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An Analysis of Export Demand and Supply for
Groups of Non-Oil Developing Countries

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Summary

The exports of many non-oil developing countries contracted substantially after 1981. This contraction was caused by a world recession that weakened demand for these exports and, in some cases, by policies in the exporting countries that turned domestic relative prices against the export sector. Since 1982, however, a number of countries have implemented exchange rate and other supply-side policies aimed at expanding their export sectors, and the economic recovery in industrial countries, commencing in 1983, also encouraged an upsurge in exports from these countries. In order to analyze these influences, this paper presents a model of export quantity flows from the non-oil developing countries to importing countries that specifies the effect of both the level of world economic activity and domestic pricing policies on the growth of developing country exports. The model specifies both demand- and supply-side determinants of exports, measures the responsiveness of export volumes to these determinants, and distinguishes long-term developments from short-term fluctuations.

Export volume flows were modelled with respect to groups of exporting non-oil developing countries and groups of importing countries. Exporting countries are divided into four groups: (i) low-income countries, (ii) major exporters of manufactures, (iii) net oil exporters, and (iv) other net oil importers. Importing countries are divided into three groups: (i) industrial countries, (ii) oil producing (OPEC) countries, and (iii) non-oil developing countries. The parameter estimates derived from the model can be used to calculate both how exchange rate policies of groups of exporting countries and how economic growth in the industrial, OPEC, and non-oil developing countries will influence export growth of non-oil developing countries.

The results indicate that growth in the importing countries is the most important determinant of non-oil developing country exports, and that exchange rate policies will be successful in increasing these exports. The results also suggest that long-term structural changes have taken place on both the demand and supply side.

I. Introduction

Over the past few decades, exports have played a critical role in the economic growth of non-oil developing countries, and policies to increase exports have been commonly employed as an instrument to deal with balance of payments difficulties. In recent years, in particular, structural adjustment programs have strongly emphasized the need for export expansion in the non-oil developing countries as a means of achieving a sustainable current account balance that is compatible with maintaining an adequate rate of economic growth. At the same time exports of many non-oil developing countries have contracted, owing to a world recession that dampened demand for their exports.

This paper presents a model of export quantity flows from groups of non-oil developing countries to groups of importing countries in order to calculate the effects of both world recession and domestic pricing policies on export growth. Exporting countries are divided into four groups: (i) low-income countries, (ii) major exporters of manufactures, (iii) net oil exporters, 1/ and (iv) other net oil importers (middle-income countries that, in general, export mainly primary products). Importing countries are divided into three groups: (i) industrial countries, (ii) oil producing (OPEC) countries, and (iii) non-oil developing countries.

1/ These are the analytical subgroups used in the World Economic Outlook paper of the International Monetary Fund. The group of net oil exporters comprises those non-oil developing countries whose oil exports exceeded their oil imports in most of the years in the 1970s. The World Economic Outlook gives separate treatment to the group of oil exporting countries. (See Appendix I for a list of these countries.)

The model contains separate equations for export volume flows from each of the four exporting groups to each of the three importing groups, and in particular, measures the responsiveness of export volumes to real income growth in importing countries, and to changes both in effective exchange rates and in deviations from output in the exporting countries.

The purpose of grouping non-oil developing countries is to pose more broadly based questions than would be possible for individual developing countries. For example, when a group of exporting countries simultaneously devalue, the outcome for export volumes is quantifiably different than the outcome for an individual developing country. When one country devalues, the increase in export volumes is likely to be offset by a reduction in export volumes from competitor countries. These offsetting effects will be much lower for groups of exporting countries, particularly for groups that are defined by type of export and are therefore not competing closely with other groups. Similarly, while an individual country can significantly increase its exports by increasing its price competitiveness, for a group of countries together the elasticity of demand for its exports with respect to income in industrial countries tends to be a constraint.

While the presentation in this paper concentrates on the basic development of the model and its estimated parameters, the model is to be used to assist in the projection of export volumes for groups of developing countries. The model produces short-run calculations of export volume growth of these groups under alternative assumptions about economic growth in the industrial, OPEC, and non-oil developing countries.

Section II reviews previous studies on the demand and supply determinants of export growth. Section III develops the model. Section IV presents the empirical results and Section V summarizes the conclusions.

II. Review of the Literature

Many studies on export determination assume that exports are determined by supply-side variables, such as domestic prices (official or market-determined), domestic GDP growth, taxes, tariffs, and subsidies. Fewer studies focus on the demand-side determinants of exports, such as foreign demand or competitor country prices. This relative gap in the literature seems to have arisen because the typical non-oil developing country is assumed to be a small country, facing an infinitely elastic foreign demand for the product it produces and for which changes in foreign demand influence exports only through changes in world prices. 1/

1/ The small country hypothesis is acceptable for many, but by no means all, non-oil developing countries. For example, coffee exports from Brazil and copper exports from Zaire constitute a sizeable proportion of the market for those exports.

