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

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# CHAPTER I

## INTRODUCTION

Since the late 1940's 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 all over the world. Economic development has been rediscovered as both an academic and a practical subject of paramount importance. The study of development problems has had a stimulating influence on several related economic fields. A clear example is the increased attention given to international trade.[1] In the last thirty years, a substantial number of publications devoted to international trade in both developed and developing countries bears witness to a revised interest in this field of economics.

In general, these publications are divided into two contrasting approaches in evaluating the role of international trade in the process of economic development. The classical approach, originated by Adam Smith, viewed international trade not only as providing a "vent for surplus" produce and extended division of labor by widening of the markets but, it was also serving as an "engine of growth"[2] or transmission belt for the transfer of the benefits of industrialization and modern technology from the developed to the DC's [3]. In short, in the classical economist's view, there can be no question that international trade ranks very high among the contributors to economic growth. As Marshall stated,

"The causes which determine the economic progress of nations belong to the study of international trade" [4, p. 270]. However, the contribution of international trade to economic growth and development to DC's has been a subject under debate in both the scholarly writings and the international forums on the subject.[3]

Those leading the debate in opposition to the classical approach are the structuralists. The structuralist approach to international trade focuses on the adverse movements in the terms of trade and its implications on the balance of payments, real income and living standards, development, the level of employment and the rate of inflation. The central argument of the structuralist is that international trade, instead of being an "engine of growth", has frequently turned out to be an instrument of exploitation of DC's by developed countries [11]. This argument is based on the reasoning that developed countries have had the best of both worlds, both as consumers of primary commodities[4] (where the prices have been declining) and as producers of manufactured goods (where the prices have been increasing). In contrast, the DC's had the worst of both worlds, as consumers of manufactured goods and as producers of primary commodities. The argument continues that, as the result of declining prices of primary commodities over the last several decades, the trends in the terms of trade[5] have shown to turn against the DC's with the result that real incomes have not increased, capacity to import has remained low, and hence economic development also remains low.

The unfavorable trend in the DC's terms of trade that has existed for some time, particularly since 1953 (the end of Korean War), was reversed by the commodity boom which began in the latter part of 1972

due to the rapid increase of overall demand and shortages of particular commodities resulting from unfavorable climatic conditions. However, the improvement in the terms of trade of these countries was relatively short lived (except for oil exporting countries) and the position of this group of countries has subsequently deteriorated.

The purpose of this study is to examine the problem of unfavorable terms of trade - which a great majority of DC's suffered - between 1960 and 1979 for two randomly selected groups of developing countries.[6] 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 its impact on the economic development of the non-oil developing countries (NODC's).

## The Decade of the 1970's - A Global Perspective

The decade of the 1970's (1971-80) was marked by a series of global economic shocks including a notable slowdown in the growth of developed countries, high rates of inflation, and a dramatic rise in the price of crude oil. NODC's were hard hit by increases in the costs of imported capital goods and food and unusually large fluctuations in commodity prices. In addition to these shocks, factors characterizing the decade for the NODC's included protectionist pressures in the industrialized countries, worsening food production problems (especially in Sub-Saharan Africa), mounting social pressures, and an increase in the number of absolute poor [14].[7]

Economic growth measured by gross domestic product (GDP) declined from 5.4 percent in the 1961-73 period to 3.6 percent in the 1974-79 period for the world as a whole (Table I). The growth rate fell sharply,

TABLE I

ANNUAL GROWTH RATES OF GROSS DOMESTIC PRODUCT
BY COUNTRY GROUP, 1961-1980
(1977 PRICES)

| Country Group | Percent | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1961-1973 | 1974-1979 | 1976 | 1977 | 1978 | 1979[a] | 1980[b] |
| World | 5.4 | 3.6 | 5.4 | 4.5 | 4.4 | 3.4 | 2.5 |
| Developed Countries | 5.0 | 2.7 | 5.3 | 3.8 | 3.9 | 3.2 | 1.5 |
| Developing Countries | 6.0 | 5.2 | 7.1 | 5.6 | 4.4 | 5.0 | 5 |
| Oil Producing DC's | 7.5 | 5.4 | 12.3 | 5.6 | 2.6 | 4.2 | 5 |
| Non-Oil DC's | 5.4 | 5.2 | 5.0 | 5.6 | 5.2 | 5.4 | 5 |
| Centrally Planned - Countries | 6.7 | 5.2 | 4.5 | 5.8 | 5.8 | 2.7 | 4.5 |

[a]Preliminary

[b]Forecast

Source: World Economic Survey, Current Trends in the World Economy, Department of International Economic and Social Affairs, UN, New York, 1980.

particularly for developed countries, from 5.0 percent in the 1961-73 period to 2.7 percent in the 1974-79 period. Preliminary figures for 1980 indicate a further slowdown of GDP growth for these countries. In contrast, the growth rate of DC's as a whole fell by 0.8 percent from the 1961-73 period to the 1974-79 period.

The economic expansion of the NODC's in the period of 1974-79 was about the same as the rate achieved in the 1961-73 period. While in general terms such a growth rate may be considered satisfactory (given past and current economic situations) it was still below the target of six percent set for the Second United Nations Development Decade (Table II). Other parameters, such as average annual rate of growth for exports, imports and agricultural output by country group was also presented in Table II. In each case the target rate for NODC's was not reached.

Among the NODC's the overall improvement in growth performance was due to a comparatively high growth rate in ten more diversified economies.[8] The majority of these countries (26 of 49) experienced a slowdown in the rate of growth. In fact, growth in these countries in the 1970's (about three percent) barely kept pace with the rise in population which was growing at an average annual rate of 2.5 percent [14].

Especially worrisome was the poor performance of the agricultural sector in these countries (Table II). The pattern of economic development emerging in many developing countries is one of relatively rapid industrial growth and relatively stagnant agricultural production. Perhaps the most crucial cause (for the poor performance) thus far has been the apparent neglect of the agricultural sector by these countries in

TABLE II

TARGETS FOR THE SECOND UNITED NATIONS DEVELOPMENT DECADE AND ACTUAL PERFORMANCE FROM 1970 TO 1980 (PERCENTAGE ANNUAL RATE OF INCREASE, EXCEPT WHERE OTHERWISE INDICATED)

| Country Group and Item | Target rate indicated in the International Development Strategy for the Second United Nations Development Decade, 1970 to 1980 | Annual Average rate of increase from 1970 to 1978[a] |
|---|---|---|
| Developing countries[b] | | |
| Gross domestic product | | |
| Total developing countries | 6 | 5.5 |
| Low-income countries | More than 6 | 3.2 |
| Per capita gross domestic product | | |
| Total developing countries | 3.5 | 2.8 |
| Low-income countries | More than 3.5 | 0.6 |
| Agricultural output | 4 | 2.9[c] |
| Industrial output | . . . | 5.5 |
| Manufacturing output | 8 | 6.8 |
| Exports[d] | Somewhat higher than 7 | 4.5 |
| Imports[d] | Somewhat less than 7 | 9.3 |
| Net official development assistance | 0.7 percent of gross national product of economically advanced countries[e] | 0.3 percent of gross national product of developed market economies[f] |
| Net (total) financial resource transfers | 1 percent of gross national product of economically advanced countries[g] | 1 percent of gross national product of developed market economies[f] |

TABLE II (Continued)

| Country Group and item | Target rate indicated in the International Development Strategy for the Second United Nations Development Decade, 1970 to 1980 | Annual Average rate of increase from 1980 to 1978[a] |
|---|---|---|
| Developed market economies | | |
| Gross domestic product | . . . | 3.4 |
| Developed centrally planned economies | . . . | 6.0 |

[a] Based on data in 1975 prices.

