimately have to be in equilibrium. Since the analysis of the balance of payments falls far outside the scope of the FAO study, an equilibrium between imports and exports was not forced in the commodity balances for 1975.

It should also be noted that the method followed (projection of domestic demand and production) led to a first approximation of the *net* import or *net* exportable supplies for a commodity in a given country and not of the *gross* imports or *gross* exports. For a well-defined primary product such as rice or peanuts, the concept of net import is the most relevant to agricultural planning in a given country, since re-exports—which generally account for the major part of the difference between gross and net—have little to do with agricultural activities. For a group of countries, the concept of net trade may, however, be misleading. An increase in the exportable oil surplus of West Africa may not be offset by an equivalent increase in the potential deficit of India. India may not have the foreign exchange to import from West Africa. Its effective imports may be lower than its potential demand; and it may restrict them to purchases under concessional terms. Therefore, to analyze the trade problems of the LDC the net exports of the net-exporting countries and the net imports of the net-importing countries were summed separately for each type of commodity. The growth rate of the sum of the net imports of the deficit countries provided a proxy for the growth rate of gross imports; the growth of the sum of the net exports of the exporting countries provided a proxy for the growth of gross exports. However, it would have been preferable to project gross and net imports simultaneously to avoid confusion. Statistics are usually published in terms of gross imports and exports, and the net trade deficit of a country is usually projected by subtracting total gross exports from total gross imports rather than by adding up the sum of the projected net imports for each commodity.

The approach followed by UNCTAD was not the same, since a major objective was to arrive at the "capital needs of developing countries." The required capital flow was taken as equal to the deficit of the current account balance of the LDC, assuming no monetary movement such as changes in reserves or IMF drawings. The deficit of current accounts was estimated as the sum of the deficit in three balances: import-export of commodities, invisibles, and investment income.

The UNCTAD study had therefore to come out with one figure for the "import-export gap," which was reached through appropriate adjustments at the country and commodity level for each of the high- and low-GDP assumptions. The trade projections were expressed in terms of gross exports and gross imports. While the FAO study attempted to project the net import demand mainly as the balance between projected domestic demand and production, using the trends in imports mainly as

a check, the UNCTAD study relied primarily on the relationships between gross imports by commodity groups and major economic indicators.

The Problem of Prices

The weakest point in the projection model is the absence of prices. As previously noted in the FAO projections published in 1962 and 1967 as well as in the UNCTAD projections, prices were introduced through the back door and often in a qualitative manner. This deficiency can be explained by two considerations. First, a major purpose of the FAO projections published in 1967 was to provide a first approximation of the demand for food as a starting point for the study of production programs to be carried out in the subregional studies of the IWP.[7] Second, projecting price trends a decade ahead or more is a risky exercise. Rather than a clear time trend, the historical price series generally show substantial fluctuations with some kind of periodicity. This suggests that the price-forecasting problem has to be approached from an autoregressive angle, taking into account lagged supply responses, rather than purely in terms of trends. An attempt is made below to consider some of the problems connected with the introduction of prices in the projection model.

The main difficulty is the limitation of our knowledge of the response of production to prices. Although a number of econometric studies deal with the subject, they are generally restricted in the developing countries to the impact of prices on the land area devoted to a particular commodity. Few econometric studies deal with the impact of prices on yields and with the impact of average farm prices on the level of total agricultural output in the LDC. We shall not consider here the general problem raised by a price projection model for agriculture as a whole including direct and cross-price elasticities, since the problem is intractable at the world level with the data presently available. We shall limit ourselves to the consideration of a single-commodity model relating to a typical export crop and assuming all cross-price elasticities equal to zero. Further, we shall initially assume prices to producers and consumers to vary proportionally with world market prices; this assumption together with that of constant elasticity is very convenient for expository purposes.

If there is no lag in demand and no lag in production responses to

[7] The committee on commodity problems, for which the projections were prepared, stressed that price adjustments should be introduced only after completion of the subregional studies.

prices, the change in prices needed to bring a balance between demand and supply projected at constant prices is:

$$(1) \qquad \log \frac{P'}{P} = \frac{1}{b_{2,o} - b_{1,o}} \log \frac{D}{S}$$

where

P = price level in the reference period,
P' = projected price level to clear the market,
D = demand projected at constant prices,
S = production projected at constant prices,
$b_{1,o}$ = short-term price elasticity of demand,
$b_{2,o}$ = short-term price elasticity of supply.

Although response of demand to price is generally somewhat higher in the long term than in the short term, the assumption of no lag in response to price might be considered as an acceptable first approximation for demand. But for production, this assumption is, *a priori*, not acceptable. For most agricultural products, tree crops in particular, the supply response is much higher in the long than in the short term.

In the simplest commodity model, the demand and supply functions can be written with time lags in the form of equations 2 and 3, assuming c_1 and c_2 constant [8] throughout the projection period.

$$(2) \qquad \log D_t = a_1 + \sum_{j=o}^{k} b_{1,j} \log P_{t-j} + c_1 t + U_{1t}$$

$$(3) \qquad \log S_t = a_2 + \sum_{j=o}^{k} b_{2,j} \log P_{t-j} + c_2 t + U_{2t}$$

with $$E(U_{1,t}U_{1,t-\theta}) = E(U_{2,t}U_{2,t-\theta}) = o \text{ for } \theta > o$$
$$E(U_{1,t}) = E(U_{2,t}) = o$$

Similarly, the reduced form of the price equation can be expressed in relation to a trend factor by:

$$(4) \qquad \log P_t = \alpha + \gamma t + x_t$$

[8] In practice c_1 and c_2 will not be constant. Demand is generally not projected on the basis of constant elasticity and world demand results from the aggregation of country projections. If the projections imply an acceleration of productivity growth, the rate of production growth will generally increase through the projection period either smoothly or by steps.

The level P_t, which will clear the market, will be such that:

$$\gamma = \frac{c_1 - c_2}{b_o}, \text{ where } b_o = b_{2,o} - b_{1,o}$$

(5) $$x_t = \sum_{j=1}^{j=k} b_j x_{t-j} + \epsilon_t$$

with: $$b_j = b_{2,j} - b_{1,j}$$

$$\epsilon_t = \frac{U_{1t} - U_{2t}}{b_o}$$

If all the roots of equation 6 are smaller than unity in absolute value, the process x_t is stationary.

(6) $$\sum_{j=o}^{j=k} b_j x^{k-j} = o$$

The variance of x_t can be decomposed in two elements as shown in equation 7: the variance of the purely random term ϵ_t and the variance due to the lagged responses:

(7) $$\text{Var}(x_t) = \text{Var}(\epsilon_t) + \sum_{1}^{\infty} a_\tau^2 \text{Var}(\epsilon_t)$$

The coefficients a are derived from the b_j coefficients by:

$$a_\tau b_o + a_{t-1} b_1 + \cdots + a_o b_\tau = o \quad \text{with } b_\tau = o \text{ for } \tau > k$$

The autocorrelation coefficients and the spectral density can be derived from the a_t coefficients; the analysis of the spectrum provides a convenient way to assess the periodicity of the autoregressive process x_t generated by the parameters b_j of equation 5.

The system can be simplified, if the short- and long-term responses to price are concentrated at specific points of time. For example, for cocoa during the postwar period, the simplest distributed lag model providing a satisfactory statistical fit can be constructed by introducing, together with a current response to prices, an eleven-year lag reflecting the impact of prices on the size of plantings. Equation 5 characterizing the autoregressive process can then be written:

(5′) $$x_t = -\frac{b_o}{b_{11}} x_{t-11} + \epsilon_t$$

with $$E(\epsilon_t \epsilon_{t-\theta}) = o$$

The model will be stable only if the elasticity in the current year b_o is higher than the lagged elasticity b_{11}. The crucial parameter is therefore:

$$\beta = -\frac{b_o}{b_{11}}$$

Equation 7 can be written:

$$(7') \qquad \mathrm{Var}(x_t) = \frac{1}{1-\beta^2}\,\mathrm{Var}(\epsilon_t)$$

If β is equal to 0.3, only 10 per cent of the variance of x_t is explained by the lagged responses to price; the system is strongly convergent. For all forecasting purposes the lagged response can be ignored and x_t approximated by ϵ_t; the projected price change can then be computed from equation 1. The price trend can be expressed in the form of equation 4. For example, if production at constant prices were to rise by 3 per cent a year and demand by 2 per cent, the price would decline by 2.5 per cent a year for $b_o = b_{2,o} - b_{1,o} = 0.4$.

If β is equal to 0.7, half of the variance of x_t is explained by the backward linkage. Prices a decade ahead have to be projected by recurrence.

If β is equal to 0.9, 80 per cent of the variance of x_t is explained by the linkage. The pronounced cyclical influence appears from the spectral density (0.05, 0.1, and 19 respectively for zero, $\frac{\pi}{2}$ and π). Ignoring the backward linkage would therefore have generally led to considerable forecasting errors.

If β is higher than unity, the system is explosive. In practice, the system does not explode since prices cannot become negative. It is therefore necessary to introduce into the model a number of constraints reflecting, in particular, the reactions of the market when prices fall below a given level.

When prices are above the long-term equilibrium level, the short-term production response to price is very low; in the case of cocoa, it did not appear statistically significant. But once the producer's price falls below the marginal variable cost, the short-term production response rises very sharply; in the case of cocoa it seems that the low prices prevailing about 1965 reduced supply significantly. Without government intervention the floor price in a downswing would largely depend on the level of the variable production cost and its distribution among producers. Since the variable production cost is low for tree crops, governments often intervene before this limit is reached, by cutting subsidies on fertilizers and pesticides and by withdrawing part of the production from the market

through various measures. The high short-term supply response when prices fall below a given level, together with the accumulation of stocks, act to dampen the price trough although they extend its duration.

In the price upswing little can be done to increase supply in the short run once the reserve stocks have been exhausted, although the price decline in the subsequent decade can be reduced by raising export taxes. In the short term the price increase can be reduced only if the consumer's response to a price increase becomes stronger once a given price level has been exceeded. The reaction of U.S. consumers to the peak coffee price of 1954 gives some support to this hypothesis. But on the whole the reaction of the market against a price boom is weak in the short term. This asymmetry in the short-term response of the market is reflected in the shape of the price cycle, with its sharp peaks and dampened but prolonged troughs. Since 1892, the period of the coffee cycle has varied between fifteen and twenty-five years with an average of twenty years, and the length of the upswing has been only about a third that of the downswing.

In view of the variability in the length of the trough, direct analysis of the past price series is of limited forecasting value. What happened in 1900 has obviously little relevance to what will occur in 1975. For forecasting purposes we have to start from the structural equations 2 and 3, with elasticity coefficients that are for all practical purposes estimated from the postwar period. If the ratio between the variance of x_t and ϵ_t computed for the postwar period is comparable to the theoretical ratio given by equation 7 (assuming no error in the specification of the model and in the estimation of the parameters), the model, despite its imperfections, will be useful in explaining the nature of price variations.

In the case of cocoa the impact of prices on the consumption of grindings and on the demand for stocks can be estimated from postwar data with reasonable accuracy. For consumption the accuracy is improved by the introduction of lags, which suggests that all of the price impact is not felt during the current year. For stocks the accuracy is improved by introducing future prices. Changes in future prices are expressed as a function of the expected changes in supply and demand, and stocks are expressed as a hyperbolic function of the difference between future and spot prices. Although the quantity produced can generally be taken as unaffected by the current price, the system is not recursive because of the interdependence between the demand for grindings and the demand for stocks. This problem can be dealt with by two-stage least squares.

