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ECONOMIC EFFECTS OF HIGHER OIL PRICES ON THE  
TERMS OF TRADE AND GROWTH IN  
DEVELOPING COUNTRIES

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ABSTRACT

This study examines the movement in the terms of trade and its subsequent effect on economic growth of a sample of non-oil developing countries for the period of 1960 to 1979. Results indicate that the terms of trade have declined significantly in the 1970's. Export and import price index equations were estimated to determine importance of world commodity prices in explaining movements in terms of trade. Results indicate that higher oil prices in the 1970's caused significant deterioration in the terms of trade for the sample of non-oil developing countries.

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For over 30 years problems associated with economic development of developing countries (DC's) comprising two-thirds of the world's population and much of its geographical area have received a good deal of attention from economists. However, it is only recently that widely fluctuating commodity prices and rapidly increased oil prices have renewed interest in focusing on the importance of international trade and its subsequent effect in promoting economic efficiency and growth.

In evaluating the role of international trade in the process of economic development, the literature, in general, is divided into two contrasting approaches. The classical approach, originated by Adam Smith, views international trade not only as providing a "vent for surplus" and extended division of labor by widening of the markets, but it also serves as an "engine of growth" for the transfer of benefits of industrialization and modern technology from the developed countries to the DC's (Myint, Marshal, Robertson, Nurkse).

Those opposing the classical methods are the structuralists. Their approach to international trade focuses on the adverse effects of movements in the terms of trade on economic growth of DC's. The central argument of the structuralist is that international trade has benefited more the developed countries than the DC's (Chambers and Gordon, Kravis, Lewis, Myrdal, Prebish, Singer). Their argument is based on the reasoning that

prices received by DC's for their exports of primary commodities over the last several decades have been declining, while their import prices have been increasing. For the DC's, therefore, the terms of trade have deteriorated with the result that real incomes in these countries have not increased, and their capacity to import has remained low. Hence, their economic development also remains low.

The process of economic growth and development through trade has been jeopardized in a number of DC's, particularly in the non-oil developing countries (NODC's) during the 1970's. Growth in the NODC's measured by GNP per capita declined from an average annual rate of 3.1 percent in 1960-70 period to 2.7 percent in the 1970-80 period<sup>1</sup>. Among the NODC's a lower growth performance occurred for the low-income non-oil developing countries (LINODC's). These countries' growth in GNP per capita declined by 44 percent in the 1970's from what it was in the 1960's. For the middle-income non-oil developing countries (MINODC's) growth declined by about 14 percent for the same time period. The projected outlook for NODC's as a whole for the 1980's shows a further decline in per capita growth rates.

Among the causes responsible for the recent past and projected slow growth rates are the continuing recession and inflation in the developed countries (which comprise the NODC's most important markets) and the dramatic rise in the price of crude oil. Increased energy prices have wide ranging effects, including their own large contribution to the deterioration in the terms of trade for NODC's. The increase in oil prices has increased the real cost of imported energy by 64 percent from 1975 to 1980. For these countries the projected real cost of imported oil is

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<sup>1</sup> Much of this discussion of growth is taken from World Development Report, The World Bank, 1980.

expected to double by 1985 and triple by 1990 from what it was in 1975.<sup>2</sup> Thus, rising oil prices are a question of vital concern to these countries.

The purpose of this study is to examine the movement in the terms of trade between 1960 and 1979 for a randomly selected group of LINODC's and MINODC's. In particular, the study will attempt to examine the contribution of higher oil prices in the 1970's to the deterioration of the terms of trade and the subsequent effect of growth in these countries.

### Terms of Trade

Terms of trade is defined as an index of relative prices of exports to imports and is a major determinant of the international allocation of resources and consequently the global distribution of income in a free trade system (Rahman). Several alternative measures of the terms of trade are reported in the literature. The two simplest and most commonly used measures are the net barter terms of trade (NBTT) and the purchasing power of exports (PPOE).