[b] Excluding centrally planned economies, because of lack of comparable data. Low-income countries refer to the developing countries with per capita incomes of less than $300 in 1975 at market prices of that year.

[c] The comparable figure for gross output is 2.6.

[d] Goods and non-factor services. The comparable figures exclusive of petroleum-exporting countries for the last column are: exports, 7.4 ; imports 6.7.

[e] By the middle of the Decade.

[f] Average for 1975-1978 for the countries that are members of the Development Assistance Committee of the Organization for Economic Co-operation and Development.

[g] By 1972, but not later than 1975.

Source: Shaping Accelerated Development and International Changes, Department of International Economic and Social Affairs, UN, 1980, p. 3.

the past decades, whatever their social system. Furthermore, agriculture is the main source of foreign-exchange earnings for most of these countries.

According to a United Nations (UN) study, lagging agricultural growth was a major reason for the failure to reach the development targets of the 1970's [15]. The same study explains the role of agriculture in the developing countries' economy as follows:

> A higher rate of food and agricultural production and a reduction of food losses are prerequisites for better living conditions of the rural populations of developing countries, for sustainable improvements in nutritional standards of urban as well as rural people, for slowing the rural exodus to the towns and for the provision of solid base to the process of industrialization which alone can enable poor countries to progress along the road to economic development [p. 14].

The Third Development Decade (1981-1990) report of the UN [16] describes what the UN believes are the crucial development issues for the decade beginning in 1981. Not surprisingly, one of the issue is agricultural growth. According to this report, developing countries, in the low-income as well as in the middle-income countries, need to reach four percent average annual growth in agricultural production. The feasibility of this annual growth was made under the assumptions that there will be increases in supply of current inputs and capital investment. Furthermore, increases in rural infrastructure and needed changes in land tenure and rural institutions will also take place. To meet this objective, developing countries must increase their annual investment in agriculture to a level 50 percent higher, in real terms, by 1990 as compared with 1980. To make full use of these investments, current inputs to production must be almost tripled in the same period.

However, a similar target for the second development decade remained unfilled due to the sudden, massive price increases in their essential imports, primarily oil, food, and fertilizers, and by the impending global economic slowdown which in turn weakened demand for the exports of developing countries and reduced their prospects for foreign exchange earnings. Given that oil prices are expected to continue increasing in this decade and that rates of growth in the world economy may be substantially less than in recent decades, whether the target set for agricultural growth by the UN in its third development decade for developing countries will be fulfilled remains to be seen.

## Statement of the Problem

Prospects for growth in the NODC's during the decade of the 1980's appear unfavorable. The most probable outcome for at least the next five years is that average annual per capita growth of the NODC's will drop in 1980-85 to 1.8 percent from 3.1 percent in the 1960's and 2.7 percent in the 1970's (Table III). More depressing still is the outlook for the 1.1 billion people who live in the poorest countries. Their already low per capita income, less than $220 per year, is likely to grow by about one percent a year (an average of $2 or $3 per person). The estimate, in fact, shows that there will be a negative growth (0.3 per cent) for the 141 million people in the low-income countries of Sub-Saharan Africa. For the other three groups of countries, the average annual per capita growth in the 1980-85 period is estimated to be about the same as it was in the 1970-80 period.

Among the causes responsible for the recent past and projected slow growth are higher world oil prices (Figure 1) and the subsequent reduced

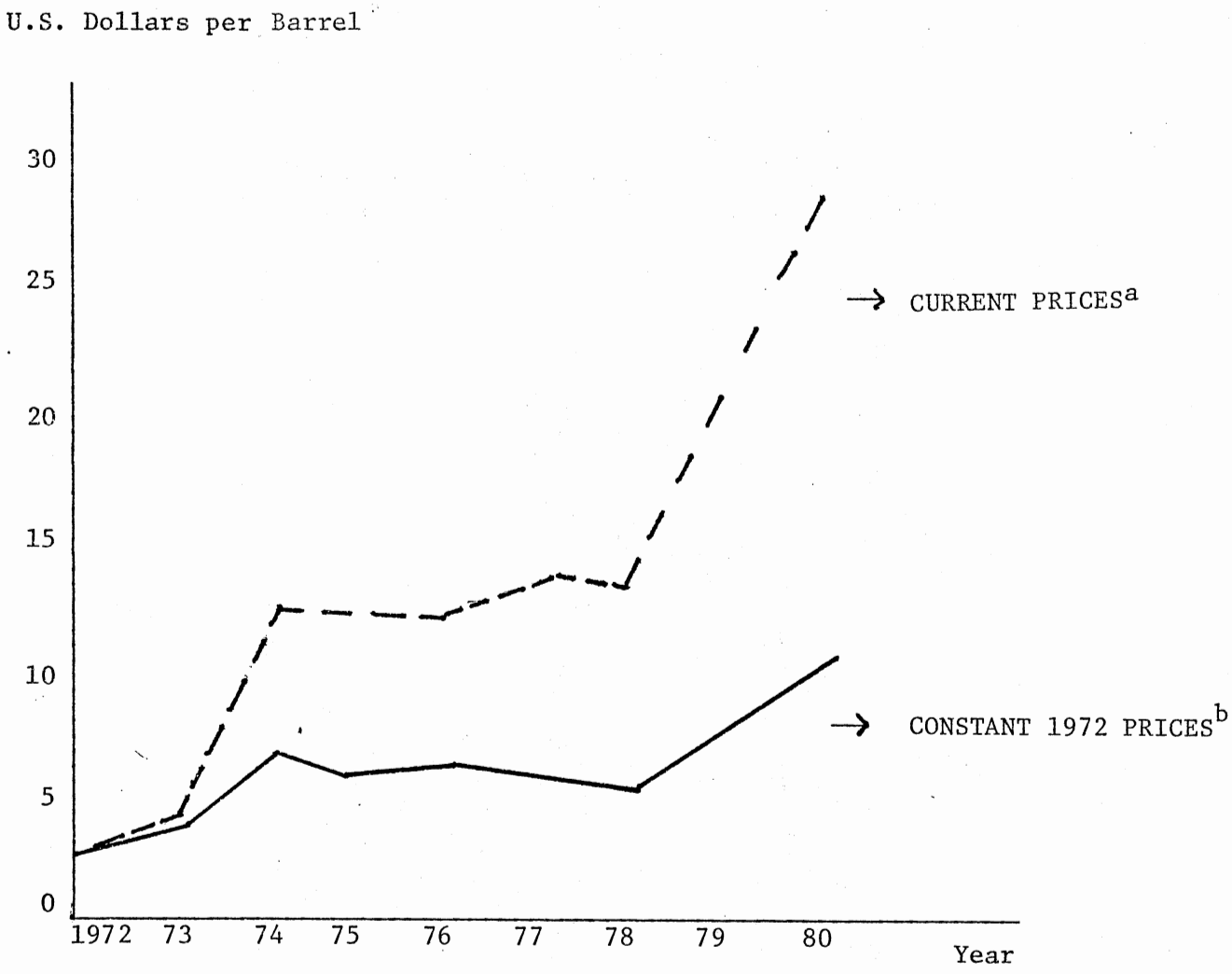
TABLE III

GROWTH OF GNP PER CAPITA BY COUNTRY GROUP, 1960-90

| Country Group | Population 1980 (Mill's) | GNP Per Capita 1980 Dollars | Average Annual Percentage Growth[a] | | | |
|---|---|---|---|---|---|---|
| | | | Actual | | Projected | |
| | | | 1960-1970 | 1970-1980 | 1980-1985 | 1985-1990 |
| Non-Oil DC's | 1,834 | 751 | 3.1 | 2.7 | 1.8 | 2.2 |
| Low Income | 1,133 | 216 | 1.6 | 0.9 | 1.0 | 1.3 |
| Sub-Saharan Africa | 141 | 239 | 1.6 | 0.2 | -0.3 | 0.1 |
| Asia | 992 | 212 | 1.6 | 1.1 | 1.1 | 1.5 |
| Middle-Income | 701 | 1,638 | 3.6 | 3.1 | 2.0 | 2.4 |
| Oil-Producing DC's | 456 | 968 | 2.8 | 3.5 | 3.0 | 3.0 |
| Industrialized Countries | 671 | 9,684 | 3.9 | 2.4 | 2.5 | 2.5 |
| Centrally Planned Economies | 1,386 | 1,720 | - | 3.8 | 3.3 | 3.3 |

[a]Calculated in 1977 dollars.