A serious problem of estimation arises with the production function. The increase in cocoa output depends on the combination of two factors:

(1) the size of the plantings by age groups, which is correlated with producers' price lagged seven to thirteen years; (2) the yield per tree by age groups, which is correlated with time because of the introduction of improved varieties and the improvement of cultural practices with wider use of pesticides and fertilizers. Because of the lack of data on plantings, lagged prices have to be used as a proxy for plantings. But in view of the length of the cycle, the price lagged is correlated with time during the postwar period. It is therefore not possible to disentangle precisely the relative weights of the lagged price response and of the technological progress in the production growth recorded during this period. Unfortunately, the level of the price projected for 1975 is very sensitive to the relative weights given to these two factors. Placing too much weight on technological improvements would lead to a declining price trend in the 1970's. Placing too much weight on the response of production to lagged prices would give a very sharp uptrend in the same period. One way to resolve this dilemma is to estimate the impact of technological progress from other sources, in particular from agronomic data on the likely impact of fertilizers, pesticides, and improved varieties. From this estimate, the price response can be measured by conditional regressions.

Although strong reservations are necessary concerning the accuracy of the production function, the results of various experiments suggest that the module of some of the roots of equation 6 may be as high as unity. It is therefore essential to introduce into the system stabilization constraints, such as a short-term production response when the world market price falls below a given level (22 cents a pound is a likely figure) and government interventions. To provide valuable long-term price forecasts, the econometric model has therefore to reach a fairly high level of sophistication. From an operational point of view, the problem is to know whether a sophisticated model will provide more valuable answers than a less formalized approach leaving more room for informed judgment. This obviously depends on the nature of the questions that have to be answered by the model.

If the primary objective is to provide guidelines for the production policy or even to reach a reasonable forecast of LDC export earnings, it is doubtful whether the construction of a series of commodity models would, in the short term, substantially improve the quality of the final forecast. If the primary objective is to assess the relative merits of alternative schemes for stabilizing the market and increasing LDC earnings, the model approach is a worthwhile investment. It compels specification of assumptions and provides a way to assess the feedbacks.

In the FAO projections for 1970 the demand curve was projected at

three alternative price levels, 18, 24, and 30 cents per pound.[9] The lowest price of 18 cents was taken as the level below which production would react in the short term, although it was not easy at the time to say whether the trough would be over by 1970. The price range selected in 1961 was not unreasonable; six years later a price range of 21 to 29 cents was taken as the basis for the negotiation of a cocoa agreement that should have covered the year 1970. In the projections for 1975 prepared in 1967 it was indicated that the trough would be over by 1975 and that prices around 1975 would be higher than in 1963–65.

In the price stabilization study initiated by the IMF and the World Bank the author felt much more strongly the need for the model approach. The emphasis was not on forecasting, but rather on assessing the genuine stability of the market without intervention, as well as the relative merits of various types of interventions. Since buffer stock was an important issue, attention was given to stochastic processes, with the impact of various policies simulated on a series of samples generated from the post-war data by the Monte Carlo method.

EXPORT PROSPECTS FOR THE MAIN AGRICULTURAL COMMODITIES

To assess the export prospects of developing countries for agricultural commodities it is convenient to draw a distinction between two main groups: (1) the traditional LDC export commodities, for which the major problem is outlet; and (2) cereals, livestock, and wood products, where the major problem for the developing countries is to increase their production. In 1961–63 the LDC had a net export surplus of 8.5 billion dollars for the first group of products but a net deficit of one billion dollars for the second.

Of the first group (coffee, cocoa, tea, bananas, tobacco, oils, sugar, rubber, and fibers), the major portion of world exports is accounted for by developing countries, half of whose production is exported, with the bulk of these exports going to high-income countries. The growth prospects for developing countries' exports are dominated by the rate of expansion of the import demand in the high-income countries. For developing countries as a whole, a marginal increase in the quantities of most tropical food and beverages exported leads, all things being equal, to a reduction of export earnings. This reflects the combination of the dominant position of these countries in the world export of these commodities with the low price elasticity of world import demand for them.

[9] *Agricultural Commodities Projections for 1970.*

More precisely, these commodities' share of world exports usually exceeds the absolute value of the price elasticity of the world import demand for them.

Of the second group of commodities (cereals, livestock, and forest products), developing countries are marginal suppliers in world markets; if rice is excluded, hardly 5 per cent of world exports originate in developing countries. These exports are marginal in relation to the production of the developing countries and to the consumption of the high-income countries. For this group of commodities world trade has expanded rapidly during the last decade, increasing twice as fast as for the previous group.

Unfortunately, production in the LDC increased more slowly for the second than for the first group of commodities, and only a few developing countries were able to take advantage of the rapidly expanding markets. The share of the LDC in the quantum of world agricultural exports declined steadily since 1950. Moreover, between 1959–60 and 1965–66 average unit value of agricultural exports [10] improved by 8 per cent for the developed countries but did not show any increase for the LDC. In part this reflects the superiority of the developed over the developing countries in regard to adaptability of the production pattern to a rapidly changing world demand. In the 1960's, developed countries succeeded in controlling the volume of their agricultural production better than the developing countries; but many of the latter have not yet succeeded in reallocating their agricultural resources to take full advantage of the rapidly expanding domestic or foreign markets.

First Commodity Group

The level of the import demand in the high-income countries is the most important limiting factor to the expansion of LDC exports. The projection of the net import demand of the high-income countries therefore provides the starting point for assessing the potential export growth of the LDC.

TROPICAL NONCOMPETING COMMODITIES (COFFEE, COCOA, TEA, BANANAS)

The import demand of the developed countries, or more specifically their quantity-price demand schedule, can be projected fairly accurately. If we assume a 10 per cent yearly demand growth in Eastern Europe,

[10] General Agreement on Trade and Tariffs [GATT], *International Trade 1966*, table 14, p. 45, Geneva 1967. (Study excludes Israel from LDC).

and if we use the high GDP assumption for the developed countries, the total import demand of high-income developed countries for coffee, cocoa, bananas, and tea, at constant prices, may not increase by much more than 2.5 per cent a year during the next decade. The remaining tariffs and special taxes in developed countries should be eliminated, but the impact of such measures will be small. The major problem is the price level.

The price elasticity of the import demand in the high-income countries is low. The long-term elasticity is somewhat higher than the short-term elasticity but nevertheless, measured at the import level, remains substantially lower than unity. Export earnings of LDC may therefore be raised by restricting supply; the coffee agreement is a case in point.

If, instead of restricting exports, Meade's proposal [11] had been applied, coffee prices might have fallen to half of their present level. To keep foreign exchange receipts of the coffee exporting countries at their present level, an income transfer of the order of one billion dollars a year would have been required. In the prevailing international context it is doubtful that the coffee-producing countries would have received one billion dollars in the form of untied grants in addition to the aid they receive today. In terms of foreign exchange the coffee countries have fared better so far with a policy of restricting supplies.

If, however, exports have been on the whole successfully controlled, the same does not apply to production. Many coffee-producing countries have accumulated useless stocks. The cost in terms of social opportunity of producing these surplus stocks was not negligible. For example, in Guatemala the cost of the imported fertilizer and pesticide applied on coffee can be valued at 3 million dollars *c.i.f.* Without pesticides and fertilizers coffee production would still have exceeded requirements. If output were restricted by acreage quota, the foreign-exchange loss in terms of fertilizers and pesticides would be higher.

The major problem arising from any price-raising scheme is its impact on production. The coffee surplus in the 1960's is largely due to the massive plantings of the early 1950's when prices reached peak levels. The free-market equilibrium in the 1960's would have led to very low prices, since in the short term a substantial curtailment of coffee production would have required a fall in prices below the variable production cost. A very low price in the 1960's could have generated a sharp price upswing in the second part of the 1970's.

[11] J. E. Meade, United Nations Conference on Trade and Development (UNCTAD), Geneva 1964, Proceedings, Vol. 3, Commodity Trade, The International Commodity Agreement, pp. 451–457.

As a means of raising LDC export earnings, an import levy scheme has considerably more appeal than a scheme based only on quantitative export restrictions. To break the cycle, the level of the import levy should be variable. However, in view of the lagged production response the introduction of an import levy scheme during the downward price swing would not permit dispensing with quotas during the initial years.

Let us assume that the price paid by the high-income countries is 30, and that, in a given year, 25 goes directly to the exporting countries and 5 to an international diversification fund. The proceeds collected from the import levy could then be redistributed to the coffee exporters in the form of grants to compensate the producing countries ready to accept a reduction in their export quota. A country with a high opportunity cost would, *a priori,* be more attracted by a grant of a given amount to reduce its export quota one ton, than a country with a very low opportunity cost.

To facilitate rational choice, a study of the relative opportunity costs would be needed. In addition to an analysis of the production costs of the specific commodities subject to an export quota (as carried out in the tripartite coffee study), a general economic survey of the country to assess opportunity costs would be required. For a country to produce so much of commodity A or commodity B in compliance with the directives of an international body of technocrats could be dangerous. But in practice the technocrats would only be asked to produce a study, of which the governments of the countries concerned could avail themselves in deciding whether to accept a quota reduction in exchange for a given grant. One could expect that a country with a high opportunity cost would be ready to give up part of its quota at a given price. The larger the resources of the international diversification fund, the greater would be the flexibility for revision of the quota.

Such grants might be given entirely or partly for specific projects. Within agriculture, the areas that would most often require particular investigation for such projects are livestock, feedstuffs, forestry industries, agricultural processing industries, and production of agricultural prerequisites. But there is no reason for excluding the manufacturing industry proper, if prospects are better there.

TROPICAL COMPETING COMMODITIES (SUGAR, OILS, AND OILCAKES)

Sugar and oils accounted in 1961–63 for 30 per cent of the LDC net export earnings derived from the commodities covered in the FAO study. From 1952–54 to 1961–63, net exports of sugar, oils, and oilcakes from the LDC to the rest of the world increased by about one

billion dollars. But the projections give a radically different picture; they suggest a reduction in the absolute level of the net import demand of the high-income countries.

Sugar. The reduction projected for the net importation of sugar into the high-income countries reflects the slackening of the growth of consumption in those countries as per capita intake gets nearer to the saturation level.

As shown in Table 5, the slowdown projected for the developed countries is the continuation of a trend that has already been very noticeable and would have been even more noticeable if figures had been expressed on a per capita basis. In Eastern Europe and the U.S.S.R. the slowdown projected is much more dramatic. The projected consumption level—halfway between the U.S. and the U.K. level—may be too low; however, for physiological reasons, the tremendous rate of consumption growth recorded during the last fifteen years is bound to decline sharply.

In brief, it does not seem that in high-income countries, sugar consumption could increase by much more than 2 per cent a year from 1965 to 1975. On the other hand, sugar production increased steadily by 5 per cent a year in those countries over the last fifteen years, and, from a technical point of view, production could still increase very substantially, mainly because of higher sugar yields. The net import require-

TABLE 5

Past and Projected Trends in the Consumption and Production of Sugar by Volume in High-Income Countries, 1951-75

(in percentage per annum compounded)

	1951-58	1958-65	1965-75
Consumption			
Developed countries	3.5	2.2	1.8
Eastern Europe, USSR	7.6	7.8	2.1
Total	4.4	3.8	1.9
Production			
Developed countries	4.2	4.6	2.8
Eastern Europe, USSR	6.5	5.9	2.7
Total	5.1	5.2	2.8

ments of high-income countries are therefore likely to decline unless there is a basic change in their production policy.