This lack of attention to the influences of foreign demand may also be traced to the almost total concentration on exports from individual countries rather than from groups of countries. Two important differences arise when exports from groups of developing countries rather than individual developing countries are being analyzed. First, the small country hypothesis is no longer relevant; the assumption that demand is infinitely elastic is no longer appropriate. Second, pricing policies may not have the desired outcome. Countries in a group that produce a product for which the market price elasticity is low may have to allow a considerable fall in the market price for the increased supply to be absorbed. By contrast, when a single country, which is not a dominant supplier of its export, takes policy measures to increase export supply, no measurable fall in the market price may have to take place for the increased supply to be absorbed. Very few attempts have been made to simultaneously model the demand and supply of non-oil developing country exports.

Numerous studies have examined the relationship between exports of non-oil developing countries and supply-side variables. Balassa (1978a, 1978b) and Tyler (1981) have found a significant positive relationship between economic growth in developing countries and the supply of exports of manufactures. Elson (1973) and Teigeiro and Elson (1973), upon examining effects of exchange rate movements on the export supply of Argentina and Colombia, conclude that their movements are an important determinant of the supply of exports in these two countries. Bhagwati (1978), Bergsten and Cline (1982), Cline (1978), and Krueger (1978a, 1978b) have analyzed how different trade policies affect growth and export behavior of developing countries. Much empirical evidence has been accumulated demonstrating the positive response of domestic supply in developing countries to changes in producer prices (Askari and Cummings (1976) and Bond (1983)). While export supply is affected by forces that influence both domestic supply of and demand for the exported good, many of the studies naturally focus on domestic supply responses, because there is little or no domestic demand for many export commodities, in particularly primary products. In general, these studies provide strong empirical evidence on the importance of prices in determining the supply of exports in the countries studied.

The principal studies of demand determinants of export growth of developing countries are those by Rhomberg (1968), Deppler and Ripley (1978), Houthakker and Magee (1969) and Khan (1974). These studies focus on the transmission of changes in aggregate demand from industrial to developing countries by examining the nature of the relationship between real income growth in industrial countries and export growth in groups of developing countries. The results from these studies demonstrate a significant positive estimate of the elasticity of the volume of exports of non-oil developing countries with respect to real GNP of industrial countries.

Houthakker and Magee, using simple export demand equations, and Khan, using two-stage estimation procedures, find that real income in importing countries and price competitiveness in exporting countries, are the principal determinants of exports of a number of developing countries. Estimates of income elasticities of importing countries 1/ with respect to exports of individual developing countries (excluding Europe and Israel) range in size from 0.34 (Brazil) to 2.01 (Peru) (Houthakker and Magee) and from 0.2 (Colombia) to 1.12 (Peru) (Khan). The mean income elasticity, calculated over individual developing countries (excluding Europe and Israel), is less than one in both papers—0.9 (Houthakker and Magee) and 0.5 (Khan). The Houthtakker and Magee estimate is probably biased upwards, because supply side variations are excluded from the equation. Goldstein and Khan record that the size of estimated elasticity itself has been increasing over the past 20 to 30 years. Using a reduced-form equation, they estimated an income elasticity of 2.30 for the period 1973-80; this estimate is considerably higher than both their estimate of 1.33 for the period 1963-80 and Rhomberg's estimate of 0.37 for the period 1953-65, using a virtually identical equation. An explanation Goldstein and Khan give for this finding is that the income elasticity is higher for manufactures than other commodities, and that non-oil developing countries have been steadily increasing the share of manufactures in their total exports over the past two decades.

Linkages between the developed and developing countries have also been studied by Hicks (1976), who simulates trade linkages between the developed and the developing countries by specifying both demand and supply equations for groups of developing countries. He analyzes the impact of alternative policies of the OECD and OPEC countries; slackening growth in the OECD countries is shown to be more detrimental to the developing countries than the direct effects of the higher price of petroleum.

Estimates for competitor price elasticities for non-oil developing countries are not nearly as robust as estimates for income elasticities. However, both Khan and Houthakker-Magee demonstrate that individual developing countries do not face an inelastic demand schedule and that price variations do affect the quantity of exports demanded.

III. The Structure of the Model

Seven regions are distinguished in the model: four exporting groups of non-oil developing countries and three importing groups. The exporting groups are determined largely on the basis of composition of exports and

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1/ Houthakker and Magee use an index of GNP of 26 importing countries and Khan uses real world income (OECD real gross national product) to represent income in importing countries.

also by per capita income. Net oil exporters were grouped separately
from the other non-oil developing countries because their terms of trade
and their exports were subject to different influences. 1/ Developing
countries that are net importers of oil were split into three groups: (i)
low-income countries, whose 1977 per capita GDP is estimated to have been
equivalent to no more than US $300; (ii) middle-income countries, whose
per capita GDP exceeded US $300 in 1977 and whose exports as a group
consist chiefly of primary commodities; and (iii) the major exporters of
manufactures, whose exports of manufactures have become relatively large
and include most of the "newly industrializing countries," a concept
utilized in studies of the World Bank. The major exporters of manufactures
account for well over 60 percent of combined total exports of all the
oil-importing developing countries.