Source: World Development Report, The World Bank, 1980.




[a]Prices Weighted by Production Shares

[b]Deflated by Manufactured Export Prices

Source: World Development Report, The World Bank, 1980, p. 14.

Figure 1. World Petroleum Prices, Annual Average, 1972-80

terms of trade, and the continuing recession in the industrialized nations. The sharp increase in oil prices has more than doubled the NODC's cost of imported energy from 1975 to 1980 (Table IV). The total import bill of oil for these countries in general rose to $57.8 billion in 1980 from $22.1 billion in 1975, an increase in cost of 171 percent in just six years. The volume of oil imports by these countries, however, increased only by 8.2 percent in 1980 compared to 1975. This indicates that, during this period, price increases of oil have contributed the largest share in the NODC's total import bill of oil. Thus, rising oil prices are a question of vital concern to these countries.

For these countries, the impact of higher oil prices can be felt in a variety of ways. Energy fuels are indispensible for modernizing industry and agriculture. One of the many petrochemical based products that has significant potential for developing countries is fertilizer.

It is widely agreed that fertilizer is probably the single most important physical factor in determining the level of agricultural productivity. A study made by the United Nations Food and Agriculture Organization (FAO) found that three-fourths of the variation in per acre grain yields among a group of forty countries was associated with variation in per acre fertilizer consumption. In the words of the foreward to the study, ". . . the investigation makes it clear that any country which aims at increasing the production of food and economic crops must plan to increase the consumption of fertilizer" [17, p. v]. This finding is supported by a sample study based on 156 cultivators in one district of India [18]. The study shows an increased level of production from fertilizer use as an input and thus an important factor for enhancing the margin of additional net income to the cultivators.

TABLE IV

NET IMPORTS OF OIL BY NON-OIL DEVELOPING COUNTRIES, 1975-90.

| Oil Imports for Energy Use Only | 1975 | 1978 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| Volume (Millions of Barrels per Day) | 4.9 | 5.8 | 5.3 | 5.8 | 6.9 |
| Low-Income Countries | 0.4 | 0.4 | 0.3 | 0.3 | 0.4 |
| Middle-Income Countries | 4.5 | 5.4 | 5.0 | 5.5 | 6.5 |
| Cost (Billions of Dollars) | 22.1 | 29.2 | 57.8 | 107.2 | 198.0 |
| Low-Income Countries | 1.8 | 2.1 | 3.3 | 6.0 | 11.0 |
| Middle-Income Countries | 20.3 | 27.1 | 54.5 | 101.2 | 186.9 |
| Price Per Barrel, (c.i.f.)[a] | | | | | |
| Current Dollars | 12.33 | 13.70 | 29.80 | 50.30 | 78.30 |
| Constant 1980 Dollars | 19.60 | 17.13 | 29.80 | 35.10 | 40.85 |

[a]Cost, insurance and freight.

Source: World Development Report, The World Bank, 1980.

Energy is a necessity for modern industrial processes which involve chemical transformation such as manufacturing cement or steel. Energy is an irreplaceable element of final consumer demand such as for transportation and lighting.[9] Given the heavy influence that the economic activity of developed countries has on developing countries, the (oil-induced) slow growth in developed countries' economies has put a brake on their volume of imports. Together with protectionism, this limits exports of the developing countries and, hence, their foreign exchange earnings.

Imports of oil constitute from about one-fifth to one-third of the total import bill (about $10 billion in 1974) of developing countries and as much as one-half in some countries. Rising international oil prices requires these countries to devote a larger proportion of their reduced foreign exchange earnings to paying for oil. This limits capacity for other imports (such as capital goods) needed to meet economic development. Added to these adverse features is the high rate of inflation which leads to a continuous increase in world prices of manufactured goods, while prices of primary commodities (which form the basis of most developing countries' export earnings) have been declining and are expected to continue declining [14] leading to further deterioration of the terms of trade of these countries.

Finally, the terms of trade loss from the sharp price increases for crude oil and other energy products and from the rise in the price of manufactured products imported from the industrialized countries, together with a marked slowdown in their own export growth, has pushed the oil importing developing countries into massive current account deficits.[10] Their collective deficits rose from $8.3 billion in 1970 to $39.6 billion

in 1975 when it represented a peak of 5.1 percent of their GNP. By 1978, the aggregate deficit of these countries had fallen to $27.1 billion or 2.3 percent of their GNP. However, it rose once again to an estimated $61.0 billion in 1980 (Appendix A). As a result, in many of these countries development lost momentum and investment in capital goods needed for growth was curtailed.

Although current account deficits in 1980 were slightly less as a percentage of GNP than in 1975, low-income developing countries will face serious problems in the years to come. Their current account deficit is expected to increase in 1985 and 1990 by 3.8 percent and 3.9 percent of their GNP, respectively. Since the low-income non-oil developing countries have only limited access to commercial funds and, unfortunately, aid prospects are not encouraging, deficits of this size would be impossible for these countries to finance and thus further slow their growth.

## Objectives

The general objective of this study is to analyze the impact of higher oil prices on the terms of trade and the subsequent effect on economic growth of randomly selected low-income non-oil developing countries (LINODC's) and middle-income non-oil developing countries (MINODC's) for the period of 1960 to 1979. The specific objectives are to:

1. Determine the direction and magnitude of changes in the import and export price indexes of the sample of NODC's and the subsequent implications on the movement of the net barter terms of trade (NBTT).

2. Determine the direction and magnitude of changes in the purchasing power of exports (PPOE) and its effect on the NODC's capacity to import.

3. Analyze the contribution of higher oil prices to the movement in the terms of trade of the sample of NODC's.

4. Determine the contribution of the terms of trade to the constraints on economic growth of NODC's.

5. Analyze the overall implications of higher oil prices on the economic growth and development of the sample of NODC's.

## Hypothesis

The central hypothesis to be tested is that the rapid escalations of oil prices, in late 1973 and early 1974 and again in 1979, have had major adverse impacts on the terms of trade of NODC's and their subsequent economic growth and development. More precisely the oil price shocks of the 1970's have played a dominant role in bringing about:

1. Increases in the index of import prices for NODC's and thus a worsening of the terms of trade.

2. A reduction in export growth of NODC's through a slowing down of economic growth in the developed countries.

3. A consistent savings constraint to growth due to the need of consumers to spend more for energy and have less savings for investment.

## Organization of Remainder of Thesis

The remaining chapters of the thesis are organized as follows. Chapter II shows the effect of higher oil prices on oil importing nations in general both from the short-run and long-run point of view. It also reviews those economic factors that are influenced by the impact of higher oil prices. Specifically the chapter discusses the argument whether the developing countries in general and the non-oil developing countries in particular suffered a deterioration in their terms of trade over the years.

Chapter III describes the different concepts of the terms of trade used to measure the gains from international trade. Although the terms of trade have been such an important and, at times, contentious topic of discussion, it is subject to a number of limitations that may distort the results of measurements. This chapter examines these shortcomings. The chapter further discusses the advantages and disadvantages of different index methods used in the construction of the terms of trade.