The NBTT is defined as the ratio of the index of export prices, EPI, to the index of import prices, MPI. A rise in NBTT indicates a favorable movement of terms of trade, while a fall in NBTT indicates an opposite movement. The NBTT allows for changes in price of exports but does not allow for changes in the volume of exports. However, a decline in export prices, and thus a deterioration in NBTT, can be offset by an expansion in volume of exports. The PPOE corrects for this discrepancy. It is calculated by multiplying NBTT by the quantity or volume of exports index (VOE). An increase in PPOE indicates a country can obtain a larger volume of imports from the sale of its exports, while a fall in PPOE indicates the opposite.

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<sup>2</sup> See World Development Report, The World Bank, 1980.

The terms of trade measures defined above explain only whether there is a deterioration or an improvement in the terms of trade of a country but do not indicate what import or export commodity price is most responsible for either situation. To determine the most important commodity or group of commodities in changing the terms of trade an export and import price index model is used.

#### Model Development

The NBTT as defined above is the ratio of the export price index to the import price index. Individual countries are presumed to be price takers. Therefore, export and import price indexes are presumed to be a reflection of weighted world prices. The weights for a particular country are determined by the quantities of exports and imports for that country. An analysis of the composition of exports and imports for individual countries help to determine the specific explanatory functions. The variables hypothesized to contribute to a quantitative explanation of the export price index are the world price indexes of agricultural products, minerals, and non-ferrous metals. On the import side, the quantitative explanation is hypothesized to come from world price indexes of cereals, crude petroleum, and manufactured goods. The equations are expressed as follows:

$$EPI_{it} = f (WAGPI_t, WMIPI_t, WNFMPI_t)$$

$$MPI_{it} = f (WCERSPI_t, WCRPETPI_t, WMANGOPI_t)$$

where

$EPI_{it}$  = export price index for country i in year t

$MPI_{it}$  = import price index for country i in year t

$WAGPI_t$  = world price index of agricultural products in year t

- $WMIPI_t$  = world price index of minerals in year  $t$   
 $WNFMPI_t$  = world price index of non-ferrous metals in year  $t$   
 $WCERSPI_t$  = world price index of cereals in year  $t$   
 $WCRPETPI_t$  = world price index of crude petroleum in year  $t$   
 $WMANGOPI_t$  = World price index of manufactured goods in year  $t$

### Model Estimation

#### The Data

Data for the export and import price indexes are from the Handbook of International Trade and Development Statistics, Supplement 1980, UNCOTAD, UN, N.Y., 1980. Data for the exogenous variables in both equations are from Methods Used in Compiling the United Nations Price Indexes for Basic Commodities in International Trade, UN Statistical papers, Series M, No.29, Rev. 2, N.Y., 1979 and UN Monthly Bulletin of Statistics, UN, N.Y., 1980. The sample of countries consists of 15 LINODC's and 15 MINODC's of the more than 80 NODC's.

The parameters of the equations are estimated using ordinary least squares procedures (OLS). Under normal conditions the relationships in the model are expected to be positive. Since differences are found among the sample countries in response to changes in a given world commodity price, specific equations are estimated for each country.

#### The Results

In the 1960's the export price indexes for most of the LINODC's fluctuated with a slight downward trend, while at the same time their import price indexes increased steadily. Export price indexes, however, remained higher than import price indexes throughout the decade for most



of the countries. This resulted in a general fluctuation of their NBTT for the same time period. For the MINODC's, export and import price indexes rose proportionally in the 1960's. The export price indexes were slightly higher for about half of the countries in the group resulting in an improvement of their NBTT. The NBTT for the other half either declined or fluctuated.

In contrast to the 1960's, both the export and import price indexes in the 1970's increased significantly for the LINODC's. However, the export price indexes did not rise as fast as the import price indexes; particularly after 1974. This was also true for the MINODC's. This resulted in the NBTT of both groups of countries to decline for most of the 1970's. The increase in the import price indexes since 1974 can be attributed to higher costs of imported manufactured goods and oil.

The PPOE for both the LINODC's and MINODC's increased in the 1960's. In general the rise in the PPOE indexes reflects the upward movement of the VOE since the change in the NBTT for the same time period was slight. The PPOE indexes in the 1970's for LINODC's fluctuated or declined, while the index for the MINODC's fluctuated erratically. Almost all of the LINODC's showed a drop in their PPOE indexes in the last part of the decade, which parallels the decline in VOE indexes for the same time period.