Long-term developments and short-term fluctuations are distinguished
in the model. The long-term developments are captured by use of a trend
term. On the demand side short-term fluctuations are transmitted from
economic activity in the importing groups to exports of the exporting
group. On the supply side, short-term fluctuations are transmitted from
output (as measured by deviations from trend) in the domestic economies
of the exporting group to their own exports. In the model, price changes
are measured by a weighted average of the real effective exchange rates 2/
of the countries in the appropriate group. The effect of price changes on
exports are assessed using both demand factors in importing groups and supply
factors in exporting groups.

Initially, two equations are specified for an individual country: an
export demand and an export supply equation. A single reduced form equa-
tion for each country is then obtained by assuming equilibrium conditions.
Finally, the reduced form equation is aggregated across countries in each
exporting and importing group in order to obtain the equation that describes
exports from each exporting group i to each importing (or "market") group j.

In the equations described below the exporting countries are labelled
$p = 1...m$, and the market countries are labelled $q = 1...m...n$. The volume
of exports from country p to country q are labelled XV_{pq}. The m exporting
countries are summed into four groups, labelled $i = 1, 2, 3, 4$, and the n
importing countries are summed into three groups labelled $j = 1, 2, 3$. The

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1/ Nevertheless, net oil exporting countries are not included in this
group, if the influences on their terms of trade and exports are more
appropriate to another group.

2/ The development of a more elaborate methodology for calculating a
nominal or real effective exchange rate index for an individual developing
country can be found in Bélanger (1976), Ridler and Yandle (1972),
and Goldstein, Feltenstein, and Schadler (1979).

volume of exports from exporting group i to market group j are labelled XV^{ij}. Each of the i groups is of size m_i and each of the j groups is of size n_j.

1. Export demand equation

The demand for exports of an individual developing country is sometimes assumed to be perfectly elastic, particularly when the country has a large proportion of primary products in its exports. Such an assumption implies that variations in export volume are determined solely by the supply. Developing countries sometimes export products that are differentiated by place of origin and demand for exports from these countries will be less elastic. The demand for exports from a group of countries will be even less elastic. The purpose here is to explain the market demand for the exports of each group of non-oil developing countries as defined above. This is done first by considering an individual country's exports to an importing country.

The export demand equation describes country q's demand for country p's exports (XVD_{pq}), which is hypothesized to depend on four variables: (i) real gross national product in country q (GNP_q); (ii) country p's price in the qth market (PX_{pq}) relative to country p's competitors' prices (PC_q); (iii) country p's price in the qth market (PX_{pq}) relative to the domestic price in the qth market (PD_q); and (iv) a trend term that takes account of factors that affect the allocation of country q's imports from country p over time. 1/ Country q's demand for exports of country p is specified as a function of real gross national product in country q, two relative prices and a trend term:

$$(1) \quad XVD_{pq} = a_0 \, GNP_q^{a_1} \, (PX_{pq}/PC_q)^{a_2} \, (PX_{pq}/PD_q)^{a_3} \, e^{a_4 t}$$

PC_q is a weighted index of the export prices of all countries, s, that compete with country p in the qth market, 2/ and

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1/ Changes in tastes or long-run barriers that affect the relative demand for imports from different groups of developing countries will be picked up by this term.

2/ PC_q is calculated as:

$$\ln PC_q = \sum_{s \neq q} \alpha_{sq} \ln (PX_s/E_s)$$

$$\alpha_{sq} \equiv \frac{XV_{sq}}{\sum_{s \neq q} XV_{sq}}; \quad \sum_s \alpha_{sq} = 1.$$

$$PX_{pq} = PX_p/E_p$$

$$PD_q = P_q/E_q$$

where E_s is a unit of country s's local currency per U.S. dollar. XVD_{pq} and GNP_q are defined in U.S. dollars. The actual flow of exports is assumed to adjust to the demand for exports over the period of one year.

In equation (1), a_1 is country q's income elasticity of demand for country p's exports; a_2 is the elasticity of q's demand for p's exports with respect to the export prices of foreign competitors, relative to p's export prices, and thus measures the substitutability between country p's exports and those of its competitor countries, s, in the qth market; and a_3 is the elasticity of q's demand for p's exports with respect to q's domestic prices relative to p's export prices, thereby indicating the substitutability between country p's exports and country q's domestic output. It is expected that a_1 will be positive, and a_2 and a_3 will be negative.