A description of the composition and growth of exports and imports is given in Chapter IV to provide the necessary background for succeeding chapters. This chapter also presents the empirical results of the terms of trade of the sample of NODC's for the time period of 1960 to 1979.

Chapter V describes the theoretical concept used to systematically identify the factors most important in determining the NBTT for the decades of the 1960's and 1970's for the sample of NODC's. This chapter also provides the empirical findings of the theoretical framework.

Chapter VI delineates the proposed "two-gap" model that is used to determine the contribution of the terms of trade to the constraints on economic growth of the sample countries. Empirical results also are provided in this chapter.

An examination of growth performance in the 1970's of the sample countries under study is presented in Chapter VII. A dynamic income determination model is described in this chapter. Empirical results are provided based on the relationships described in the model.

Finally, a summary of the main findings of this study and the general conclusions regarding the terms of trade and its subsequent effect on

growth are offered in Chapter VIII. The limitations of the study along with some suggestions for future research are also considered.

FOOTNOTES

[1]The subject of international economics is traditionally divided into two distinct parts; international finance and international trade. International finance is concerned with foreign exchange rates, the balance of payments and the way they interact with the domestic macroeconomy. International trade is concerned with the causes of and benefits from country to country exchanges of commodities, services, technology and even corporations and people themselves [1]. More effort is devoted to international trade in this study than to international finance.

[2]This famous phrase was introduced by Robertson in his 1938 article "The Future of International Trade" [2].

[3]According to Ragnar Nurkse [5], trade in the 19th Century was an "engine of growth" for the regions of recent settlement (Argentina, Australia, Canada, New Zealand, South Africa, Uruguay and the United States). However, he suggested trade for the developing countries of the 20th Century can no longer be relied upon to be an "engine of growth". See his reasons for this conclusion on page 95. Other writers such as Prebisch [6], Singer [7], and Myrdal [8] have taken a more extreme view of international trade being an "engine of growth". They, in fact, argue that trade is detrimental to the development propsects of the developing countries. For recent arguments against trade being an "engine of growth" see Kravis [9], and Chambers and Gordon [10].

[4]For the purpose of this study primary commodities or products are defined as products of the land, produced by forms of agriculture (including food, agricultural raw materials, livestock and timber) or extracted by mining and subjected to a limited amount of processing. Some examples of primary commodities are: tin, copper, rubber, coffee, tea, cocoa, bananas, and petroleum. For more discussion and other definitions of primary commodities see Rowe [12] and Brown [13].

[5]The terms of trade is defined as an index of relative prices of exports and imports. See Chapter II and III for further discussion.

[6]For the purpose of this study the method of grouping of the developing countries by GNP per person is based on the 1980 World Bank publication, World Development Report [14].

[7]Absolute poverty is generally measured by numbers of percentages of population below some poverty level.

[8]These countries are Argentina, Brazil, Colombia, Egypt, Malaysia, Mexico, South Korea, Thailand, Chile and Yugoslavia. These countries experienced rates of growth of GDP ranging from six percent to nine percent in 1979. See Statistical Year Book of UN, 1979.

[9]The role of kerosene as lighting in developing countries is particularly important in seeking to spread literacy into rural villages with lack electrification.

[10]Current account deficit is defined as a deficit in the balance of payments due to current transactions on goods and services and transfer payments. It is the difference between export of goods and services and import of goods and services plus transfer payments.

# CHAPTER II

# REVIEW OF THE MAJOR ECONOMIC EFFECTS OF HIGHER OIL PRICES

## Introduction

The oil crisis has been an important factor in the general development of the non-oil developing countries (NODC's) in the recent past, having far reaching immediate and long-run implications. It is a major factor in accounting for their economic performance during the Second Development Decade (1971-80). Present evidence indicates it also will be a major factor in accounting for their performance during the Third Development Decade.

The purpose of this chapter is to review those economic factors highly influenced by the impact of higher oil prices including the terms of trade, the balance of payments, export growth, and food and agricultural production of the NODC's. There is a significant body of work in each of these categories.

Since 1972, world commodity prices have risen at rates unequaled for over a quarter of a century. This dramatic change of commodity prices attracted much attention and has caused particular concern.[1] The major contributor to increased commodity prices has been crude oil (Table IV and Figure 1). Several factors accounted for crude oil price increases including increased demand, reduced supplies and formation of the Organization of Petroleum Exporting Countries (OPEC)[2] in 1960. But

there were also substantial increases in agricultural prices which exceeded those of manufactured goods. In 1973, the cost of imported food by NODC's had risen some $4.5 billion (U.S.) above the level of the preceeding year, largely as a consequence of price increases [19]. Prices of food grains stayed at these higher levels in 1974, in fact, rising somewhat higher on an average, further compounding the effect on the already heavy financial outlays for needed food grains.

In general terms, the effect of higher oil prices on oil importing nations (both developing and developed) is summarized, both from the short-run and long-run point of view, by Dunkerly and Steinfeld [20]. The increase on oil prices leads to sizable increases in total cost of imports particularly since it is difficult to reduce oil consumption substantially in the short-run. In the absence of a reduction in other imports or an equivalent increase in exports, trade balances deteriorate and the resulting deficits have to be financed by borrowing or by running down foreign exchange reserves.

Internally, rising oil prices lead to inflation.[3] Consumer prices rose from 7.5 percent in 1978 to almost 10 percent in 1979 for developed economies and from 20.7 percent in 1978 to 32.6 percent in 1979 for developing economies (Table V). While the increase in inflation rates was universal for developing economies, the most dramatic increases took place in the regions of West Asia and the Western Hemisphere. The need for consumers to spend more for energy means that there is less money to buy other goods and services. In the absence of countervailing measures, demand for the other goods falls and economic activity declines. The rise in prices of imported oil, therefore, has simultaneous inflationary and deflationary repercussions on the domestic economy. These combined

TABLE V

WORLD MARKET ECONOMIES ANNUAL RATES OF CHANGE
IN CONSUMER PRICES, 1971-1979

| Country Group | Annual Average 1971-1978 | 1977 | 1978 | 1979[a] |
|---|---|---|---|---|
| Developed Market Economies | 8.1 | 8.4 | 7.5 | 9.9 |
| Major Industrial Countries | 7.7 | 7.7 | 6.8 | 9.4 |
| Other Industrial Countries | 7.9 | 7.3 | 5.5 | 5.3 |
| Primary Producing Countries[b] | 13.5 | 18.1 | 17.3 | 20.0 |
| Developing Market Economies | 15.0 | 21.5 | 20.7 | 32.6 |
| Oil Exporting | 12.1 | 15.8 | 11.0 | 14.3 |
| Non-Oil Exporting[c] | 15.9 | 23.2 | 23.4 | 36.5 |
| Africa | 12.7 | 23.4 | 21.1 | 28.2 |
| South and East Asia | 9.5 | 8.1 | 5.8 | 9.8 |
| West Asia | 18.8 | 22.9 | 29.0 | 50.5 |
| Western Hemisphere | 23.7 | 40.6 | 39.4 | 55.7 |

[a]For developing countries, the average of months available in 1979 in relation to the average of the same months in 1978.

[b]Countries such as Australia and New Zealand are heavily dependent upon agriculture yet, on the basis of the usual criteria for development, especially the criterion on income per capita, are usually included among the developed countries of the world.

[c]Including Yugoslavia.

Source: World Economic Survey, Current Trends in the World Economy, Department of International Economic and Social Affairs, UN, NY, 1980.

inflationary and deflationary effects in the industrial countries further deteriorates the terms of trade of developing countries in two ways: (1) price of imports from industrialized countries rise as a result of inflation; and, (2) the slowdown in economic growth in the developed world makes it difficult for developing countries to maintain their level of exports. Since the terms of trade, which is highly influenced by the oil price increases of the 1970's, largely determines the gain from international trade, it is discussed in depth in the next section.