Analysis of the composition of exports and imports led to the exclusion of some of the variables in the export and import price index equations for some of the countries in the sample. Results of the estimated equations are presented only for the LINODC's (Tables 1 and 2).

In general, both the export and import equations showed highly significant coefficients. The performance of the variables in accounting for total variation in the dependent variable was very high. All the variables

in both the export and import price index equations had positive effects on the dependent variables. There was no autocorrelation indicated in the residuals for either the export or import equations in the model.

From the estimated export and import price index equations the corresponding elasticities of NBTT were calculated. The estimated elasticities were generally less than one. Among the variables included in the import equation, WMANGOPI was the most important variable in influencing the NBTT for both the LINODC's and MINODC's. However, an application of the estimated elasticities to the ratio of the percentage change in the price index of the commodity in question to the percentage change in total world commodity price index revealed different results particularly for the 1970's. These results, i.e., the relative percentage change in the terms of trade, are presented for the LINODC's in Tables 3 and 4 for the 1960's and 1970's, respectively.

The results of the estimated relative changes in NBTT associated with changes in the export and import prices for the 1960's were generally comparable with the magnitude of the estimated elasticities. The import variable WMANGOPI contributed the largest share in the changes of the terms of trade of the countries under study. For the 1970's the estimated relative changes in NBTT for all LINODC's was influenced overwhelmingly by the import variable WCRPETPI. The total effect of NBTT of changes in the price index of the commodities under study varies from country to country for the two time periods. However, the estimates show that changes in the real price of the commodities under study in the 1970's have caused the terms of trade of the LINODC's to decline by a larger percentage than in the 1960's. These findings were also true for the MINODC's.

TABLE 1. STATISTICAL PARAMETERS OF THE ESTIMATED EXPORT PRICE INDEX  
EQUATION FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES\*

Country	Estimated Coefficients			R <sup>2</sup> %	DW
	CONSTANT	WAGPI	WMIPI		
Malawi	1.1518 (0.2126)	0.6072 <sup>a</sup> (4.3285)	0.4080 (1.9251)	95	1.30
Sri Lanka	-14.7120 (-1.0869)	0.8893 <sup>a</sup> (2.5381)	0.5533 (1.0452)	85	0.98
Benin	11.6609 <sup>a</sup> (3.8436)	0.9318 <sup>a</sup> (23.9239)	-- --	97	1.72
Burma	9.7988 (1.1663)	0.5994 <sup>a</sup> (2.7559)	0.4269 (1.2991)	88	0.66
Cen. Afr. Rep.	-5.0919 (-0.4937)	0.9733 <sup>a</sup> (3.6454)	0.2623 (0.6499)	89	0.95
Mozambique	-11.9605 <sup>a</sup> (-3.7823)	0.4923 <sup>a</sup> (6.0138)	0.5764 <sup>a</sup> (4.6603)	98	1.61
Mauritania	35.5533 <sup>a</sup> (12.1391)	0.1683 <sup>a</sup> (2.2204)	0.4954 <sup>a</sup> (4.3251)	95	1.93
Pakistan	-4.2777 (-0.9409)	0.7374 <sup>a</sup> (6.2662)	0.3288 <sup>b</sup> (1.8489)	97	1.51
Senegal	-25.4730 <sup>a</sup> (-4.8358)	0.5803 <sup>a</sup> (4.2555)	0.6482 <sup>a</sup> (3.1464)	96	1.47
Chad	-9.4971 (-1.2053)	0.9644 <sup>a</sup> (4.7284)	0.2432 (0.7893)	93	1.35
Niger	6.7257 <sup>b</sup> (2.1293)	0.9203 <sup>a</sup> (22.6932)	-- --	97	1.32
Sudan	-15.9320 <sup>a</sup> (-3.3634)	0.7561 <sup>a</sup> (6.1665)	0.3432 <sup>b</sup> (1.8526)	97	2.10
Upper Volta	4.7447 (1.1066)	0.9668 <sup>a</sup> (17.5636)	--	94	1.07
Uganda	-20.1417 (-0.9810)	1.5503 <sup>a</sup> (2.9170)	-- --	80	1.17
Bangladesh	19.3523 <sup>a</sup> (2.6615)	0.3665 <sup>b</sup> (1.9469)	0.5211 <sup>b</sup> (1.8325)	86	0.65

\*The figures in parentheses are the t-values.