2. Export supply equation

Country p's export supply to country q (XVS_{pq}) depends on four variables: (i) the domestic price level in country p (PD_p), measured in U.S. dollars, relative to the price of exports in market q (PX_{pq}) also measured in U.S. dollars; (ii) output in country p measured by deviation from trend (QT_p); (iii) other factors (Z_p), such as weather conditions, that affect the country's exports; and (iv) a trend term that takes into account factors that affect the export production of country p over time: [1]/

$$(2) \quad XVS_{pq} = b_0(PD_p/PX_{pq})^{b_1} QT_p^{b_2} Z_p^{b_3} e^{b_4 t}$$

$$QT_p = GDP_p/GDPT_p.$$

GDP_p is an index of country p's domestic output. $GDPT_p$ is an index of country p's potential domestic output derived by the trend through peaks method.

In equation (2), exporters are expected to increase their supply if the price of exports in local currency rises relative to domestic prices.

1/ Export supply is also heavily affected by official price-incentive policies, tax and trade policies and other measures, and by the long gestation periods required for certain products before increased output can occur. Where it is possible these effects will be captured by a dummy variable.

Domestic prices are used here as a proxy for domestic cost factors. As export prices rise relative to domestic costs, export supply increases. Therefore it is expected that the sign of coefficient b_1 will be negative. Adjustment of actual exports to the supply of exports is assumed to take place in the period of one year. However, certain products, such as coffee, require very long gestation periods before increased output can occur, and for exporting groups that have a large proportion of these products in their exports, the coefficients will be biased in a downward direction.

3. Reduced form

Equations (1) and (2) constitute the model for an individual country and can be used together with the equilibrium conditions given in equation (3).

$$(3) \quad XV_{pq} = XVD_{pq} = XVS_{pq}$$

By solving equations (1), (2) and (3) for PX_{pq}, the reduced form equation is obtained. This equation, written in logarithmic form, shows the effects of all the exogenous variables on the quantity of exports from country p to country q:

$$(4) \quad \ln XV_{pq} = c_0 + c_1 \ln REER_{pq} + c_2 \ln GNP_q + c_3 \ln QT_p + c_4 \ln Z_p + c_5 t$$

where $REER_{pq}$ is the real effective exchange rate for country p vis-á-vis country q and is calculated as follows:

$$(5) \quad \ln REER_{pq} = \delta \cdot \ln (PD_p/PC_q) + (1-\delta) \ln (PD_p/PD_q).$$

$$\delta = a_2/(a_2 + a_3); \quad (1-\delta) = a_3/(a_2 + a_3).$$

The first part of equation (5) shows the competition between country p and its competitors in the qth market, and the second part the competition between country p and country q in the qth market. δ reflects the weight of the first part in the total index.

The reduced form coefficients are related to the structural parameters in the following way:

$$c_o = \left[\frac{b_o}{b_1} + \frac{a_o}{a_2 + a_3} \right] \cdot B; \quad c_1 = B; \quad c_2 = \frac{a_1}{a_2 + a_3} \cdot B;$$

$$c_3 = \frac{b_2}{b_1} \cdot B; \quad c_4 = \frac{b_3}{b_1} \cdot B; \quad c_5 = \left[\frac{a_4}{a_2 + a_3} + \frac{b_4}{b_1} \right] \cdot B$$

where $B = a_2 + a_3 + b_1$, and is negative. The expected signs of the behavioral parameters lead us to expect the following pattern of signs for the reduced form coefficients:

$$c_o \gtrless 0; \quad c_1 < 0; \quad c_2 > 0; \quad c_3 \gtrless 0; \quad c_4 \gtrless 0; \quad c_5 \gtrless 0.$$

The expected signs show that a nominal devaluation of the exchange rate by country p will increase its export volume; this increase is the result of both demand and supply effects. On the demand side, country p's export prices will have fallen compared to competitor prices, and compared to the price in country q, 1/ so that the demand for export volume from country p increases. On the supply side, export prices in domestic currency will have risen compared to domestic prices, making export production more profitable. Although the supply effects are likely to be more important for an individual country, both demand and supply for export volumes are affected by devaluation when countries are grouped together.