## The Terms of Trade

The net effect of the increase in the price of oil and other primary commodities, together with widespread inflation in the developing countries, was a substantial change in their terms of trade of the NODC's. The terms of trade is an index of relative prices of exports and imports which is a major determinant of the international allocation of resources and consequently the global distribution of income in a free trade situation [22].[4]

The terms of trade, according to Rostow [23] is of particular importance for at least three reasons. Movements in the terms of trade have come to play an increased role in the expansion of modern economic history, as a shorthand index of certain complex forces operating on the balance of payments of real wages, as well as a way of isolating an important factor determining relative income changes as between one country (or sector) and the international (or national) economy. Second, movements in the terms of trade hold central positions in the analysis of current international (and inter-sectoral) economic problems, such as international transfer of income and changes in world demand and

supplies of basic commodities, and in the formation of policy designed to solve these problems. Third, the terms of trade concept has its roots planted into now largely separated bodies of economic thought: the short-run theory of international trade and the theory of economic development. For the past several years, economists and political scientists increasingly have devoted attention to bringing together these lines of theory (Prebisch, Singer, Lewis, Myrdal, Viner, Kindleberger, Ellsworth, Morgan, Haberler and Taussing).

There are different concepts or alternative measures of the terms of trade. They are net barter or commodity, the gross barter, single-factoral, double-factoral, income or purchasing power of exports or capacity to import, and utility terms of trade.[5] Thus, despite a common heritage of doctrine, theories of the terms of trade can be distinguished in their techniques of analysis.

The terms of trade are said to deteriorate for a country if export prices decline relative to import prices, even though both may rise. Historically, the prices of primary commodities (the exports of most developing countries) have declined relative to manufactured goods (the exports of developed countries). As a result, the terms of trade of NODC's have deteriorated while they have improved for developed countries.[6] The well-known theory of "secular deterioration"[7] supports this point through arguments which are both analytical and empirical.

The explanation for this hypothesis or theory is based on the following reasons:[8] (1) low income elasticity of demand for primary products which is a generalized version of Engel's Law;[9] (2) nonadaptability of supply in developing countries, i.e., supply inelasticities; (3) differences in the methods of distributing productivity gains (productivity

gains in countries producing manufacturers take the form of higher incomes rather than lower prices while productivity gains in countries producing primary materials tend to be passed on to the consumer in the form of lower prices); and (4) development of substitutes for many primary commodities, as a result of technological progress by developed countries, which decreases the demand for raw material input needed for manufacturing output.

Of the various empirical studies, the most challenged is that of Prebisch [11, 27]. He made use of the "inverse" of the United Kingdom's (UK) terms of trade to show losses of the developing countries[10] (i.e., the improvement in UK terms of trade was achieved at the expense of DC's). Referring to the period of some sixty years between 1876 and 1938, he concluded that the developing countries suffered a 36 percent loss in their terms of trade.

This provoked a barrage of criticism against Prebisch by several writers, notably Haberler, Meier, Morgan, Ellsworth, Baldwin and Kindleberger. Haberler [28] has these basic objections to the argument. First, the terms of trade does not allow for changes in quality and makes insufficient allowances for new products. This introduces a bias because industrial products have improved substantially in quality. Second, the terms of trade index leaves out services. For the index of the British terms of trade, prices are taken c.i.f. (cost, insurance and freight) at British ports of entry and export prices f.o.b. (free on board) at British ports of exit. Therefore, he argues, in the case of a change in transportation cost, it is impossible even in a two country model to regard the terms of trade of one partner as an accurate index of the terms

of trade of the other. Third, the British terms of trade cannot be taken without verification as representative of the terms of trade of other developed countries.

Further objection came from Ellsworth [29] who, using more aggregative methods, reaches the conclusion that for the period from 1876 to 1905 a larger proportion, and perhaps all, of the decline in the British prices of primary products can be attributed to the great decline in inward freight rates. Since the price of the British manufactured exports fell in this period by 15 percent, the terms of trade of primary countries, where f.o.b. prices were used for their exports as well as for their imports, may well have moved in their favor.

This view is also supported by Morgan [30]. Morgan argues that, due to low costs of transportation, primary producers of the world outside Britain, for the past century and more, have been receiving a price for their products that fell short of the price in Britain and other importing countries by a smaller and smaller amount. During the same period, primary producers of the world have been paying prices for their imports of manufacturers that exceeded the prices of manufacturers in Britain and other industrial countries by a smaller and smaller amount. These two distortions, he said, work in the same direction, i.e., producers of primary goods have been doing much better in the past century and more than the British data indicate. His conclusion, therefore, is that the widely used British data are unreliable as a measure of long-run price position of primary producers. As a check on the above reasoning, he took time series data (1787-1953) from six primary producing countries[11] and found a variety of experiences of the terms of trade

among these countries. In his view, the experience of one country should not lead to generalizations concerning experience of other countries.

Another challenge to Prebisch's view is that of Baldwin [31]. He argues that no allowance is made for the introduction of new commodities which have been the case in the industrial products more than in primary products. According to Baldwin, since historically the price of a new product is decreasing rapidly in the early years, this omission means that, in the ordinary terms of trade calculations, the export price index is higher relative to the import price index in the British series than would be the case if the price of the new product has been included.

Kindleberger [32], in his study of the terms of trade of Europe, has constructed a rough index of the current account terms of trade (including services) and seems to confirm all of the above findings against Prebisch's argument. From his calculation of indices for other European countries, he concluded that they do not support the generalization which is based on the United Kingdom terms of trade alone.

However, Kindleberger found some support for a somewhat different proposition. He states that the question of the terms of trade between developed and developing countries should not be identified with that between manufactured and primary products because developed countries also export primary products and developing countries often export manufactured products.

In summary the critics of the "secular deterioration" hypothesis (almost all of whom are from developed countries) have essentially the following contentions according to Mannur [33]:

1. There is no convincing statistical or analytical proof to show that historically the developing countries have suffered a deterioration in the commodity terms of trade.

2. Even if it can be statistically shown that the commodity terms of trade have deteriorated for the developing countries, the argument remains because the declining commodity terms do not necessarily mean reduction in the real incomes and the welfare of developing countries. Improvements in the commodity terms of trade are not always desirable.

3. In fact, the entire concept of commodity terms of trade is inappropriate in relating terms of trade with the question of developing countries economic well-being. One should rather look into other concepts of terms of trade as well before pronouncing any judgment on welfare implications of a given behavior in terms of trade [p. 54].

There may be lack of historical proof to support the argument that developing countries have suffered a "secular deterioration" in the terms of trade, but the post World War II data show that the commodity terms of trade favor developed countries and discriminate against the developing countries.

Prebisch estimated [34] that from 1950 to 1961 the terms of trade of primary commodities fell by 26 percent compared to manufacturers, and the terms of trade for developing countries compared to developed countries fell by 17 percent. The difference is due to much primary export production taking place in developed countries and some developing countries exporting manufactures. This is evidence to the earlier proposition by Kindleberger that developing countries are not the sole exporters of agricultural products to the complete exclusion of developed countries.

In his report, Prebisch [34] was mainly concerned with the long term trend of developing countries' growth. Taking the target of five percent annual growth as set out in the UN First Development Decade (1961-1970),

he anticipated an annual growth of six percent in import requirements (growing faster than national output because of the need to import capital equipment) against a projected export volume growth of four percent a year based on the experience of the 1950's.