<sup>a</sup>Significant at .01 level.

<sup>b</sup>Significant at .05 level.

<sup>c</sup>Significant at .10 level.

TABLE 2. STATISTICAL PARAMETERS OF THE ESTIMATED IMPORT PRICE INDEX EQUATION FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES\*

Country	Estimated Coefficients				R <sup>2</sup> %	DW
	CONSTANT	WCERSPI	WCRPETPI	WMANGOPI		
Malawi	4.2037 (1.4301)	0.0507 (1.2870)	0.0965 <sup>a</sup> (2.2425)	0.8382 <sup>a</sup> (12.9238)	99	1.35
Sri Lanka	7.9562 <sup>a</sup> (3.3739)	0.0427 <sup>c</sup> (1.3544)	0.3933 <sup>a</sup> (11.4034)	0.4988 <sup>a</sup> (9.5946)	99	2.03
Benin	5.3798 <sup>b</sup> (2.1124)	0.0374 (1.0976)	0.1553 <sup>a</sup> (4.1690)	0.7728 <sup>a</sup> (13.7645)	98	1.27
Burma	7.6976 <sup>a</sup> (2.3109)	0.0017 (0.0374)	0.2262 <sup>a</sup> (4.6419)	0.7191 <sup>a</sup> (9.7930)	99	1.23
Cen. Afr. Rep.	6.7927 <sup>c</sup> (1.4734)	0.0428 (0.6938)	0.1545 <sup>a</sup> (2.2915)	0.7790 <sup>a</sup> (7.6658)	99	1.43
Mozambique	8.5281 <sup>a</sup> (2.3853)	-- --	0.3028 <sup>a</sup> (5.7077)	0.6357 <sup>a</sup> (7.3823)	99	1.75
Mauritania	3.6027 (1.3058)	0.0614 <sup>c</sup> (1.6629)	0.1157 <sup>a</sup> (2.8668)	0.8109 <sup>a</sup> (13.3325)	99	1.25
Pakistan	6.5918 <sup>a</sup> (2.5199)	0.0552 <sup>b</sup> (1.8248)	0.2679 <sup>a</sup> (8.1099)	0.6365 <sup>a</sup> (12.7825)	99	1.14
Senegal	6.6846 <sup>a</sup> (2.8401)	0.0461 <sup>c</sup> (1.4661)	0.2427 <sup>a</sup> (6.9873)	0.6612 <sup>a</sup> (12.7885)	99	1.68
Chad	3.5403 (0.7557)	0.0654 (1.0439)	0.0970 <sup>c</sup> (1.4152)	0.8434 <sup>a</sup> (8.1667)	99	1.58
Niger	7.1272 <sup>a</sup> (2.1696)	0.0355 (0.8086)	0.1629 <sup>a</sup> (3.3908)	0.7635 <sup>a</sup> (10.5435)	99	1.19
Sudan	6.6834 <sup>a</sup> (2.2918)	0.0332 (0.8496)	0.2266 <sup>a</sup> (5.3132)	0.6981 <sup>a</sup> (10.8591)	93	1.29
Upper Volta	6.2670 <sup>b</sup> (1.9421)	0.0558 (1.2913)	0.1226 <sup>a</sup> (2.5976)	0.7908 (11.1174)	99	1.24
Uganda	7.9962 <sup>b</sup> (2.0209)	0.0141 (0.2662)	0.2259 <sup>a</sup> (3.9040)	0.7158 <sup>a</sup> (8.2067)	99	1.38
Bangladesh	7.0510 <sup>b</sup> (2.0991)	0.0545 (1.2115)	0.2613 <sup>a</sup> (5.3188)	0.6466 <sup>a</sup> *8.7315)	99	1.25

\*The figures in parentheses are t-values.

<sup>a</sup>Significant at .01 level.

<sup>b</sup>Significant at .05 level.

<sup>c</sup>Significant at .10 level.