4. Aggregation

Equation (4) is assumed to be an adequate description of the determination of export flows between an exporting country and an importing country. Owing to nonlinearities, however, the exact aggregation of equation (4) is possible only under highly restrictive assumptions that are unlikely to be satisfied in practice. Nevertheless, it seems reasonable to assume here that equation (4) can be used as an adequate approximation of the relationships in which XV^{ij} represent exports from an analytical group to a

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1/ If country p is a "small country", then all of the devaluation effect will result from supply side effects.

market group, and the real effective exchange rate, GNP in market groups, deviations of output from trend in analytical groups, other factors and the trend term are appropriately weighted averages. The estimating equation describing group i's export flows to importing group j is specified in log-linear form as follows:

$$(6) \quad \ln XV^{ij} = d_0 + d_1 \ln REER^{ij} + d_2 \ln GNP^j$$
$$+ d_3 \ln QT^i + d_4 \ln Z^i + d_5 t \quad \underline{1/}$$

XV^{ij} is the flow of exports from analytical group i to market group j; $REER^{ij}$ is the real effective exchange rate of group i vis-à-vis its competitors in market j and vis-à-vis domestic prices in market j; GNP^j is the importing group's GNP (or GDP); QT^i is deviation of output from trend in analytical group i; and Z^i reflects other f ct rs that

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1/ The superscript i defines the four exporting groups. The m exporting countries are summed into four groups of various sizes, m_i where i = 1,2,3,4,. In the same way superscript j defines the three importing groups. The n importing countries are summed into three groups of various sizes, n_j where j = 1,2,3. The volume of exports from exporting group i to importing group j are therefore summed over the p exporting and q importing countries in the following way:

$$\ln XV^{ij} = \sum_p^{m_i} \sum_q^{n_j} \ln XV_{pq}.$$

In the same way the real effective exchange rate, GNP, and capacity utilization are summed:

$$(7) \quad \ln REER^{ij} = \delta . \sum_p^{m_i} \beta_p^j \sum_q^{n_j} \theta_{pq} \ln(PD_p/PC_q) + (1-\delta). \sum_p \beta_p^j \sum_q \theta_{pq} \ln(PD_p/PD_q)$$

$$\ln GNP^j = \sum_q GNP_q$$

$$\ln QT^j = \sum_p QT_p$$

The weight β^j is the share of exporting country p in the jth importing group, namely $\beta_p^j = XV^j/\Sigma XV^j$, and the weight θ_{pq} is the share of importing country q in the total imports of the group, namely $\theta_{pq} = XV_{pq}/\Sigma XV_{pq}$.

influence exports from group i. The four analytical groups, (i = 1,2,3,4) and the three market groups, (j = 1,2,3) are defined in the introduction to this paper. Intra-group trade was excluded from the endogenous and exogenous variables when j = 3, i.e., when the developing countries are the importing group.

IV. The Empirical Results

Equation (6) was estimated using annual data for the period 1967 to 1981 and ordinary least squares estimation procedures. The estimates of the export flows from the four exporting groups to the three importing groups, using equation (6), are presented in Table 1. A sample of 39 exporting countries were taken to represent the exporting groups. [1]/ All the Fund member countries were taken to represent the importing groups. (The sample groups of non-oil developing countries are defined in Appendix I.) Definitions of the data used in the estimation and the sources of these data are given Appendix II, and the dummy variables used to represent explanatory variables of a qualitative nature, are described in Appendix II.

The estimated coefficients are consistent with the relationships hypothesized in equation (6), that is, that exports from non-oil developing countries depend on growth in the importing countries, the real effective exchange rate, deviations of output from trend and the trend term. For all groups, the lagged responses of export flows to the real effective exchange rate were captured by averaging the real effective exchange rate over two periods: (i) an average of rates during the current period and the first preceding period and (ii) an average over the second and third preceding periods. These two variables were designed to reflect the short-term and longer-term developments in the real effective exchange rate. Exports responded in large part to changes in the real effective exchange rate within two years; consequently, the variable representing lags in the second and third preceding periods was dropped from the equation, and $REER^{ij}$ stands only for current and recent real effective exchange rates.

In Table 1, the estimated coefficients on the real effective exchange rate suggest that a sustained devaluation of the manufacturing exporters and the net oil exporters relative to domestic competitors and third country

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[1]/ These 39 countries were chosen in such a way that each of the four non-oil developing country groups is adequately represented.

Table 1. Empirical Results: Estimates of Export Equations
from Exporting Group i to Market Group j. 1/