In the LDC gross exportable supplies could increase much more rapidly than gross import requirements. If imports of mainland China do not rise tremendously, a strong surplus situation is bound to prevail on the world sugar market. The burden of the adjustment would fall on the exporting countries, which would have to forego expansion and possibly cut their production, although they are as a rule low-cost producers. Prices do not play a useful role in the allocation of world resources devoted to sugar, because there are so many different prices for sugar. Most importing countries protect their domestic industries with guaranteed prices. Most exporting countries receive preferential prices in domestic or foreign markets for at least part of their production. Consequently, on the residual "free market," prices fluctuate very widely. From an average of 8.3 cents in 1963, prices on the free market fell to an average of 2 cents in 1965. Among agricultural products sugar probably offers the most striking example of resource misallocation at the world level.

Oils. Owing to the variety of products and end uses, projections for oils are very complex and uncertain. Nevertheless, contrary to past performance, the gross exports of high-income countries may increase as rapidly, if not more rapidly, than their gross imports. The reasons for this are as follows: On the demand side—for food uses—the increase in per capita consumption of all oils and fats will slow down, as in the case of sugar, with consumption even in Southern Europe approaching saturation by 1975—for nonfood uses—the competition from synthetics will increase. On the supply side, production of animal fats and soybean oil is bound to increase rapidly following the expansion projected for livestock production. For animal fats the link is obvious; for soybean oil it is explained by the fact that oil is a by-product of soybean cake in great demand for livestock feeding.

Among developed countries most of the increase projected for gross exports is accounted for by U.S. exports of soybean oil, while half of the increase in the gross imports of developed countries would be taken by Japan. For all LDC, the increase in gross exportable supplies (mainly from Africa, the Philippines, and Argentina) could be of the same order of magnitude as the increase in gross import requirements. However, in the past most of LDC exports went to the developed countries and very little to other developing countries. The projected deficit (half of it in India and Pakistan) may be filled partly by concessional soybean oil

sales, and the market for LDC with exportable supplies may be very small. In the absence of arrangements to promote trade between LDC the prospects for the developing countries with exportable supplies are not favorable unless the net import demand of the centrally planned countries increases greatly. For oilcakes however the prospects remain favorable.

AGRICULTURAL RAW MATERIALS (COTTON, JUTE, SIZAL, ABACA, RUBBER)

Between 1960 and 1965, the average unit value of LDC exports declined by about 20 per cent for this group of commodities, more than offsetting the increase in the volume of their exports. Prices have declined since 1965 and are expected to decline still further, with a resultant reduction in LDC export earnings. However, the slow expansion or decline projected for LDC exports of raw jute and cotton reflects partly the projected increase in their exports of textile goods. Taking rubber and raw fibers together with cotton and jute goods, export earnings of the LDC might increase slightly. The gain would be even more substantial if account were taken of the reduction of LDC import of textile goods from developed countries.

Among the remedies proposed to improve the competitive position of the natural products versus synthetics are: reduction of short-term fluctuations, research for new uses, and reduction of production costs. A number of experts argue that the production costs of natural rubber with high-yielding varieties could remain competitive with synthetic rubber. If it were possible to insure natural rubber producers of a minimum price five to ten years ahead, even at a substantially lower level of production than the present one, an insurance scheme to promote investment of high-yielding plantings might be considered. This might lead to a better allocation of resources between developed and developing countries in terms of alternative opportunity costs. However, the uncertainty about technological advance in synthetic rubber for the international community may be too great for setting a minimum price level five or ten years ahead.

Second Group of Commodities
(livestock, cereals, wood products and miscellaneous)

Developing countries have a net export surplus only for beef, coarse grains, and round woods. Only a limited number of LDC export these three commodities, and export is directed mainly to the market of the

high-income countries. These exports increased rapidly over the last decade and could continue to do so over the next.

Meat. If border trade, which is not accurately recorded, is excluded from consideration, the number of developing countries entering in the world market as significant exporters is small. More than 90 per cent of meat exports from the LDC originate in Argentina, Uruguay, Mexico, and part of East Africa. Of this meat more than 90 per cent is beef.

According to most livestock experts the main bottleneck encountered in increasing output in the developing countries is feed. Emphasis should therefore be placed on higher yield per animal rather than on larger herds. The key problem is how to increase production and improve the sanitary conditions. The possibility of expanding exports, however, depends greatly on the growth in domestic consumption. This growth is illustrated for Mexico, East Africa, and Argentina in Table 6.

In Mexico, beef consumption per capita is only one-fourth of the level prevailing today in Australia and the United States. To keep per capita consumption at its present level beef supplies in Mexico should rise by 3.5 per cent per year. To allow for the increase in per capita demand generated by higher personal income, supplies should rise by 5.3 per cent per year. Such a rate appears enormous as compared with past performances of countries with a dynamic livestock economy. Thus, in Australia and New Zealand, beef production increased on an average only 3.4 per cent per year during the decade 1951–53 to 1961–63. This rapid increase took place as a result of large investments stimulated by the favorable prospects on the world beef market. During the same decade the production record of 5 per cent growth per year was held by the Common Market countries. But this was achieved only by using up a large part of the existing calf reserves.

In East Africa the situation is somewhat more favorable than in Mexico because population is expected to increase by only 2.2 per cent instead of 3.5 per cent a year. Nevertheless, total domestic demand is projected to increase by almost 4 per cent per year at constant prices. A substantial increase in exportable supplies could be achieved only if the control of animal diseases were coupled with a policy of high beef prices to reduce the increase projected for the domestic demand as well as stimulate local production. At present more than 80 per cent of East African meat exports consist of canned meat, because their chilled meat or live animals are generally unable to meet the strict health requirements of most of the importing countries. Since most meat-exporting countries use only the low cuts for canning, price for canned meat will remain low

TABLE 6

Beef and Veal: Trade and Domestic Consumption in Selected Countries

	1961-63			1962-75 Projected Annual Growth in Domestic Demand (per cent)		
	Exports (thousands of metric tons)	Trade/ Production Ratio (as percentage)	Annual Per Capita Consumption (kilograms)	Population Effect	Income Effect	Total
LDC						
Argentina	606	25	85	1.6	0	1.6
Uruguay	72	24	85	1.2	0	1.2
Mexico	75	14	12	3.5	1.8	5.3
East Africa	74	10	9	2.2	1.9	4.1
Developed countries						
United States	-715	10	44	1.4	1.0	2.4
Australia	358	42	45	1.7	0	1.7
All	-622	4	24	1.1	1.5	2.6

Source: See Table 3.

on the world market. As long as East African exports remain restricted to canned meat, the export sector will not provide the necessary price incentive to build up a dynamic livestock industry. But if animal diseases could be controlled through large-scale eradication programs, the export sector could be oriented toward the chilled beef market and could offer to local producers the high prices needed to expand production rapidly. A large fraction of the high cuts of beef could thus be exported; and with the price differential, domestic consumption would be reoriented to low cuts of beef and other types of meat.

In Argentina and Uruguay per capita beef consumption today is almost twice as high as in Australia or the United States. There does not appear to be any need for increasing this exceptionally high level of consumption. Population growth is relatively low: 1.6 per cent per year in Argentina and only 1.2 per cent in Uruguay. To maintain per capita domestic consumption and total exports in Argentina and Uruguay at the 1961–63 level would therefore require a yearly increase of only 1.3 per cent in domestic production between 1962 and 1975. Therefore, if a policy of high beef prices aiming at restricting consumption and stimulating production were politically acceptable in Argentina and Uruguay, these countries could increase considerably the volume of their beef exportable supplies. On the demand side, part of the reduction in domestic beef consumption could be compensated by an increase in the consumption of poultry and of pork, both of which are low at present. On the supply side, with the existing natural resources and high beef prices to producers, production might perhaps rise at rates comparable to those recorded in Australia. But the complete elimination of the foot and mouth disease is essential, if Argentine beef is to enter the U.S. market.

Only a few developing countries are expected to enter the world market as significant exporters over the next decade. In most cases, output will lag behind demand; but only in those countries with adequate foreign exchange reserves—the oil countries in particular—will this potential meat deficit materialize into an effective import demand.

Cereals. The LDC have been rapidly increasing their exports of coarse grains (maize and sorghum) to high-income countries. Argentina has kept the lead, but the emergence of Thailand as an important exporter to Japan and the recent increase in the exports from Mexico and Brazil are interesting features. Further expansion of LDC exports in the next decade and entrance of additional countries, in particular Kenya, Uganda, Tanzania, and Indonesia into the world market is quite possible.

The prospects are less favorable for wheat, since, with the important exception of Japan, the import demand of most high-income countries may shrink during the next decade. Argentina, which is a low-cost producer, is the only significant exporter among the LDC today. Some other countries could increase their production sufficiently to export—Mexico is a case in point—but at a cost generally higher than for the traditional high-income exporters.

The development that recently attracted world attention was not the increase in exports of maize and sorghum from a few developing countries but the increase in wheat imports to the LDC. This rapid rise in imports, at a time when the U.S. surplus stocks disappeared, caused concern. Some economists predicted an over-all world cereal shortage in the near future. The projections, however, do not support this alarming view.

Under the assumptions made in the FAO projections, the increase in the net exportable supplies from the high-income countries could cover the increasing deficit of the LDC, if net imports into China were to remain at about their present level. But this projected increase is far from representing the maximum cereals surplus that could technically be mobilized in the high-income countries. If all available cereal land in North America and Australia were put into cultivation, the exportable supplies of the high-income countries could increase by a further 50 million tons by 1975. Therefore, unless these figures are completely off the mark, by 1975 the high-income countries would still have the physical capacity to fill the cereals gap [12] of the developing countries, even with the most pessimistic assumptions as to the growth of cereal production in those countries during the next decade.

The same conclusion was reached in a recent study [13] of the USDA. The study was based on four assumptions regarding the growth of cereal production in the LDC. The most pessimistic extrapolation over the 1965–80 period of the trend recorded between 1954 and 1966 gave an increase of 20 million tons in LDC net imports. But it was estimated that, if acreage restrictions were discontinued in the United States, the U.S. exportable supplies would rise by 70 million tons between 1965 and 1980. The combination of the two would result in a world surplus of 30 million tons.

It seems, therefore, that for the developed countries with a reserve potential, in particular the United States, the problem in the next decade

[12] Defined as the economic demand and *not* the difference between nutritionally desirable consumption levels and domestic availabilities.

[13] "World Food Situation."

will remain management of supplies. A sufficient reserve stock should be maintained to avoid temporary shortages, since it is not possible to project the net grain deficit of the developing countries with the accuracy required for operational purposes.

The margin of error involved in projecting the net cereals deficit of the LDC is illustrated by the range of projections corresponding to the varying assumptions in the FAO and in the USDA studies. In the FAO study the net deficit of 10 million tons in 1961–63 could either disappear or increase to 25 million tons by 1975, depending on whether the assumption is optimistic or pessimistic. In the USDA study the projected net deficit of the LDC ranges from 6 to 39 million tons in 1980. This wide margin reflects the marginal character of the net deficit (4 per cent of total LDC production in 1961–63), the uncertainty regarding the rate of adoption of improved techniques, and the impact of government policies (price and food aid policies in particular) on production in the LDC.

In regard to the marginal character of the deficit, a difference of 10 million tons in the projection for 1975 under the high FAO assumption would correspond to the difference between an average production growth of 2.7 and 2.5 per cent a year in the LDC, for a given level of demand. Anyone familiar with agricultural statistics in the LDC will recognize that a difference of 0.2 per cent is within the margin of error of the estimation of past trends; it is well within the margin of error of any projection.