Furthermore, during the 1950's, because of deterioration in the terms of trade, Prebisch stated that exports grew in total value by only two percent annually in terms of real purchasing power. Attempts, he said, by developing countries to diversify out of primary commodities were frustrated by trade barriers, this view is also supported by a report to the Club of Rome.[12] He called for compensation to be paid to make up for productivity gains in primary export production, the benefit of which had occurred to developed countries in the form of lower prices.

According to Todaro [35], between 1955 and 1970 the terms of trade for developed countries rose by over 10 percent while terms of trade of the developing countries fell by seven percent. For primary commodity exports, 1973 represented a return to the peak price levels of the Korean War [36]. However, this commodity boom has benefited mainly the richer primary producers, while the poorest suffered both from adverse terms of trade and lower export volumes. By the end of the 1970's, there was a decline in the terms of trade of virtually all of the NODC's [37].[13] The poorest countries were, in general, the most severely affected. For example, according to Chenery [38] their terms of trade, for 1977 and 1978, deteriorated by 20 percent which was twice as much as the fall in OECD countries.

Furthermore, in 1960, according to the UN Development Forum [39], a developing country could export 25 tons of rubber and earn enough to buy six tractors, but in 1975 it can only buy two tractors of the same kind

for the same 25 tons of rubber exports. The NODC's have increased the volume of their exports by over 30 percent in the last 20 years, but have seen their revenue go up by only four percent over the same 20 year period. Therefore, these countries have to sell even greater quantities of their primary products to purchase a given quantity of imports or they have to reduce imports which will result in a slowdown, even a decline, in their economic growth.

The fluctuations in the prices received by developing countries for their exports of primary commodities (other than oil) in the 1970's were accompanied by a steady rise in their import prices. Underlying this rise was not only the quadrupling of the price of oil in 1974, but also steep increases in prices of manufactured goods, basic food stuffs and fertilizer which is made more expensive by increased oil prices. During the period 1970 to 1975, price increases added $56 billion to the import costs of NODC's (Table VI). Of the total, price increases for manufacturers added $27 billion, for fuels $20 billion and for primary commodities $10 billion. During the same period, price increases added $36 billion to their total export earnings. Price increases added $20 billion to the trade deficit of these countries.

The net effect of these price movements was to bring about an almost continuous deterioration in aggregate terms of trade of all NODC's. Decline in the terms of trade has been the principal cause of the increased deficit in the balance of payments. It has been estimated that of the $31.3 billion increase in the deficit of the NODC's between 1970 and 1975, $26.3 billion may be attributed to price changes. The financing of these huge deficits, as explained earlier, places new and

TABLE VI

THE IMPACT OF PRICE AND VOLUME CHANGES ON THE IMPORTS AND EXPORTS OF DEVELOPING COUNTRIES 1970-1975[a]

| | (Billions of U.S. $) | | | | |
|---|---|---|---|---|---|
| | | | Increment 1970 to 1975 | | |
| | 1970 | 1975 | Total Change | Attributable to Price Change | Attributable to Volume Change |
| Imports (c.i.f.) | | | | | |
| Primary Commodities | 10.1 | 25.1 | 15.0 | 9.5 | 5.5 |
| Fuels | 4.9 | 25.5 | 20.6 | 19.5 | 1.1 |
| Manufactures | 29.3 | 75.8 | 46.5 | 27.3 | 19.2 |
| Total | 44.3 | 126.5 | 82.1 | 56.3 | 25.8 |
| Exports (f.o.b.) | | | | | |
| Total | 35.7 | 86.0 | 50.3 | 35.5 | 14.8 |

[a]Excluding oil exports.

Source: Review of International Trade and Development, UNCTAD, New York, 1978.

heavy burdens on countries and the problems of servicing the debts have acquired a new dimension in the 1970's.

The importance of the terms of trade for developing countries in general, and for NODC's in particular, can hardly be overstressed. Even minor changes in their terms of trade, given the high foreign trade ratios typical of most NODC's, produce financial hardships many times larger than the availability of foreign assistance and concessional credit. In comparison with credits, a favorable turn in the terms of trade has the same advantage as aid in that it does not require future resources in order to service the loans [40]. A UN estimate [41] shows that the improvements in the terms of trade of Latin America from 1946 to 1952 made available to that continent more than $11 billion for the seven year period. According to another UN study, a 10 percent change in the developing countries' terms of trade would modify their capacity to import by as much as $1.5 billion a year [11].

An appropriate adjustment in the developing countries (particularly the low-income NODC's) terms of trade by the developed countries in an effort to help the struggling NODC's to develop is, thus, necessary and urgent. In particular, the rate at which exports are exchanged for imports must improve if these countries are to increase their capacity to import from exports alone. Given the alarming balance-of-payments deficits, what happens to the terms of trade becomes all the more important if these countries want to reduce their reliance on foreign aid and foreign loans.

For those who accepted the "secular deterioration" hypothesis, some of the various policy recommendations that have been proposed as economically justifiable given the terms of trade experience of developing

countries are:[14] (1) tariff protection, (2) international price stabilization schemes, (3) international income transfers to compensate the developing countries for past and future losses of income, (4) increases in the bargaining power of primary producers through legislation, and (5) import-substitution. However, many writers argue that, since "secular deterioration" in terms of trade are much too ambiguous, some of the policy conclusions may make matters worse rather than better for developing countries. As Myrdal [40] recognizes, it is extremely doubtful that the poor countries have sufficient monopoly and monopsony power to improve their terms of trade by imposing restrictions.

## Balance of Payments Deficits

The balance of payments deficits have been a problem in practically all of the lower-income and some middle-income NODC's for some time, without the added burden of the increase in the price of oil. The balance of payments may be defined as a summary of all economic transactions between a country and the rest of the world for a given period of time [43].[15] The balance of payments reflect all payments due and made to the country as well as all liabilities accrued and paid to other countries. The difference between receipts and payments is either a surplus or deficit. Richardson [1] explains a deficit in the balance of payments as causing a country to lose official reserves which are socially useful by allowing governments to intervene in the foreign exchange market. This intervention usually stabilizes exchange rates which are important prices not only for international trade but also for domestic resource use.

In Richardson's view, the social value of official reserves has four overlapping aspects: (1) insuring a country against excessive depreciation, (2) insuring a country against disruption caused by unforeseen events such as crop failures, civil strife or war, (3) measuring of a country's international credit worthiness in the eyes of private and governmental lenders, and (4) financing investment in assets that do earn returns for the nation and for its citizens.

No period since World War II has been as difficult for the balance of payments of the NODC's as the seven years from the end of 1972 to the end of 1979. These balance of payments difficulties have usually been attributed to the oil price increases in late 1973 and early 1974 and again in mid and late 1979. The dramatic impact of energy-related imports on the balance of payments of the NODC's selected for this study can be seen by comparing the balance for 1971 and 1972 with the years following the price increases of 1973-74 (Appendix B).

A study by Powelson [45] shows that in 1975 the NODC's paid $11.4 billion more for their purchases of oil than in 1970 and they received back $5.2 billion in exchange for their exports. According to the same study, the impact on NODC's becomes more severe when indirect effects are counted. Not all NODC's have their own refineries, so to a large extent their purchases of petroleum products are not made directly from OPEC. For example, petrochemical products are supplied largely by developed nations. Indirectly, therefore part of the payment made by the industrialized countries covered oil whose increased final consumption occurred in NODC's.

El Serapy [46] argues that the oil price increases have certainly been part of the cause for the deterioration in the external payments

of NODC's. However, since the energy needs of the low-income countries are on the whole modest, the impact of the oil price increases on their balance of payments has been limited.

Others argue that the balance of payments problems of NODC's have also been affected by other factors such as interest payments on external debts [47]. The fact remains, however, that even though the oil price increase of the 1970's is only one factor contributing to the large deficit in the balance of payments of the NODC's, it has been the major element affecting the balance of payments in these countries. These countries have no alternative but to adjust without any delay to their new balance of payments equilibrium. This will not be easy for most countries and will be particularly difficult for the low-income countries.