1967 to 1981

Exporting Group to Importing Group	Constant	$REER^{ij}$	GNP^j	t_1	t_2	Cu^i	DOIL 1	DOIL 2	R^2	DW	SEE
Low-Income to Industrial 2/	-3.67 (1.29)	-0.76 (10.15)	1.28 (3.92)	0.05 (4.15)	0.04 (2.81)				.966	2.02	0.05
Middle-Income to Industrial 3/	-8.03 (1.00)	-0.10 (0.92)	1.42 (1.48)	-0.02 (0.89)	0.02 (2.03)		-0.11 (2.59)		.881	1.60	0.04
Major Exporters of Manufactures to Industrial	-21.12 (12.21)	-0.83 (2.24)	2.91 (14.50)	-0.02 (2.23)		-0.72 (0.87)	0.05 (2.42)		.998	1.94	0.02
Net Oil Exporters to Industrial 4/	-12.66 (0.54)	-1.35 (1.83)	1.97 (0.72)	-0.29 (0.41)				0.33 (2.33)	.898	1.85	0.10
Low-Income to OPEC	-16.58 (7.65)	-0.58 (3.02)	1.37 (6.87)	-0.10 (3.34)			-0.31 (3.77)	0.54 (4.67)	.981	2.39	0.09
Middle-Income to OPEC	-4.53 (3.33)	-0.20 (2.25)	0.51 (1.86)	0.01 (0.04)	0.16 (11.00)			-0.21 (4.13)	.995	2.32	0.07
Major Exporters of Manufactures to OPEC	-22.36 (2.55)	-0.59 (0.65)	1.88 (2.77)	0.12 (4.18)		-5.60 (2.01)	0.11 (1.93)		.994	1.52	0.09
Net Oil Exporters to OPEC	-1.70 (0.26)	-2.12 (1.81)	0.55 (1.07)	-0.04 (0.94)			0.33 (2.34)	-0.41 (3.08)	.851	1.62	0.10
Low-Income to Non-Oil Developing	-15.79 (1.86)	-0.98 (2.86)	1.36 (2.10)	-0.01 (0.13)	0.05 (1.28)		-0.33 (5.90)		.861	2.05	0.11
Middle-Income to Non-Oil Developing	-39.50 (3.45)	-1.39 (2.86)	2.84 (3.38)	-0.12 (2.26)					.980	1.98	0.06
Major Exporters of Manufactures to Non-Oil Developing 5/	-13.04 (3.69)	-0.37 (0.36)	0.85 (3.39)	0.10 (5.47)	0.10 (5.36)	-0.30 (1.51)			.996	2.19	0.04
Net Oil Exporters to Non-Oil Developing	-27.11 (2.30)	-1.77 (3.31)	1.94 (2.25)	-0.01 (1.60)				0.26 (3.67	.968	2.25	0.05

1/ The t-statistics are in parentheses
2/ Corrected for second order autocorrelation ρ_1 = -.961 (3.67); ρ_2 = -.513 (1.89)
3/ Corrected for first order autocorrelation ρ_1 = .444 (1.73)
4/ Estimated over the period 1972 to 1981
5/ Corrected for first order autocorrelation ρ_1 = -.511 (2.26).

competitors would contribute to an increase in their exports. These increased exports are brought about by an increase in both the demand for exports by importing groups and the supply of exports from exporting groups.

The estimated coefficients on the real effective exchange rate for manufacturing exporters to each of the three markets are all less than one in absolute terms. By contrast, the size of the estimated coefficient on the real effective exchange rate for the net oil exporters is greater than one in each of the three markets, perhaps reflecting the lack of trade barriers imposed against oil products and the ability of importing countries to find domestic resources to substitute for imported oil.

For the low-income and middle-income exporting groups the weighting scheme used to calculate the real effective exchange rate has been simplified in two ways. First, competition in third markets has been eliminated so that only domestic competition is taken into account and consequently δ has been given a value of zero in equation (7). Third market competition is relatively unimportant for most primary producers. Second, when the market is the industrial and OPEC countries, the primary commodities index in U.S. dollars (PCI) was used to represent the price in the importing country—(PD_q) in equation (7)—because for the industrial country and OPEC country market groups the importing country offers little competition in the form of domestic production. Thus for low-income and middle-income country exports to industrial and OPEC country markets, the real effective exchange rate takes into account one price on the demand side and the competition on the supply side among producers of primary commodities. The size of the estimated coefficients on the real effective exchange rate for the low-income and middle-income country groups is, in general, smaller than the sizes of the coefficients for the other two groups. The demand for primary products is generally less price-elastic than the demand for manufactured products, and the difference in the coefficients between these two sets of groups reflects this fact.

These measures of the real effective exchange rate sensitivity must be viewed with caution. The real effective exchange rate variable is based on the nominal exchange rate, the consumer price index and the weighting scheme described in equation (7). Furthermore, in the equations for manufacturing exporters and net oil exporters the consumer price index was used as a proxy for the export price because of lack of alternative indices. Thus the real effective exchange rate here reflects third country competitor domestic prices rather than third country competitor export prices.

The principal explanatory variables for exports from non-oil developing countries are gross national product (or gross domestic product) in

the market groups, whose coefficients range from 0.51 to 2.91. Exports of manufacturing exporters show the greatest sensitivity to short-term fluctuations in industrial country markets, followed by exports of middle-income countries to non-oil developing country markets. Exports from middle-income countries and net oil exporters to OPEC country markets are less responsive to short-term fluctuations in demand. Total non-oil developing country exports show the greatest sensitivity to short-term fluctuations in GNP in industrial country markets (2.39), followed by non-oil developing country markets (1.57) and OPEC markets (1.52). 1/ These elasticities are presented in Table 2.