Wood-products and miscellaneous. The prospects for exports from LDC to high-income countries are good for round wood and wood panels and for oilcakes, fishmeal, and a variety of miscellaneous items such as off-season fruits and vegetables and various tropical fruits still largely unknown on Western markets. The small miscellaneous items are often those with the most dynamic growth, but none is important enough at present to merit a review of its prospects in a paper of this scope.

MAJOR EXPORT MARKETS FOR THE LDC

In the following section we will analyze the prospects for agricultural exports of LDC by main areas of destination.

Developed Countries with Market Economies

Taking all agricultural products together, developed countries import from the rest of the world more than they export. Their net imports—

TABLE 7

Trends in the Volume[a] of Gross Agricultural Imports and Exports 1952-54 to 1961-63 for Developed and Developing Countries

(average percentage per annum compounded)

	Developed Countries with Market Economies			LDC		
	Gross Imports	Gross Exports	Net Imports	Gross Imports	Gross Exports	Net Exports
All Agric. Commodities	3.3	5.5	1.1	5.3	3.4	2.4
Food & feed	4.5	6.1	-.1	5.8	3.9	-.1
Tropical beverages	3.5	1.4	3.5	5.2	3.7	3.6
Agric. raw material	1.8	4.0	-.4	3.4	2.9	2.8

Source: *Agricultural Commodities Projections 1975 Vol. II*, table III.9, p. 306, Rome, 1967.

[a]Weighted at 1961-63 prices.

excess of gross imports over gross exports—increased very slowly in the postwar period. This is illustrated in Table 7 showing the trends in the volume of trade between 1952–54 and 1961–63. During that period, gross agricultural exports from developed countries increased rapidly (5.5 per cent a year). Gross imports into these countries, despite the intensification of intraeuropean trade, progressed more slowly (3.3 per cent a year) reflecting an apparent elasticity of 0.8 in relation to GDP. Net imports into developed countries from the rest of the world increased, in volume terms, by only 1 per cent a year for all agricultural products, by 3.5 per cent for coffee, cocoa, and tea under the stimulation of declining prices, and by 1 per cent for sugar, oils, and oilseeds; for agricultural raw materials, net imports declined slightly.

An accurate picture of the imports into developed countries from developing countries can be derived from the UN trade data systematically recorded in recent years by origin and destination. The trends over the period 1960–65 are illustrated in Table 8 for the main commodity groups.

TABLE 8

Trends in Gross Imports from LDC to the Rest of the World, 1960-65

(average percentage per annum compounded[a])

	World Outside LDC-Current Value				Developed Countries With Market Economies-Volume			
	All Countries	Developed Countries	E. Eur./ U.S.S.R.	Asian Communist Countries	All Countries	North America	Western Europe	Japan
All commodities	7.0	6.4	13.7	12.7	6.4	3.9	6.5	13.8
Agricultural commodities	3.6	2.3	12.0	14.5	2.3	0.1	2.4	9.0
Temperate food	6.0	6.6	26.0	37.0	3.7	4.2	2.2	16.8
Competing food		0.6			-0.5	-0.3	1.0	3.4
Noncompeting food and beverages	3.4	2.8	13.7	38.0	2.8	0.4	4.0	32.0
Raw material	0.4	-0.5	4.1	4.2	2.7	1.7	1.7	7.1
Nonagricultural commodities	10.5	10.3	27.0	-0.2	10.1	7.0	10.9	18.0
Mineral other than fuel	5.6	5.4	21.0	0	2.4	0.3	1.3	10.4
Fuels	10.7	10.7	–	–	11.5	5.7	13.7	23.0
Manufactured gas	19.4	19.2	30.0	-0.2	19.2	19.5	18.8	46.0

Source: Data derived from internal IBRD paper prepared by B. Balassa.

[a]Computed From ratio between terminal years.

The rapid economic expansion of the developed countries during the first half of the 1960's led to a remarkable expansion of their imports from LDC. But the high rate of growth of gross exports from LDC to the developed countries (6.4 per cent a year) between 1960 and 1965 resulted from the combination of two different developments: a very fast increase in the volume of nonagricultural exports (10 per cent a year) and a slow expansion in the volume of agricultural exports (2.3 per cent a year). The impact of GDP growth in developed countries on their import demand from LDC can be expressed in two components: the population effect (1.2 per cent a year) and the income effect measured by the elasticity of imports per capita relative to GDP per capita. The apparent income elasticity thus calculated on a per capita basis amounts to barely one third for agricultural commodities, compared with two and a half for nonagricultural commodities.

The growth of agricultural imports into developed countries during the first half of the 1960's is compared in Table 9 with the FAO growth projections for 1970. In this study, the projections were confined to exports of tropical food and beverages and agricultural raw materials from the LDC to the developed countries. Exports of temperate-zone food (cereals and livestocks) were not included because *en bloc* the LDC are a net importer for this group of products. The average unit value of LDC agricultural exports did not show much change between 1960 and 1965, and the actual GDP growth of the developed countries in this period was close to that of the high-income assumption (5 per cent a year). Therefore, in Table 9 the annual percentage growth in the volume of imports from 1960 to 1965 was compared to the average percentage growth projected under the high-income assumption without any adjustment.

The trends recorded between 1960 and 1965 are well in line with those projected under the high assumption. The most important discrepancies appearing in Table 9 are for sugar and oils in the commodities group, and North America in the importing areas group. However, the declines recorded between 1960 and 1965 under these two headings reflect the 22 per cent reduction in the volume of U.S. sugar imports from LDC associated with the Cuban crisis. This reduction, due to particular circumstances, does not provide a basis for extrapolation over a twelve-year period. If the volume of U.S. sugar imports had remained constant between 1960 and 1965, most of the discrepancy would have been removed (see note Table 9).

Since 1965, the rate of economic expansion of the developed countries has been slackening and this has been reflected in a reduction in the

TABLE 9

Growth of Volume Imports to Developed Countries from LDC of Tropical Food and Beverages and Agricultural Raw Materials; Comparison of FAO Projections for 1970 and Actual, 1960-65

	FAO Projections 1958-70 (high GDP assumption)		Actual 1960-65
	Index 1970 (1957-58 = 100)	Per Cent Per Year Compounded	Per Cent Per Year Compounded
By commodity group			
Sugar, oils, oilseeds	102	0.2	-1.0[a]
Coffee, cocoa, tea	136	2.6	2.5
Agricultural raw materials	138	2.7	2.7
Total (including citrus)	127	2.0	1.75[a]
By importing area			
North America	116	1.2	-.2[a]
Western Europe	123	1.75	2.1
Japan	175	4.8	6.4
Total (including Oceania)	127	2.0	1.75[a]

Source: Index 1970 – *FAO Commodity Projections for 1970,* table 17 p. 1–35, Rome, March 1962; percentages for 1958-70 derived from index projections; percentages for 1960–65 from unpublished IBRD study by B. Balassa.

[a]If the volume of U.S. sugar imports from LDC had been the same in 1965 as in 1960, -1.0 for sugar and oils would have been replaced by +.4, 1.75 for the total by 2.1, and -.2 for North America by +.8

growth of their imports from the LDC. In the second half of the 1960's the growth in the developed countries might therefore be closer to the low than to the high assumption in the 1970 projection (low, 3.9 per cent; high, 5 per cent).

The 1970 projections of the import demand in developed countries for the agricultural products of developing countries were considered gloomy at this time. The analysis carried out in 1966–67 for the preparation of the 1975 projections did not give a more favorable picture. This pessimistic view resulted from a combination of four main factors in the

developed countries: (1) slackening in the rate of population growth; (2) per capita consumption moving toward saturation for sugar, oils and fats, and tropical beverages; (3) increasing replacement of agricultural raw material by synthetics; and (4) continued tendency for food output to increase faster than demand for food.

In developed countries food consumption—valued at farm prices—is projected to increase by 1.7 to 1.9 per cent a year. Food production increased on the average by 2.5 per cent a year since 1950, the rate of growth showing no sign of slackening towards the end of the period. Food production is therefore likely to move ahead of food consumption in developed countries, and maintaining income parity between farm and nonfarm occupations will remain a major problem. Since the share of purchased inputs in gross food output will continue to increase, the value added by the agricultural sector is not expected to show much progress. Consequently, much of the improvement in per capita farm income will have to come from further reductions in the size of the farm labor force.

In this context reducing domestic production (that of sugar beets for example) substantially to allow for larger imports from LDC will be politically difficult. Moreover, with the increasing flexibility in the production pattern, restricting production of one commodity may stimulate production of others with a consequent reduction in imports of the latter.

On the whole, the FAO projections for 1975 give an unfavorable picture.[14] Excluding wheat, dairy products, and forestry products, for which LDC are, and will remain, major net importers, the net import demand in developed countries for agricultural products (coarse grains, feedingstuff, and meat included) of undeveloped countries is not projected to rise by more than 2 per cent a year even under the high-income assumption. This represents a significant slowdown in relation to past trends.

The price of tropical noncompeting food and beverages could be maintained and in some cases improved by appropriate international action, but such action would in all likelihood be more than offset by the decline in the price of agricultural raw materials. On the whole, the margin for maneuver appears rather limited.

The decline in the growth of net agricultural exports from developing to developed countries partly reflects the increasing disparity between these two groups of countries in respect to agricultural land available per

[14] The main agricultural products not included in the FAO trade projections for 1975 are: starchy roots, pulses, vegetables, fruits other than bananas and citrus, and fish.

capita. The following figures quoted by Kristensen [15] in this regard are quite impressive. In 1965 there was, on the average, twelve times the agricultural land per head of the agricultural population in the developed countries that there was in the Far East (excluding mainland China). In the year 2000, the corresponding ratio could be 50 to 1, that is four times that of today. Kristensen notes that a sharp reduction in the size of agricultural holdings will not facilitate the adoption of modern technology, and he stresses the need for a modification of the traditional trade pattern between developed and developing countries.

Socialist Countries

Agricultural exports from the LDC to countries with centrally planned economies increased very rapidly in the first half of the 1960's. Between 1960 and 1965 this flow of trade to Eastern Europe and the U.S.S.R. increased by 12 per cent a year and that to mainland China increased even more rapidly (see Table 8). It is very difficult to make any forecast for mainland China, but there are good reasons to believe that the 12 per cent yearly rate of growth registered by Eastern Europe and the U.S.S.R. in the past will be very substantially reduced during the next decade.

Agricultural imports from LDC to Eastern Europe and the U.S.S.R. comprised two major groups: basic foods and agricultural raw materials, which accounted for $650 million each in 1965, and tropical fruits and beverages, accounting for only $240 million. The very rapid increase in basic food imports during the first half of the 1960's was heavily weighted by the large sugar imports from Cuba. This is a one-time effect that should not be extrapolated. For agricultural raw materials, imports increased only by 4 per cent a year between 1960 and 1965, and future growth is uncertain. In 1965, production of synthetics in the U.S.S.R. was surprisingly low, reaching only half of the U.K. output. The production of synthetics may increase sharply during the next decade. Because of the heavy emphasis placed on petrochemical synthetics such an increase might further reduce import needs for natural products in this sector. The past rate of import growth could be maintained only for noncompeting food and beverages—per capita consumption remaining very low. But in 1965 noncompeting tropical food and beverages accounted for only 15 per cent of agricultural imports to Eastern Europe and the U.S.S.R. from LDC.

[15] Organization for Economic Cooperation and Development [OECD] *The Food Problem of the LDC*, 1967, Chapter 4.