The problem of how to control the balance of payments is known as the balance of payments adjustment problem. For various reasons, however, conventional adjustment mechanisms such as devaluation and/or deflation are not applicable to the current oil deficits problem [48].[16] Some other possible adjustment methods are: drawing on reserves, inflows of capital resources from other countries, improvements in terms of trade, a reduction of imports (both oil and non-oil imports), and growth and diversification of exports.[17]

In the short-run the prospects for relieving the balance of payments pressures of these countries through domestic adjustment (i.e. reduced consumption) to higher oil prices are not promising. Given that energy consumption per capita is only about one percent as much as the United States, it is doubtful that a significant reduction can be accomplished without causing a lower agricultural and industrial

production and thus a decline in economic growth. If exports could be increased to the levels which will neutralize the increase in the prices of their imports, the balance of payments problem would be solved. However, because of reduced economic growth in developed countries and lower import demands due to higher costs of oil, the problem of adjustment by the NODC's has been aggravated.

## Exports and Economic Growth

The role of exports in the process of economic growth and development has been discussed extensively -- both theoretically and empirically - in the literature on trade and development.[18] The base for this discussion is in terms of both direct and indirect effects of exports on growth of the economy. Emery [51] summarized these effects as follows.

> There are direct benefits from a high export growth rate.
>
> 1. A country's ability to increase its level of imports is improved. These imports include capital goods which are especially important in contributing to economic growth.
>
> 2. Concentration of investment tends to occur in the most efficient sectors of the economy, i.e., those in which the country enjoys a comparative advantage. Specialization in these products tends to increase overall productivity.
>
> 3. Internalization of gains from economies of scale since the international market added to the domestic market permits larger-scale operations than does the domestic market alone [p. 471].
>
> Indirectly, a dynamic export sector produces several benefits to economic growth.
>
> 1. It stimulates additional investments, both domestic and foreign. Where exports of a primary product are profitable and expanding, there is a stimulus to domestic investment in both the existing industries and in the

various processing industries associated with the product in its various stages of production. Expanding exports also encourage investment in ancillary industries set up to supply and service the operations of the main export industries. A rapid growth in exports also serves as an inducement to foreign investment in the country, particularly where the investment is profitable.

2. It increases flow of technological and market innovations, as well as managerial skills. Under the pressure of competition and the desire to continue expanding foreign sales, foreign techniques and methods are imported to further improve productivity and quality. This is beneficial for both the domestic exporter and the foreign importer, the latter often pressing for the new techniques to improve his own sales and profit position.

3. It stimulates increased consumption. As consumers become gradually aware of the foreign consumer products that they can obtain because of expanded export earnings, there is an increased desire to acquire these products. Thus, there is a kind of "demonstration effect" wherein individuals decide to increase their expenditures when they become aware of the existence of a large variety of goods or of superior goods [p. 472].

Emery concludes that all of these factors tend to reinforce each other, stimulating further expansion of exports, investment and consumption, with the result being a substantial rate of growth in real GNP.

Given the importance of exports to a country's economic growth and development, export instability (associated with fluctuations in primary commodity prices) and in recent years a slowdown in export growth of developing countries is a concern of paramount importance. Of particular interest to us is the latter problem that confronts the NODC's.

Many factors have undoubtedly contributed to the slowdown in the growth of NODC's exports. However, the most important factor appears to have been the oil induced recession in the developed countries, thus reducing their demand for imports from developing countries. A simple regression analysis associating deflated exports for 20 countries, which account for 85 percent of NODC's exports, and deflated output of

the Organization for Economic Cooperation and Development (OECD) countries for the period 1960-73 indicates a high correlation between these two variables [47]. The study also shows an association in OECD output and NODC's exports continuing during the years after 1972. Real exports of the NODC's expanded in 1973, 1976 and 1977, years in which OECD output increased relatively rapidly but exports grew little in 1974 and actually declined in 1975 when OECD output declined. Therefore, the level of real exports of NODC's appears to be closely tied to the level of economic activity in the remainder of the world. Hence, any rational policy for economic growth or development is made difficult in these countries by relatively large short-term fluctuations in their foreign exchange receipts from exports.

When export earnings decline, imports decline (since export earnings are used to finance imports), thereby jeopardizing development that is dependent on certain import requirements. If imports are not reduced, a problem that arises from a decline in export earnings is a short-run balance of payments deficit, which was explained above. Imports can be financed in other ways, some of which are similar to that used in the adjustment of the balance of payments. One way is through drawing down of foreign reserves. However, the capacity to finance imports from reserves is limited for most of the low-income NODC's where the level of reserves is seldom sufficient to carry them over any great length of time. Another way to finance imports is through foreign borrowing which was used extensively by most of the middle-income NODC's in the 1970's.[19] But, because of the current high level of foreign debt for most low-income NODC's, this option was and still is very limited.

Given these circumstances, the policy options of the low-income NODC's in their efforts to achieve economic growth (as measured by GNP) is also limited. According to the World Bank in its World Development Report [14], the GNP growth rates of these NODC's depend essentially on three factors: (1) their own efforts to increase savings and investments, (2) the availability of concessional finance, and (3) how efficiently they use domestic and foreign resources. Without more aid, the report indicates per capita GNP in these countries is unlikely to grow faster than 1.7 percent a year in the first half of the 1980's.

Unfortunately, the prospects of increased foreign assistance are not encouraging. As reported by Robert McNamara, past president of the World Bank, the Official Development Assistance (ODA) flows, including those from OPEC[20] countries, did not increase in the 1977-79 period [62]. In real terms, ODA has declined and the outlook for the future is not bright. Recent aid cuts announced by the British Government will cause their ODA to fall to .38 percent of GNP by 1985 from an average of .49 percent for 1977-79. Aid bills continue to face difficulties in the U.S. Congress. Finally, even though they indicated their intention to continue aid flows, Germany and Japan have not committed themselves to increasing the share of GNP allocated to concessional assistance.

The effects of higher oil prices have not only reduced overall exports of the NODC's, thus limiting their importing ability, but have also reduced agricultural output thus limiting food production and the use of agriculture as the traditional sector for generating export earnings.

## Decreased Food and Agricultural Production

Over the past two decades, agricultural output of all developing countries was relatively constant. According to a UN study, lagging agricultural growth was a major reason for the failure to reach the development targets of the 1970's [15].

Developing countries experienced respectable rates of growth of GDP during the 1960's (Chapter I). The greatest share of this overall growth, however, came not from the agricultural sector but from the manufacturing and commerce sectors. In fact, the contribution of agricultural output to the total GDP declined. This is in sharp contrast to the historical experience of developed countries where agricultural output in their early stage of development contributed the largest share in total GDP.

During the period 1970-75, agricultural production in developing countries increased at an average rate of two percent, while the total food production for the same time period increased at an average rate of 2.2 percent (Table VII). Per capita food production increased by less than one percent in the 1960's and actually declined in the early 1970's. Particularly distressing is the fact that per capita food production for the least developed countries has shown a sharp decline since the 1960's.