Output, measured by deviation from trend, was included in the supply equations of the developing countries in order to capture the effects of domestic "recession-boom" on exports. One problem with including output in the equations is that it is not independent of GNP in the market countries, or of exports in the supplying countries; thus, its inclusion in the equations makes it difficult to accurately interpret the value or significance of the regression coefficients. This problem was particularly severe for the net oil exporters and consequently this variable was dropped from the equations for this analytical group. The output variable was not included in the equations for the low-income and middle-income groups because the concept is not a particularly meaningful one for producers of primary commodities.

In the equations for exporters of manufactures the inclusion of output (measured by deviation from trend) did not change the size of the coefficients on the other variables. Furthermore, the sign of the coefficient is negative for all three market groups though not significant at the 95 percent level. The size of the coefficient for the OPEC market group is much larger than the size of the coefficients for the two other groups. Thus, as domestic output rises in the exporters of manufactures group, much of the additional exports may go to OPEC countries because of the lack of trade barriers against non-oil developing countries in those markets.

In the specification of the model, the time trend was included to represent long-run factors that affect both the demand and supply of exports. The estimated coefficients for the time trend are negative for most of the equations. However, for the manufacturing exporters the estimated coefficients are positive for two of the three importing groups. The change in the structure of their economies that produced the high growth rates in domestic production of manufactures also produced high

1/ These elasticities are calculated by summing and weighting the elasticities over the four analytical subgroups. The weights used are the exporting group's share in the importing group's imports for the year 1980.

Table 2. Developing Countries: Elasticities of Real Exports with Respect to
Real GNP in Industrial, OPEC and Non-Oil Developing Countries, 1967 to 1981

	Industrial Countries	OPEC Countries	Non-Oil Developing Countries	Exporting 1/ Group's Exports to all Markets
Net oil exporters	1.97	0.55	1.94	1.92
Net oil importers				
Major exporters of manufactures	2.91	1.88	0.85	2.25
Low-income countries (excluding India and People's Republic of China)	1.28	1.37	1.36	1.32
Other net oil importers	1.42	0.51	2.84	1.71
Total non-oil developing country exports to each market 2/	2.39	1.52	1.57	2.01

1/   The weights of industrial, OPEC, and non-oil developing country markets in
each exporting group's exports in 1980 were used to obtain the total elasticity for
each group's exports to all markets.
2/   The weights of each exporting group's exports in total non-oil developing
country exports in 1980 were used to obtain the total elasticity for all non-oil
developing country exports to each market.

growth rates in the export sector; this change was probably brought
about by increases in the capital stock. This would give a positive
coefficient on the supply side. Furthermore, large increases in the
manufacturing exporters' shares in all three importing groups have taken
place on the demand side over the period 1967-1981. 1/ The above obser-
vations are borne out by the equation for manufacturing exporters exports
to OPEC markets. The negative coefficient on the trend variable for
manufacturing exporters' exports to industrial countries does not con-
flict with the above observation, as the large increase in manufacturing
exporters' exports to industrial countries may have coincided with the
shorter run changes in GNP. The estimated negative coefficient in the
equation here is thought to reflect the growing curtailment of imports
of manufactures from non-oil developing countries that has taken place
in the industrial countries over the 1970s. 2/ For exports from low-
income and middle-income countries the negative trend in the equations
for industrial country and non-oil developing country markets is likely
to be picking up long-run structural changes on the supply side. The
positive coefficient on the time trend for low-and middle-income count-
ries exports to OPEC countries reflects the huge structural changes in
OPEC country import growth over the 1970's. The second time trend (t_2)
was included to represent structural changes in non-oil developing country
economies which took place in 1970-71.

The dummy variables were included in the equations to represent the
effects of the two oil crises--1973-74/DOIL 1 and 1979-80/DOIL 2--on non-
oil developing country exports. The oil crisis dummy has a negative co-
efficient for the middle-income and low-income groups exports to industrial
and non-oil developing country markets; these negative coefficients show
the deleterious effect that higher oil prices have on non-oil developing
country exports because higher oil prices increase their production costs.
Exports of net oil exporters to industrial and non-oil developing country
markets increase when oil prices rise. Nevertheless, the same group's
exports to OPEC markets increased after the first oil crisis and fell
after the second. A possible explanation is that import demand of oil
exporting countries was more restrained after the 1979-80 oil price
increase than after the earlier price increase.

1/ Equations were also run using a market share approach, and the esti-
timated positive coefficients obtained on the trend term for these equa-
tions support this claim.

2/ From the early 1970s industrial countries adopted a series of piece-
meal measures to curtail imports of textiles, clothing, footwear, elec-
tronics, steel and ships, (among other items). For example, a multifibre
agreement negotiated in 1973 and extended to the end of 1981, limits annual
export growth rates from developing countries to 6 percent. With the
onset of the 1975 recession, imports of other items began to be curtailed.