Developing Countries

Since the possibilities of expanding LDC agricultural exports to high-income countries are severely limited, it is of particular importance to investigate the scope for expanding trade between the developing countries themselves. Today, about one-third of LDC food exports (including beverages and tobacco—sections 0, 1 and 4 and division 22) goes to other developing countries. After a period of stagnation during the 1950's, this flow of trade expanded substantially in the 1960's. From 1961 to 1965 LDC food exports to other developing countries increased in percentage terms more rapidly than LDC food exports to the rest of the world.

The expansion of agricultural trade between the LDC raises questions on both the demand and supply sides of the trade picture. First, how fast are LDC import needs likely to rise, and which part of these needs could materialize in an effective demand? Second, could the exportable supplies of the needed commodities increase rapidly enough in a number of developing countries to allow for the expansion of such intratrade in addition to LDC agricultural exports to high income countries?

On the demand side, the needs for agricultural imports are bound to increase more rapidly in the LDC than in the high-income countries. As previously noted, between 1952–54 and 1961–63, gross agricultural imports into the LDC increased on the average by 5.3 per cent a year. During the same period the volume of gross agricultural imports into developed countries increased by only 3.3 per cent a year, and this was due in part to a rapid expansion of intraeuropean trade. During the first half of the 1960's, despite an exceptionally high rate of economic growth, gross agricultural imports into developed countries from developing countries increased by only 2.3 per cent a year.

During the next two decades population will increase twice as fast in the developing than in the high-income countries and per capita consumption of most commodities will remain far from saturated. Demand for food valued at producer prices is projected to increase twice as fast in the LDC as in the high-income countries. Urbanization will be the key factor in the increase in LDC food imports. Between 1962 and 1985, the urban population might increase by 580 million in the developing countries (excluding mainland China) as compared with only 140 million in the developed countries. The urban population of the developing countries, which was smaller than that of the developed countries in 1962, would be 70 per cent larger in 1985.

In view of the differences in natural endowment, it would be uneconomical for each developing country to aim at self-sufficiency. If food aid is not used indiscriminately, these import needs should largely materialize in a commercial demand. Among developed countries with market economies the most rapid increases in food imports in recent years have been recorded in southern Europe and Japan. On the basis of the high FAO income assumption, thirty developing countries will reach or exceed by 1985 the average income level recorded for southern Europe and Japan in 1960. The high FAO income assumption is certainly optimistic, but the dispersion in the rates of growth between countries will be much wider than assumed in the FAO study. Preliminary estimates indicate that in 1966 at least fifteen developing countries with a per capita GNP ranging from $200 to $600 have recorded a rate of growth higher than 5 per cent.

On the supply side, the availability of exportable supplies from developing countries is not as easy to predict. It is sometimes argued that developing countries are in the position of having mainly cocoa and coffee surpluses to offer to other developing countries that have little need for them. The actual situation, however, is quite different, as illustrated in Table 10.

The scope for cereal trade between developing countries may be smaller than suggested by the figures in the table, because a large part of the import requirements would be for food grains and a large part of the exportable supplies in the form of feed grains. But for oils, sugar, and tea the scope is very substantial. There is also scope for expanding meat trade between bordering countries. West Africa, where more cattle could be exported from the savannah zone to feed the rapidly growing urban population of the coastal countries, provides an example.

The greatest scope for expanding trade between developing countries might be in processed and manufactured products. For example the largest potential market for cotton textiles is certainly in the developing countries themselves. Notwithstanding this, a modern textile industry already established in several such countries continues underutilized. The same is true of fertilizers and pulp and paper, for which a demand exists in developing countries. With fast-growing species of trees in semitropical climates, several developing countries have the natural resources to expand production considerably. In many cases production costs could be kept low if the size of the mill were large enough. This is true in Chile, for example. In 1962 that country had one integrated Kraft paper mill (sulphate pulp) producing 60,000 tons a year. Half of this production was sufficient for the needs of the domestic market; the other half was

TABLE 10

Projected Expansion of LDC Gross Imports and Exports[a] for Selected Commodities, 1962-75, Under Two GDP Hypotheses

(millions of metric tons)

	Import Needs			Export Availabilities		
	1961-63	Increase 1962-75		1961-63	Increase 1962-75	
		Low GDP	High GDP		Low GDP	High GDP
Cereals	22.0	28.0	6.0	13.0	13.0	16.0
Oils (fat content)	0.8	1.8	1.5	3.2	1.3	2.3
Sugar (centrifugal)	3.4	0.5	0.3	13.3	2.1	8.2
Tea	0.13	0.06	0.08	0.52	0.26	0.23

Source: See Table 3.

[a]Gross imports is defined as the difference between total consumption and total production in the developing/importing countries. Gross exports is defined as the difference between total production and total consumption in the developing/exporting countries.

exported. If the capacity of the mill had to be limited to the domestic market, the capital investment per ton produced would have been almost twice as high. Tripling the capacity of the mill to reach a production of 180,000 tons—at present under consideration—would almost halve the capital investment per ton. Since only eleven developing countries have a GDP equal to or higher than that of Chile, a policy of self-sufficiency for pulp and paper in most developing countries would be the negation of efficiency.

According to OECD estimates,[16] developing countries would require by 1980 $5 billion foreign exchange for fertilizers (in the form of products or raw materials) compared with $870 million in 1964–65. Some developing countries with oil resources are in an ideal condition to take advantage of this rapidly expanding market. The raw material to produce ammonia could be obtained at a very low cost from gas which is often just burned; energy would be cheap and foreign exchange available to import the machinery. Here too, as with pulp and paper, economies of scale are very important. By international standards an efficient ammonia plant should produce at least 200,000 tons a year in terms of nitrogen; this corresponds to half the consumption of Africa and one-third of the consumption of India in 1966. Some of the oil-rich countries of the Arabian peninsula could make a most useful contribution to agricultural development by providing cheap ammonia to other developing countries less favored by nature, receiving from them in return food or manufactured goods (for example, meat from East Africa, irrigation pumps from India, etc.).

In the manufacturing field a number of developing countries—including some that are relatively highly industrialized such as India, Brazil, Argentina, and Mexico—seem to have reached the economical limit of import substitution within their national boundaries. An expansion of trade between developing countries is a way of reducing the disadvantages of national policies of self-sufficiency. The foregoing discussion suggests that agricultural products in the raw or processed form could play an important role in the expansion of the trade between developing countries. The gain would result not so much from the comparative advantages in the Ricardian sense, as from economies of scale and from not having to maintain inefficient industries under high protection.

Fortunately, the importance of trade between developing countries seems to be progressively more recognized. During the first UNCTAD conference in 1963, this problem did not raise any interest and was quickly disposed of. But the Algiers charter, adopted by seventy-seven

[16] OECD, *Supply and Demand prospects for Chemical Fertilizers,* Preliminary Report, April 1967.

countries in October 1967 in preparation for UNCTAD II, devotes an important section to the problem of trade expansion between LDC. One can also discern an evolution in the attitudes of developed countries and international agencies, such as GATT and IMF in favor of preferential trade arrangements between developing countries. This change in attitudes has already been reflected in the actual trade pattern. The trade between developing countries, which remained rather stagnant in the 1950's, increased during the first half of the 1960's by 6.3 per cent a year, that is, as rapidly as exports from the LDC to developed countries.

AGRICULTURAL EXPORTS WITHIN THE OVER-ALL EXPORT PROSPECTS FOR THE LDC

To assess the implications of the LDC export prospects for agricultural products, it is useful to refer to the UNCTAD projections for 1975. As previously noted, these projections for agricultural products were based largely on the FAO study. To integrate the findings of the FAO study in the UNCTAD projection model, a number of adjustments had to be made, however.

The UNCTAD projections of LDC exports for the period 1960–75 are summarized in Table 11 by main destinations and commodity groups. For some of the aggregates an attempt has been made to break up the fifteen-year projection period given by the UNCTAD into two subperiods, 1960–65 and 1965–75, on the basis of the IBRD data for the single years 1960 and 1965. This breakdown is presented in Table 12, with due warning as to the limitations of the exercise.

Tables 11 and 12 suggest that from 1965 to 1975 the rate of growth of LDC exports to the three main groups of countries should not differ widely. This reflects the considerable implied reduction in the growth rate of export to socialist countries in relation to 1960–65. This has to be interpreted with great caution in view of the limited knowledge regarding future economic policies in these countries, mainland China in particular. Regarding agricultural products, the lowest rate of import growth should be for the developed countries with market economies, and the highest for socialist countries. In view of the very rapid increase in exports of manufactures from LDC during the first half of the 1960's, the projections implied for 1965–75 may appear conservative. Moreover, the average export unit value of agricultural products may decline in relation to nonagricultural products. These two considerations suggest

TABLE 11

Projected Growth of LDC Volume[a] Exports, 1960-75, According to Two GDP Assumptions

(percentage per annum compounded)

	All Countries		Developed Countries		Socialist Countries		LDC	
	Low	High	Low	High	Low	High	Low	High
All commodities	5.0	5.6	5.1	5.5	6.5	8.2	4.6	5.5
Agricultural	2.45	3.1	1.8	2.2	5.6	7.4	3.6	4.6
Food and beverages	2.8	3.5	2.2	2.5	9.4	11.5	4.0	5.2
Agricultural raw materials	1.6	2.3	1.0	1.6	2.4	3.5	2.9	3.4
Nonagricultural	7.1	7.6	7.6	8.0	11.8	13.0	5.2	6.0
Minerals other than fuels	4.3	4.8	4.0	4.6	7.9	8.7	7.1	7.8
Fuels	7.5	8.0	8.8	9.2	–	–	3.9	4.4
Manufactured goods	8.3	9.3	8.7	9.4	14.2	15.6	7.0	8.4

Source: United Nations, Conference on Trade and Development, *General Survey of Trade Prospects and Capital Needs for Developing Countries*, table II, 3. (to be published).

[a]Weighted at 1960 constant prices.

TABLE 12

Projection Period in Table 11 Broken into Two Subperiods – Developed Countries Only

	1960-75[a]			1965-75[c]	
	Low	High	1960-65[b]	Low	High
All commodities	5.1	5.5	6.4	4.5	5.2
Agricultural commodities	1.8	2.2	2.3	1.6	2.2
Food and beverage	2.2	2.5	2.1	2.4	2.7
Agricultural raw materials	1.0	1.6	2.7	0.4	1.3
Nonagricultural commodities	7.6	8.0	10.1	6.3	7.0

[a]See Table 11.
[b]From Bela Balassa, "Economic Growth, Trade and the Balance of Payments in LDC, 1960-65" (unpublished).
[c]Computed by difference.

that the share of agricultural products in the total might be lower, rather than higher, than indicated. Such considerations fall outside the scope of this paper, however, and the UNCTAD projections will be used to analyze the changes in the export pattern of the LDC.

The modification in the commodity composition of LDC exports on the basis of the UNCTAD projections is shown in Table 13. The modifications are the most pronounced for exports from developing to developed countries. In this particular flow of trade the most striking feature is the evolution of the relative share of agricultural products and of petroleum. The share of agricultural products was about three times that of petroleum in 1950. In 1960 the ratio had fallen to two to one. By 1965 agricultural products exceeded petroleum by less than 40 per cent. In 1975 earnings derived from all agricultural products exported from developing to developed countries are projected at only half of those derived from petroleum. During the first half of the 1960's the increment in export earnings of LDC derived from petroleum was almost three times that derived from all agricultural products. By 1975 the ratio might be five to one.