TABLE 3. RELATIVE EFFECT OF EXPORT AND IMPORT VARIABLES ON  
NBTT FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES,  
1960-69 (PERCENT)

Country	Estimated Changes Associated With					Total
	Export Variables		Import Variables			
	WAGPI	WMIPI	WCERSPI	WCRPETPI	WMANGOPI	
Malawi	0.43	-0.46	-0.06	0.03	-1.88	-1.94
Sri Lanka	0.48	-0.47	-0.04	0.10	-1.03	-0.96
Benin	0.57	---	-0.04	0.04	-1.75	-1.18
Burma	0.36	-0.41	*	0.06	-1.60	-1.59
Cen. Afr. Rep.	0.60	-0.26	-0.05	0.04	-1.76	-1.43
Mozambique	0.41	-0.77	---	0.08	-1.50	-1.78
Mauritania	0.09	-0.46	-0.07	0.03	-1.70	-2.11
Pakistan	0.52	-0.37	-0.08	0.08	-1.70	-1.55
Senegal	0.54	-0.97	-0.06	0.07	-1.65	-2.07
Chad	0.66	-0.26	-0.08	0.03	-1.93	-1.31
Niger	0.62	---	-0.04	0.04	-1.72	-1.11
Sudan	0.70	-0.48	-0.04	0.06	-1.69	-1.45
Upper Volata	0.65	---	-0.07	0.03	-1.79	-1.18
Uganda	0.88	---	-0.02	0.06	-1.71	-0.79
Banglādesh	0.21	-0.49	-0.06	0.07	-1.40	-1.67

\*The percentage change in NBTT is insignificant.

TABLE 4. RELATIVE EFFECT OF EXPORT AND IMPORT VARIABLES ON  
NBTT FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES,  
1970-79 (PERCENT)

Country	Estimated Changes Associated With					Total
	Export Variables		Import Variables			
	WAGPI	WMIPI	WCERSPI	WCRPETPI	WMANGOPI	
Malawi	0.64	0.34	-0.04	-1.54	-0.86	-1.46
Sri Lanka	0.72	0.36	-0.03	-5.64	-0.47	-5.04
Benin	0.87	--	-0.03	-2.47	-0.80	-2.43
Burma	0.54	0.31	*	-3.48	-0.73	-3.36
Cen. Afr. Rep.	0.91	0.20	-0.03	-2.46	-0.80	-2.18
Mozambique	0.62	0.58	--	-4.89	-0.69	-4.38
Mauritania	0.14	0.34	-0.04	-1.69	-0.77	-2.02
Pakistan	0.78	0.28	-0.05	-4.92	-0.77	-4.68
Senegal	0.81	0.73	-0.04	-4.18	-0.75	-3.43
Chad	0.99	0.20	-0.05	-1.51	-0.88	-1.25
Niger	0.94	--	-0.03	-2.55	-0.78	-2.42
Sudan	1.05	0.36	-0.03	-3.80	-0.82	-3.19
Upper Volat	0.98	--	-0.04	-1.91	-0.82	-1.79
Uganda	1.33	--	-0.01	-3.71	-0.78	-3.17
Bangladesh	0.32	0.37	-0.04	-3.92	-0.64	-3.91

\*The percentage change in NBTT in insignificant.

### Summary and Conclusions

The empirical results of NBTT for the 1960's show a general fluctuation for the LINODC's, while it either declined or fluctuated for about half of the MINODC's. In contrast, the pattern of the NBTT in both the LINODC's and MINODC's in the 1970's was considerably different than that of the 1960's. The NBTT for the LINODC's in general and the MINODC's in particular declined steadily in this period. Greater deterioration in NBTT indexes for both groups of countries occurred from 1974 to 1979.

The findings of the PPOE indexes for the 1960's show, with few exceptions, an increase for both the LINODC's and MINODC's. The PPOE in the 1970's was substantially different than that of the 1960's. This index either declined or fluctuated for the LINODC's, while it fluctuated erratically for most of the MINODC's.

Based on the results of the static export and import equations used to identify empirically the major factors that have contributed to the movement in the terms of trade, it appears that higher oil prices in the 1970's have been the cause for the significant deterioration in the terms of trade of NODC's for this time period. This finding is consistent with other related studies in the recent past. Effects of this deterioration in the terms of trade are reflected in economic growth rates and debt levels of NODC's (these results are not presented in this article because of limited space). This implies that these countries, in their quest for increased economic growth, must look both to expanding their own energy resources and to making more efficient use of the energy they import.

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