V. Conclusions

Economic developments in the non-oil developing countries over the past decade or so have been dominated by the need for export earnings as a means of achieving a sustainable current account and, in some cases, as a means of supporting the policies of import substitution adopted by these countries in the late 1950s and the 1960s. The difficulties many of the non-oil developing countries have faced in recent years arise from the fall in world demand for their products, at a time whe domestic policies that had turned relative prices against the export sector were beginning to take effect. This paper analyzes the impact that these two important events have had on the exports of the non-oil developing countries.

To facilitate a quantitative assessment of the effects of industrial country growth, real effective exchange rate changes, and output growth in the domestic economies on the exports of non-oil developing countries, a model explaining the volume of exports from these countries has been estimated. In explaining the volume of exports flowing from the non-oil developing countries to their market countries, seven groups of countries have been distinguished--four exporting groups and three importing groups-- and a distinction has been made between the responsiveness of exporting groups to both short-term fluctuations and long-term developments.

These non-oil developing countries have been grouped in order to answer more broadly based policy questions than would be possible for an individual developing country. Examples of the type of policy questions that can be answered from this analysis are: (i) how much does devaluation by a group of exporting countries increase their exports, and (ii) how much do changes in GNP in importing countries change exports of groups of non-oil developing countries. The empirical evidence demonstrates that the real effective exchange rate, market country GNP, and output (as measured by deviations from trend), as well as long-term developments, all play an important role in the determination of exports of groups of non-oil developing countries. In general, the exports from non-oil developing countries are strongly influenced by real effective exchange rate changes. The results indicate that exchange rate policy in the non-oil developing countries as a group, should be successful in promoting export growth in these countries, by increasing both the demand for and the supply of their products. The paper also shows that flows of exports from the non-oil developing countries are strongly influenced by market country GNP. Short-term fluctuations in industrial country GNP appears to have a greater impact on non-oil developing country exports than short-term fluctuations in GNP in the other two market groups.

Finally, no discussion of developing country exports would be complete without highlighting the longer-term structural developments that have taken place in both importing and exporting countries. On the

demand side, there is no doubt that the share of LDC's exports among
imports of manufacturers in industrial countries has grown considerably.
However, measures taken in the industrial countries and the non-oil
developing countries *to curtail imports probably had a detrimental impact*
on non-oil developing country exports. By contrast, the longer-run
developments in OPEC markets have had a beneficial impact on non-oil
developing country exports. On the supply side, structural developments
are much more varied; however, for the low-income and middle-income
groups there is some evidence that the negative coefficient on the trend
term is picking up long-run structural changes.

Classification of Countries

The classification of countries adopted in this paper is the same as the one adopted by the Fund in December 1979 and utilized in International Financial Statistics and the World Economic Outlook (1983).

Industrial countries comprise

Australia	Germany, Fed. Rep	New Zealand
Austria	Iceland	Norway
Belgium	Ireland	Spain
Canada	Italy	Sweden
Denmark	Japan	Switzerland
Finland	Luxembourg	United Kingdom
France	Netherlands	United States

Oil Exporting Countries comprise

Algeria	Kuwait	Qatar
Indonesia	Libya	Saudi Arabia
Iran	Nigeria	United Arab Emirates
Iraq	Oman	Venezuela

Non-oil Developing Countries:

The four sample exporting groups of non-oil developing countries distinguished in the paper are as follows:

Net Oil Exporters comprise

Ecuador	Mexico	Syrian Arab Republic
Egypt	Peru	Tunisia
Malaysia		

Low-Income Countries comprise

Bangladesh	Pakistan	Tanzania
Kenya	Sudan	Zaire
Madagascar		

Middle-Income Countries comprise

Cameroon	Guatemala	Romania
Chile	Ivory Coast	Thailand
Columbia	Morocco	Turkey
Ghana	Philippines	Zambia

Major Exporters of Manufactures comprise

Argentina	Israel	South Africa
Brazil	Korea	Yugoslavia
Greece	Portugal	
Hong Kong	Singapore	

1. Definitions of the Variables in the Model

E_p Country p's local currency per U.S. dollar, in index form. (1980 = 100)

GDP_p Index of country's p's domestic output in index form 1980 = 100

$GDPT_p$ Index of country p's potential domestic output in index form

GNP_q Real gross national product in country q (in billions of U.S. dollars in 1980 market prices).

MV_q Volume of imports of country q (in billions of U.S. dollars and in 1980 prices).

P_p or P_s Consumer price index for country p or country s in local currency (1980 = 100).

PCI   Primary Commodities Index, in U.S. dollars (1980 = 100)

XV_{pq} or XV_{ps} Volume of exports from country p to country q, or market country s. (in billions of U.S. dollars and in 1980 prices).

2. Data Sources

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