A reduction of the share of agricultural products in the export earnings of LDC has two important effects:

The first effect is to increase the outflow of investment income as a percentage of the total LDC export earnings. Factor income payments

TABLE 13

Projected Percentage Breakdown of LDC Volume Exports by Commodity Groups, 1960-75, According to Two GDP Assumptions

(volume weighted at 1960 prices)

	All Destinations					Developed Countries				
	1960	1975		Increment 1960-75		1960	1975		Increment 1960-75	
		Low	High	Low	High		Low	High	Low	High
Agricultural commodities	52	36	37	21	25	53	33	33	15	17
Fuels	27	39	38	51	47	26	43	43	59	57
Minerals other than fuels	12	11	10	10	9	15	13	13	11	11
Manufactured Goods	9	14	15	18	19	6	11	11	15	15
Total	100	100	100	100	100	100	100	100	100	100

Source: See Table 11.

generated from an increase in LDC agricultural exports are insignificant; they are limited to some foreign-owned plantations. But the factor income payments outflow resulting from an increase in petroleum exports is large. The outflow is substantial for minerals other than fuels and may not be negligible for manufactured export goods (Hong Kong is an example).

The second effect is to increase the factor of inequality in the distribution of export earnings among the LDC. Almost every developing country has an agricultural sector, and most are in a position to export some agricultural products. This is not the case with petroleum. In 1965 a few oil-exporting countries, which together had only 1.5 per cent of the total LDC population, accounted for about one-fourth of the total LDC export earnings. Likewise, exports of minerals other than fuels are not very widely spread among developing countries, although the concentration is much less pronounced than for petroleum. In future decades the rapid expansion of manufactures exports may be in favor of countries with large population. In the past, however, the picture was different. Between 1953 and 1965 LDC exports of manufactures increased by 170 per cent.[17] One-fourth of the increase went to Hong Kong, and another 15 per cent to Taiwan and South Korea. Between 1953 and 1965 the absolute increase in manufactures exports from Hong Kong was two and a half times that of exports from India.

This widening factor of inequality of export earnings among the LDC between 1950 and 1965 can be seen from Table 14 and Figure 1. The developing countries were ranked according to their level of export earnings per capita for a given year. The first line of Table 14 shows that in 1950 10 per cent of the population of the LDC received 50 per cent of their export earnings, while at the other end, only 10 per cent of the earnings went to 45 per cent of the population. The inequality factor in the distribution also increased steadily from 1950 to 1965. Thus in 1965, as shown in the fourth line, only 7 per cent of the population received half of the earnings (compared with 10 per cent in 1950), while at the other end 57 per cent shared only one-tenth of the earnings (compared with 45 per cent in 1950). If all the typical oil countries, as well as Hong Kong and Singapore are excluded, the picture is a bit more favorable, but the trend is the same, as shown in lines five and six. The fraction of the total population receiving only 20 per cent of the earnings increased from 58 per cent in 1950 to 66 per cent in 1965. It is worth noting that during that period the reverse occurred among the developed countries: there was less disparity in distribution in 1965 than in 1950.

[17] *International Trade 1966*, table 19, p. 56.

TABLE 14

Cumulative Export Earnings Progressively Related to Portion of Population Receiving Them: Developing and Developed Countries with Market Economies 1950-65[a]

	Cumulative Percentage of Total Population Receiving the Following Cumulative Percentages of Export Earnings:								
	20	30	40	50	60	70	80	90	100
All developing countries									
1950	1.0	1.9	4.8	10.0	16.3	23.2	35.0	54.8	100.0
1955	0.7	1.7	3.8	8.3	14.0	21.5	31.2	48.8	100.0
1960	0.6	1.1	3.1	7.1	12.6	20.1	29.7	46.6	100.0
1965	0.9	1.2	3.5	6.9	11.3	18.7	27.9	42.7	100.0
Selected developing countries[b]									
1950	3.1	6.4	10.8	16.1	21.9	30.3	41.8	60.9	100.0
1965	2.9	5.1	8.8	13.7	19.1	26.0	34.4	59.4	100.0
Developed countries									
1950	5.9	10.1	14.8	21.2	29.4	37.7	48.1	61.2	100.0
1965	6.8	11.7	18.1	25.0	32.8	43.9	57.0	69.7	100.0

[a]Computation based on three-year average centered in the year indicated.

[b]Minus major oil exporters–Kuwait, Netherlands Antilles, Libya, Trinidad, Brunei, Venezuela, Iraq, and Iran; major reexporting centers–Singapore, Aden, Hong Kong, and Israel.

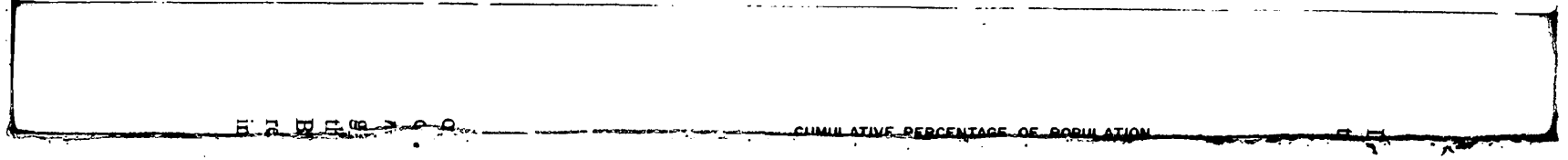
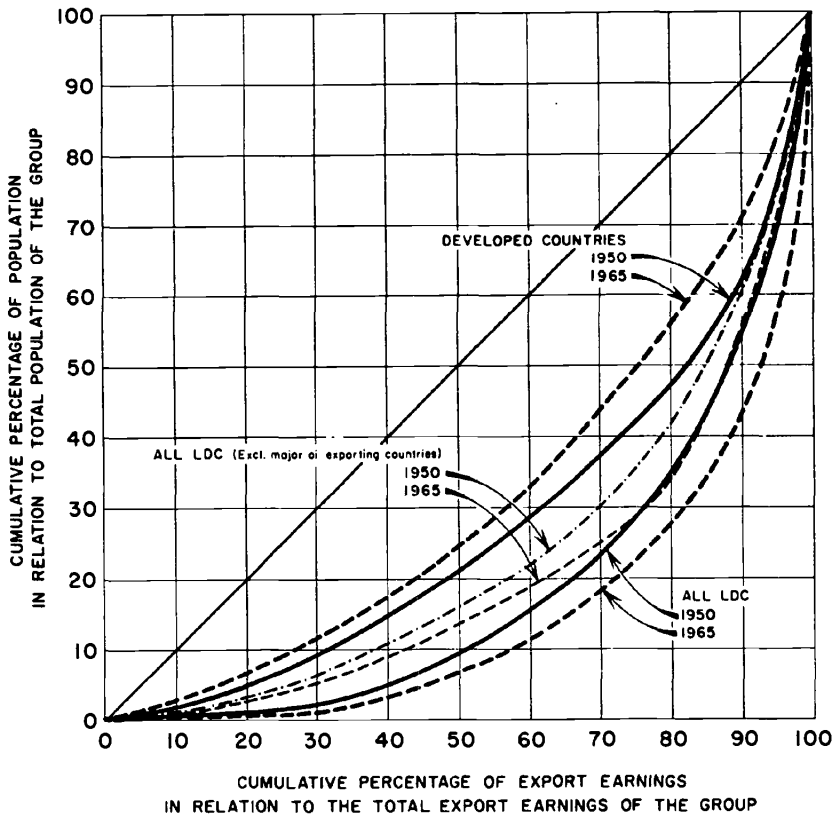


Figure 1

Lorenz Curve Illustrating Changes from 1950 to 1965 in the Distribution of Export Earnings by Countries in Relation to their Population



Note: Based on dat in Table 14

The combination of these two effects—greater percentage of outflow of investment income and a wider factor of inequality in the distribution of income among countries—together with the unfavorable growth of the *net* capital inflow go a long way to explain why, despite a higher export growth in the first half of the 1960's compared with the second half of the 1950's, the average rate of economic growth of the LDC declined. Between 1958–60 and 1964–66 the export-import gap of all LDC was reduced by 1 billion dollars. But this over-all reduction concealed an increase of 2.4 billion dollars in the export-import surplus of the develop-

ing countries exporting petroleum and an increase of 1.4 billion dollars in the export-import deficit of the other developing countries.

ANNEX I

Impact of Urbanization on the Accuracy of Demand Projections Based on National Averages

In many developing countries, particularly Africa, the rural/urban disparity in per capita income is considerable, and urbanization proceeds at a rapid pace. As a result, the growth rate of the national per capita income is substantially higher than the weighted average of the urban and rural rates. Let us consider a country in which per capita income is three times higher in the urban than in the rural sector and total population, of which 15 per cent is initially urban, increases by 2.5 per cent a year. If per capita income rises by 2 per cent a year both in the urban and in the rural sectors, over a ten-year period the average per capita national income will rise by 2.6 per cent a year. The difference between 2.6 and 2 per cent is explained by the shift into a higher income bracket of the rural population that migrates into urban areas.

Similarly, for a given commodity the growth rate of per capita consumption for the country as a whole will be higher than the weighted average of the sectoral growth rates if the per capita consumption level projected for that commodity is higher for the urban than for the rural sector or vice versa.[18] Whether the weighted average of the sectoral elasticities will be biased and in which direction, depends, therefore, on the relative income and consumption patterns in the urban and rural sectors. Those can be analyzed from nationwide household surveys.

If the same demand function can be fitted to the urban and the rural population, there is no genuine urbanization effect; the difference in the per capita consumption level can be entirely explained in terms of per capita income differentials. The separate projections of the urban and rural demand will then lead to the same result as a direct projection based on national averages (using the weighted average of the sectoral elasticities, provided that if income enters the demand function in the logarithmic form, the percentage per capita income growth is the same in the two sectors). But if the demand functions are not the same for the two sectors, the projection based on national averages is biased.

[18] See formula, pp. 65–66.

Figure 2

Positive Urbanization Effect

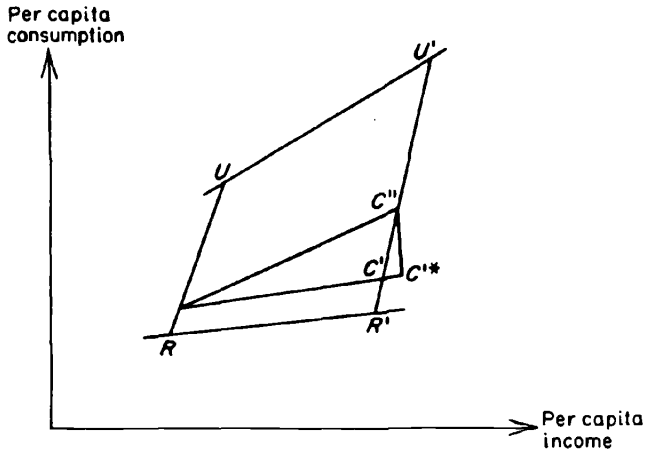
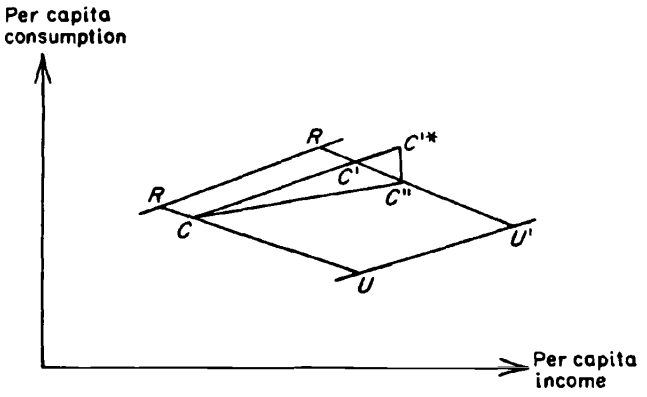


Figure 2 illustrates the case of a positive urbanization effect when the urban regression line UU' lies above the rural regression line RR'. The points R, U, and C are representative of the average per capita income and consumption levels in the base year for rural, urban, and nationwide population, respectively. Points R' and U' refer to the projected year. If the fraction of the urban population in the total were to remain constant ($u' = u$), the average for the country would be at $C'(\overline{RC} = u\overline{RU}$, $\overline{R'C'} = \overline{uR'U'})$. The slope of CC' is the weighted average of the slopes of the urban and rural regressions $[ub_u + (1 - u)b_r]$ when the horizontal projections of UU' and RR' are the same, that is, if the increase in per capita income measured with the appropriate scales is the same for urban and rural population. The point C' is therefore the one that would have been projected from national averages using the weighted average of the sectoral regression coefficients. But, if there is a transfer from rural to urban population ($u' > u$), the average for the country will rise from C' to $\overline{C''}$: as $\overline{C'C''} = (u' - u)R'U'$. The projection based on national averages with the weighted regression coefficient would have led to the point C'^*. The demand would have been underestimated by $\overline{C'^*C''}$.

Figure 3 illustrates a negative urbanization effect. This would often apply to the types of food produced in the subsistence economy; for these, per capita consumption can be as high or higher in rural than urban areas despite the income differential. An extreme example is that

Figure 3

Negative Urbanization Effect



of milk consumption between nomadic and urban populations, when the nomadic population largely fed on milk progressively disappears over the projection period.

For all food valued at farm prices the urban demand curve is likely to lie below that of the rural. In cases of rapid urbanization the projections of total food valued at farm prices may therefore be overestimated. This may partly explain the fact that in some developing countries, despite an increase in per capita national income, per capita food consumption hardly rose.[10] More commonly the tendency would be to overestimate the demand for the commodities produced in a subsistence economy and to underestimate the demand for foods not locally produced. In other words, rapid urbanization would stimulate demand for imported foods rather than for those traditionally produced in subsistence economy.

In the covariance analysis of household surveys the total variance V of income per capita is the sum of the variance between strata VB and the variance within strata ($VW = \sum_i (VW)i$). The average coefficient within strata can be written:

$$b_a = \sum_i b_i(VW)i$$

[10] It would generally imply that part of the increase recorded in per capita income is artificial and reflects differences of accounting for subsistence and market production.

The coefficient b_o obtained without stratification is the weighted average of the coefficients b_a (within strata) and b_m (between strata):

$$(V)b_o = (VW)b_a + (VB)b_m$$

The coefficient b_m measures the slope of RU in Figure 2, while the coefficient b_a may be close to the slope of CC' especially if b_u and b_R have similar values. Consequently, the coefficient b_o estimated without stratification may not differ much from the slope of CC''; at least it is biased in relation to b_a in the right direction.

This can be illustrated in the case of the United States from the 1955 consumption survey. Households were classified in three groups: rural farm, rural nonfarm, and urban. Demand functions were computed for each group and the difference in the relations were analyzed by covariance. If we call (somewhat pejoratively) the shift, rural-farm-to-rural-nonfarm-to-urban "urbanization," then the urbanization effect on consumption can be characterized by the difference between the regression coefficients b_m (between group averages) and b_a (average within groups). This analysis reveals a positive urbanization effect for: fresh citrus, canned and frozen fruits, vegetables and juices, meat (except beef), fish, margarine, vegetable oils, and coffee powder. It showed a negative urbanization effect for: cereals, potatoes, pulses, sugar, fresh vegetables and fruits (except citrus), eggs, milk products, and cocoa.

Over the period 1955–65 the share of the urban population increased from 61.5 to 68.1 per cent while that of rural nonfarm and especially rural farm declined. About one-fifth of the annual growth in the average U.S. per capita income over this period can be accounted for by this urbanization process. Using the formula presented at the end of this annex, a comparison was made between the elasticity coefficient η^* calculated as the weighted average of the elasticity for each group (corresponding to the regression line CC' of Figures 2 and 3) and the coefficient of elasticity η. which should have been applied to the national average to reflect the urbanization process (line CC''). The results are shown in Table 15 for two commodities: cereals, with a negative urbanization effect, and frozen juice, with a positive urbanization effect. The elasticity η^* (obtained by weighting the elasticity for each group proportionally to the total consumption of the group) does not greatly differ from η_a (average within groups) but does differ substantially from the correct elasticity η (reflecting the urbanization effect). The elasticity η_o (estimated for the entire population without stratifying by group) is closer than either η_a or η^* to the elasticity η reflecting the urbanization process.

TABLE 15

Impact of Urbanization on Demand Projections as Reflected in Elasticities for Two Products, U.S.A., 1955-65[a]

(semilog)

Elasticity	Cereals	Frozen juices
Average within groups, η_a	-.15(±.02)	0.98(±.11)
Between group averages, η_m	-.91(±.08)	3.20(±.21)
Overall without stratification, η_o	-.24	1.22
Weighted average of group elasticities, η^*	-.07	1.0
Elasticity reflecting urbanization effect over 1955-65 period, η	-.20	1.15

[a]Elasticities originally obtained in survey made in 1955.

A similar computation was made for Madagascar starting from the 1962 survey which included a stratification between urban and rural demand. The computation was made working backwards over the period 1950–62, assuming as previously the same percentage per capita income growth in each group. The results (Table 16) show that the application of a weighted income elasticity would have led to an insignifi-

TABLE 16

Impact of Urbanization on Demand Projections as Illustrated by Comparison of Elasticity Reflecting Urbanization and Elasticity Derived From Weighted Group Averages: Madagascar, 1950-62.

(semilog)

Elasticity	Rice	Vegetable Oils	Fresh Milk	Milk
Weighted of urban and rural, η	0.04	1.15	0.75	0.92
Including urbanization effect 1950-62, η	0.03	1.27	0.73	0.91

[a]Elasticities originally obtained in survey made in 1962.

cant overestimation of the demand for rice, fresh milk, and meat, but to a significant underestimation of the demand for vegetable oils.

Undoubtedly, the ideal would be to project demand separately for each sector. But this would require the knowledge of a separate food balance for each. Due to the lack of comprehensive consumption surveys in most developing countries, one can only measure, in the few countries where data are available, the bias attached to national vs. sectoral projections.

Computational Formula

a_i = population of group (group i refers for example to rural or urban) i as a fraction of total population in base year.

a_i' = population of group i as a fraction of total population in projected year.

x_i = average per capita income of group i over average per capita income of total population in base year.

y_{ij} = average per capita consumption of commodity j for group i divided by average per capita consumption of commodity j for total population in base year.

X_i = ratio of per capita income of group i: value projected over value in base year.

Y_{ij} = ratio of per capita consumption of commodity j for group i: value projected over value in base year.

η_{ij} = income elasticity of the demand for commodity j in group i in the base year.

For the entire population the increase of average per capita income in terms of ratio of projected income over income in base year can be written:

$$X = \sum_i a_i' x_i X_i = X^* + \sum_i (a_i' - a_i) x_i X_i$$

with X^* the weighted average of the sectoral ratio X_i:

$$X^* = \sum_i a_i x_i X_i$$

Similarly for the increase of the average per capita consumption:

$$Y_j = \sum_i a_i' y_{ij} Y_{ij} = Y_j^* + \sum_i (a_i' - a_i) y_{ij} Y_{ij}$$

With a semilog demand function, the relation between increase in consumption and income can be written for group i:

$$Y_{ij} - 1 = \eta_{ij} \log X_i$$

With η_j^* weighted average of the sectoral income elasticities η_{ij}:

$$\eta_j^* = \sum_i a_i y_{ij} \eta_{ij}$$

and η_j elasticity relating actual increments in national per capita income and consumption reflecting simultaneously the pure income effect and the modification in the sectoral composition of the population.

$$Y_j - 1 = \eta_j \log X$$

The relation between the correct elasticity η_j and the weighted average elasticity η_j^* can be written:

$$(\eta_j^* - \eta_j) \log X = Y_j^* - Y_j - \eta_j^* \log \frac{X^*}{X}$$

The two elasticities coincide $\eta_j^* = \eta_j$

if $$Y_j^* - Y_j = \eta_j^* \log \frac{X^*}{X}$$

This implies that the group averages fall along a regression line of slope η_j^*.

ANNEX II

Impact of an Increase of Exports on GDP—Distinction Between "Accounting" and "Induced" Effect

Export may be thought of mainly as a means of securing the imported goods required for growth. Under this premise the developmental impact of an expansion of exports—or more precisely, of the increase in the import capacity thus generated—will depend on the GDP response to an increase in the import capacity.

During the postwar period the elasticity of imports in relation to GDP has been close to 1.1 for all developing countries together. In individual countries, however, the import elasticity departed substantially from this average. Thus, among the twenty-nine developing countries analyzed in the UNCTAD study, the "historical" elasticity fell between 0.9 and 1.3 for ten; below 0.9 for eleven; and at 1.3 or above for eight. Among the extremes were: Brazil (0.28), Colombia (0.38), Venezuela

(0.39), and Ceylon (0.47) on the one hand; and Nigeria (2.6), Pakistan (2.6), Taiwan (1.86), and Chile (1.82) on the other.

If exports are taken as exogenous, the developmental impact of exports on GDP can be estimated by regressing GDP (at constant prices) on exports (deflated by average import unit value). During the postwar period the elasticity of GDP in relation to exports, thus estimated, was found significant ($t > 3$) for twenty-five countries. The elasticity was equal to 1.1 for one country. It fell between 0.7 and 0.81 for ten; between 0.5 and 0.7 for seven; between 0.3 and 0.5 for three; and below zero for four. If we take 0.7 as the most common value, then a 10 per cent increase in export earnings is often associated with a 7 per cent increase in GDP.

Simultaneity between the increase of exports and GDP does not mean causality. For example, one would not like, *a priori,* to say that, in the case of the four countries with an apparent negative elasticity, the growth of GDP was due to the decline in exports. When the time trend elements in GDP and exports are removed, either by introducing time as an additional variable or by regressing the first differences, the relation between the fluctuations in export earnings and GDP becomes very weak. Moreover, the correlation between the rates of growth of GDP and export earnings between countries is low. Taking all the thirty-nine countries for which data were available, only 20 per cent of the variance in the rates of GDP growth is explained by variations in the rates of export growth. Eliminating the thirteen countries for which the rates of growth are not significant, only 12 per cent of the variance is explained. The relation between the growth of exports and GDP, therefore, needs to be analyzed in greater depth.

Assuming constant prices; a given increase in exports will generally be associated with a somewhat smaller increase in the value added by the export sector. This difference is due to the deduction of the import content of the incremental export and of the inputs from the nonexport sectors incorporated in the export goods. The net import capacity of the country will rise by the difference between the increase in exports and the import content of the incremental exports. This rise, in the nature of an "accounting" increase, would be very small if the increase in exports reflected mainly an expansion of reexporting activities, or if the country started from full utilization of resources with optimal allocation. On the other hand, if the import content and the production foregone in the nonexport sectors were negligible, the automatic increase in GDP and net import capacity would approximate the increase in exports. In brief, an increase of ten dollars in gross exports will be automatically

associated with an increase in GDP and net import capacity of somewhere between zero and ten dollars. This "automatic" increase reflects accounting identities. The problem is to know what will be the impact on the economy of this increase in disposable income and import capacity.

Let us assume an automatic increase of seven dollars. At one extreme, this amount could be absorbed entirely by an increase in domestic consumption and be balanced by an equal increase in imports of consumer goods, without any impact on domestic production. In such a case, the increase in exports during the first round would not induce in subsequent rounds any increase in domestic production and GDP.

At the other extreme, the seven-dollar increase in import capacity could be entirely devoted to the importation of equipment. This might induce an increase in domestic capital formation of more than seven dollars. If the lack of demand and in particular the lack of foreign equipment were holding back production and investment, potential savings previously idle and labor and capital previously underutilized might be brought into motion. The initial gain in export could thus have a large induced effect on domestic production and GDP, but the full effect would not be felt immediately.

To summarize: If a one-dollar increase in export earnings is to generate several dollars increase in GDP, the induced effect has to be large, and most of it will probably not be felt during the same year as the initial increase in exports. It might therefore be possible, through distributed lag functions, to express the response of GDP to an increase in export earnings in the form of two components: a short-term and a long-term elasticity.

Within one year one would not expect that one dollar increase in exports will generate very much more than one dollar increase in GDP since only part of the induced effect could be felt. If, however, within a rigidly planned economy, a windfall in export earnings were the only way to correct misallocation of foreign exchange, for example by importing spare parts, the induced effect could be sizable in the short term; but this is likely to be the exception rather than the rule. One could therefore expect the short-term elasticity to range from zero to somewhat above the ratio of exports to GDP. But the long-term elasticity could be much higher.

The value of the short-term elasticity will depend greatly on the nature of the increase in exports: for example on whether the terms of trade or the volume of exports have been modified or the import content and content of scarce domestic inputs have been incorporated in the additional volume of exports, etc. The ratio between the long- and short-

term elasticities will depend largely on the state of the economy, in particular on the existence of bottlenecks, and on the economic policies followed. The nature of the export industry will also influence the induced effect. In the case of minerals, the industry is sometimes more closely integrated with the economy of the developed than with that of the developing countries, and part of the induced effect may be felt in the importing countries. On the other hand, when the export sector is closely integrated with the domestic sector, trade may play a vital role in spreading improved technology throughout the economy; unfortunately this is not generally the case in the LDC.

To conclude, one cannot expect on theoretical grounds to find much uniformity in the relation between GDP and export growth in the LDC. The statistical analysis presented below confirms this lack of uniformity.

In several respects the relation between GDP and export earnings or import capacity is comparable to the capital-output ratio. It is extremely convenient to use and it provides an easy argument for illustrating quantitatively the beneficial impact of trade and aid. It should be used with time lags although it is generally used without them. It is not very reliable and cannot usually provide more than a rough first approximation.

Statistical Analysis

Y_t = GDP in year t at constant prices.

X_t = Export earnings in year t deflated by average import unit value.

t = Year.

Functions Without Time Lag

(1) $$\log Y_t = cst + d_{(yx)} \log X_t$$

(2) $$\log Y_t = cst + d_{(yt)} t$$

(3) $$\log X_t = cst + d_{(xt)} t$$

(4) $$\log Y_t = cst + d_{(yx.t)} \log X_t + d_{(yt.x)} t$$

(5) $$\log \frac{Y_t}{Y_{t-1}} = cst + d'_{(yx)} \log \frac{X_t}{X_{t-1}}$$

The regression coefficients $d_{(yx.t)}$ of equation 4 and $d'_{(yx)}$ of equation 5 can be taken as estimates of the short-term elasticity of GDP in relation to exports. The ratio of the regression coefficients $d_{(yt)}$ of equation 2

over $d_{(xt)}$ of equation 3 can be taken as a first estimate of the long-term elasticity. These coefficients are linked by the relation:

$$d_{(tx)} = \frac{d_{(yt)}}{d_{(xt)}} R^2_{(xt)} - d_{(yx.t)}(1 - R^2_{(xt)})$$

or

$$d_{(yx)} = \eta = R^2_{(xt)}\eta_1 + (1 - R^2_{(xt)})\eta_s$$

The ratio used as a proxy for the long-term elasticity is a poor estimate. If $R_{(xt)}$ is low, exports do not follow a time trend and the coefficient $d_{(xt)}$ has not much meaning. If $R_{(xt)}$ is high, the impact of exports on GDP cannot be precisely dissociated from the time trend.

Function with Time Lag

(6) $$\log Y_{(t)} = cst + b \log X_{(t)} + c \log Y_{(t-1)}$$

The regression coefficient b is an estimate of the short-term elasticity, the coefficient $\frac{b}{1 - c}$ is an estimate of the long-term elasticity.

The results of the statistical analysis, summarized in Tables 17, 18 and 19, suggest the following conclusions:

The function without time lag generally leads to a significant elasticity of GDP in relation to export earnings. However, the value of the elasticity (d_{yx}), and in particular the ratio between the rates of growth of GDP and exports (d_{yt}/d_{xt}), varies rather widely from country to country. When the time trend is eliminated, the relation between the yearly fluctuations of GDP and export earnings appears rather loose ($d_{yx.t}$ and in particular d'_{yx} obtained by first differences do not differ significantly from zero in most cases). In cases where the short-term elasticity is significant, it is generally lower than the direct elasticity d_{yx}, which in turn is generally lower than the ratio of the rates of growth (first approximation of the long-term elasticity). Moreover, the correlation between the rates of growth of exports and GDP (d_{xt} and d_{yt}) among countries is low.

The lagged function (equation 6), shows that the hypothesis of an induced effect of exports on GDP is consistent with the time series available in a number of developing countries. As shown in Tables 18 and 19 Thailand provides a good example. Over the period 1950–65, the t ratios

TABLE 17

Regression Without Time Lag

Country	Period	$d_{(yx)}$		$\frac{d_{(yt)}}{d_{(xt)}}$	$1-\bar{R}^2_{(xt)}$	$d_{(yx.t)}$	
			(t)				*(t)*
Argentina	1951-65	0.52	(3.9)	0.92	0.50	0.05	(0.6)
Chile	1959-65	-.22	(2.7)	-0.27	0.34	0.064	(7.2)
Colombia	1950-65	0.77	(2.6)	2.47[a]	0.76	0.07	(3.7)
Cyprus	1959-65	0.62	(6.2)	1.43	0.20	0.67	(2.5)
Ecuador	1953-63	1.10	(2.9)	2.62[a]	0.64	0.13	(3.2)
Ethiopia	1961-65	0.36	(10.0)	0.67	0.15	0.06	(0.5)
Greece	1951-65	0.52	(19.8)	0.54	0.04	0.13	(2.2)
Guatemala	1950-65	0.81	(9.1)	0.95	0.19	0.15	(1.8)
Honduras	1959-65	0.38	(6.4)	1.61	0.63	0.11	(2.4)
India	1957-65	0.78	(4.5)	1.75	0.34	0.04	(0.2)
Iran	1959-65	0.75	(8.1)	0.30	0.23	0.28	(2.9)
Iraq	1957-65	0.74	(2.9)	1.38	0.38	0.04	(0.4)
Korea	1953-65	0.54	(2.2)	0.81	0.59	0.20	(2.6)
Malaysia	1961-65	0.79	(2.8)	0.96	0.44	0.09	(1.7)
Nicaragua	1950-65	0.72	(13.7)	0.80	0.18	0.31	(6.2)
Pakistan	1957-65	0.75	(3.9)	1.34	0.44	0.06	(1.0)
Panama	1960-65	0.65	(11.0)	1.73	0.29	0.17	(1.9)
Taiwan	1951-65	0.76	(8.0)	0.92	0.22	0.10	(2.5)
Tanzania	1960-65	0.51	(3.1)	2.55[a]	0.84	0.22	(1.6)
Thailand	1953-65	0.82	(11.5)	0.93	0.04	0.34	(4.9)

[a]Coefficient $d_{(xt)}$ does not differ significantly from zero.

of the regression coefficients *b* and *c* are highly significant (5.3 and 11); the long-term elasticity is about 2.5 times the short-term elasticity.

During the postwar period Thailand consistently followed an export-oriented policy with a minimum of import controls. Since no acute disequilibrium took place, the value of the elasticity may have remained

TABLE 18

Distributed Log Model, Selected Countries

$(\log Y_{(t)} = a + b \log X_{(t)} + c \log Y_{(t-1)})$

Country	Period	b	(t)	c	(t)	Watson Test	$\bar{R}^2$	$\frac{1}{1-c}$	$\frac{b}{1-c}$
Argentina	1952-65	0.13	(1.5)	0.77	(6.2)	1.99	0.865	4.35	0.57
Dominican Republic	1960-64	0.74	(5.0)	0.49	(4.6)	1.49	0.941	1.98	1.47
Ecuador	1954-63	0.18	(2.4)	0.95	(17.5)	2.32	0.984	20.0	3.6
Greece	1952-65	0.17	(1.8)	0.65	(3.6)	2.48	0.981	2.86	0.49
Nicaragua	1951-65	0.25	(3.2)	0.69	(6.8)	1.97	0.978	3.23	0.81
Pakistan	1958-65	0.20	(1.4)	0.84	(9.5)	2.85	0.981	6.25	1.25
Syria	1957-64	0.63	(2.9)	0.59	(4.9)	3.12	0.841	2.44	1.53
Thailand	1953-65	0.31	(5.3)	0.61	(11.0)	2.62	0.984	2.5	0.77

stable. The export sector was on the whole closely integrated with the rest of the economy, the five main exports being rubber, rice, tin, maize, and kenaf (variety of jute). Maize and kenaf were the two dynamic export commodities (more than 30 per cent yearly growth) that might have acted as the "engines of growth." The fluctuations [20] of the export earnings derived from these two crops, although high (25 per cent for maize and 40 per cent for kenaf), amounted to only 8.4 per cent for total export earnings, 6.2 per cent for all imports and 3 per cent for GDP.

[20] Fluctuations measured as the average absolute value of deviations from a logarithmic trend:

$$\log y_t = \log \hat{y}_t + \log\left(1 + \frac{e}{\hat{y}_t}\right)$$

$$\log \hat{y}_t = a + bt$$

$$f = \frac{100}{n} \sum_t \frac{|e_t|}{\hat{y}_t}.$$

TABLE 19

Short – and Long-Term Response of GDP to Exports

Country	Period	Direct $d_{(yx)}$		Short-Term Response $d_{(yx.t)}$		b		$d'_{(yx)}$		Long-Term Response $\frac{d_{(yt)}}{d_{(xt)}}$	$\frac{b}{1-c}$
			(t)		(t)		(t)		(t)		
Argentina	1951-65	0.52	(3.9)	0.05	(0.6)	0.13	(1.5)	0.08	(1.4)	0.92	0.57
Dominican Republic	1959-64	1.03	(1.7)	0.42	(1.5)	0.74	(5.0)	0.46	(2.6)	1.45	1.47
Ecuador	1953-63	1.10	(2.9)	0.13	(3.2)	0.18	(2.4)	0.14	(4.1)	2.62	3.6
Greece	1951-65	0.52	(19.8)	0.13	(2.2)	0.17	(1.8)	0.16	(1.5)	0.54	0.49
Nicaragua	1950-65	0.72	(13.7)	0.31	(6.2)	0.25	(3.2)	0.22	(2.9)	0.80	0.81
Pakistan	1957-65	0.75	(3.9)	0.06	(1.0)	0.20	(1.4)	0.04	(0.6)	1.34	1.25
Syria	1956-64	0.73	(1.2)	0.82	(3.0)	0.63	(2.9)	0.44	(1.7)	3.53	1.53
Thailand	1953-65	0.82	(11.5)	0.34	(4.9)	0.31	(5.3)	0.22	(3.4)	0.93	0.77