A decline occurred in both per capita agricultural and food production for each major region within the developing countries (Table VIII). In Latin America, there was some increase in the per capita growth of food production in the 1960's (0.6 percent). However, there was no increase in per capita agricultural production. In the 1970's,

TABLE VII

AGRICULTURAL AND FOOD PRODUCTION: KEY RESULTS IN THE SECOND DEVELOPMENT DECADE BY MAJOR DEVELOPING COUNTRY[a] CATEGORIES

| Growth Rates[b] | All Developing Countries | Major Petroleum Exporters | All Other Developing Countries | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Total | Fast-Growing Manufacturing Exporters | Remaining Countries | | | |
| | | | | | Total | Per Capita GNP $250 or Above | Per Capita GNP Under $250 | Of Which Least Developed Countries |
| Agricultural Production | | | | | | | | |
| 1961-1970 | 2.8 | 3.0 | 2.7 | 3.9 | 2.6 | 3.0 | 2.4 | 2.5 |
| 1970-1975 | 2.0 | 2.2 | 2.0 | 1.8 | 2.0 | 2.6 | 1.5 | 1.7 |
| 1970-1980 target | 4.0 | -- | -- | -- | -- | -- | -- | -- |
| Food Production | | | | | | | | |
| Total | | | | | | | | |
| 1961-1970 | 3.0 | 3.4 | 3.0 | 4.2 | 2.8 | 3.2 | 2.6 | 2.3 |
| 1970-1975 | 2.2 | 1.7 | 2.2 | 2.2 | 2.2 | 2.8 | 1.7 | 1.9 |
| Per Capita | | | | | | | | |
| 1961-1970 | 0.5 | 0.8 | 0.5 | 1.4 | 0.4 | 0.5 | 0.3 | -0.2 |
| 1970-1975 | -0.3 | -0.9 | -0.3 | -0.2 | -0.2 | 0.1 | -0.6 | -0.6 |

[a] According to preliminary estimates, during the year 1976 both agricultural and food production of developing countries as a whole grew by three to four percent.

[b] Trend rates.

Source: Review of International Trade and Development, UNCTAD, UN, New York, 1977.

TABLE VIII

ANNUAL GROWTH (AND STAGNATION) OF PER CAPITA FOOD AND AGRICULTURAL OUTPUT IN THIRD WORLD REGIONS, 1948-1979

| | Percent | | | | | |
|---|---|---|---|---|---|---|
| | Per Capita Food Production | | | Per Capita Agricultural Production | | |
| Region | 1948/52-70 | 1960-70 | 1970-79 | 1948/52-70 | 1960-70 | 1970-79 |
| Latin America | 0.4 | 0.6 | 0.9 | 0.2 | 0.0 | 0.6 |
| Far East (exc. Japan) | 0.8 | 0.3 | 0.5 | 0.7 | 0.3 | 0.4 |
| Near East (exc. Israel) | 0.7 | 0.0 | 0.7 | 0.8 | 0.0 | 0.5 |
| Africa (exc. S. Africa) | 0.0 | -0.7 | -1.2 | 0.3 | -0.5 | -1.5 |
| All Undeveloped Countries | 0.6 | 0.1 | 0.7 | 0.6 | 0.0 | 0.6 |
| Developed Capitalist Countries | 1.1 | 0.9 | 1.4 | 1.0 | 0.6 | 1.3 |

Source: K. Griffen, "Agrarian Policy: The Political and Economic Context", World Development, Vol. 1, No. 11, 1973, p. 3; Handbook of International Trade and Development Statistics, Supplement, 1980, UNCOTAD, UN, New York, 1980.

the per capita food production rose by 0.3 percent over what it was in the 1960's, while the increase in per capita agricultural production for the same time period was 0.6 percent. Compared to the pre-1960's, there was a decline in both measures of agricultural performance for the Far East. However, these measures improved slightly in the 1970's. During the 1960's, there was no growth in both the per capita food and agricultural production for the Near East region, but the growth of these measures improved in the 1970's.

The agricultural performance for Africa shows disappointing figures for both decades. Per capita food and agricultural production declined sharply in the 1960's, by -0.7 percent and -0.5 percent, respectively. The situation was even worse in the 1970's. For both measures of agricultural performance, the decline was about twice what it was in the 1960's. In contrast, the annual rate of per capita food production of the developed countries increased by 0.9 percent in the 1960's, while the per capita agricultural production increased by 0.6 percent for the same time period. In the 1970's, both measures increased over what they were in the 1960's. Given this production problem of the past two decades, the energy crisis of the 1970's has intensified even more the concern about the ability to provide additional food for the world's half billion low-income people.

About 90 percent of agricultural production is dependent upon photosynthesis for the conversion of solar energy into a form that is suitable for consumption by animals and human beings. In addition, modern agriculture requires fossil energy in the form of fertilizer, pesticides and fuel for operation of agricultural machines. Thus, agriculture is both a producer and a consumer of energy.

From the consumption point of view, the implications of higher energy costs for agriculture have received considerable attention [63, 64, 65, 66]. Worldwide, agriculture consumes approximately 3.5 percent of total energy of which 2.9 percent is used by developed countries and 0.6 percent by developing countries. Although agriculture accounts for only a small share of overall energy consumption, it clearly deserves to be given the highest priority since the increased yields expected from the application of technology in developing countries depends to a large extent on energy-intensive inputs such as fertilizers, pesticides and water application.

The oil price increases are expected to differentially affect productivity in NODC's since the amount of oil used in various forms of agriculture depends on the nature of farming, the crops produced and the degree of mechanization. In most of the low-income countries animal power is still the most important form of energy in the rural areas. However, oil is used to operate tractors, water pumps for irrigation and other farm machines and an increase in its price means an increase in the cost of production for the larger and more mechanized farms generally found in the middle-income NODC's.

Mechanized irrigation is one of the few areas of agricultural mechanization which increases both employment and production substantially. But mechanized irrigation requires power, and it is here that the role of energy in agriculture, particularly in the form of oil, is most crucial in raising the productivity of agriculture while providing the job opportunities essential to the equitable distribution of the fruits of economic development.

Another dimension of the energy crisis that affects agricultural production is the increase in the price of petrochemical products such as fertilizer. Because of the recent five-fold increase in the price of oil and scarce foreign-exchange, most NODC's are not in a position to import fertilizers in large amounts to increase their agricultural production. One study in India shows that an estimated shortage of one million tons of oil in the agricultural sector would prevent the irrigation of some ten million acres of land and cause a decrease in grain production by five million tons. Alternatively, a shortage of one million tons of oil in the fertilizer industry would decrease grain production by eight million tons [67].

The oil-fertilizer crisis of the 1970's was one of the principal factors in India attritubed to the decrease of grain production from a high of 108 million tons in 1970-71 to 103 million tons in 1973-74. [68]. Given the shortages of food in many parts of the world, production in agriculture must increase, not decrease.

## FOOTNOTES

[1]The aggregate spot price index (1970=100) of primary commodities (see the example of primary commodities footnote 4 in Chapter I) compiled by the IMF reached 212.1 in 1974 (its highest level since 1957) and then dropped to 174.1 in 1975. See the Funds monthly publication, IFS.

[2]These countries are: Gabon, Algeria, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, Venezuela and the United Arab Emirates.

[3]For recent patterns of inflation in the NODC's, see Ching-Yuan Lin and Abul K.M. Siddigue [21].

[4]The terms of trade can be related to prices of goods traded as well as to quantities. However, it is more conventional and preferable to define the terms of trade as the ratio of export prices to import prices, because it separates the effects of changing terms of trade from those of a changing balance of trade (the balance of trade is the difference between the value of commodity exports and the value of commodity imports). But if the terms of trade is defined as quantity imported over quantity exported, they may both improve or deteriorate since relative prices of exports and imports change and trade balances change.

[5]The definition and methods of calculation are given in the next chapter.

[6]This implies that developed countries are getting richer from international trade faster than developing countries and appropriating a larger and larger share of the world's benefits from international exchange. Or as Prebisch [6, 11, 24] puts it, trade instead of proving an "engine of growth" has really turned out to be an instrument of exploitation of peripheral countries by the industrial centers.

[7]The theory states that the terms of trade have a secular tendency to deteriorate for exporters of primary goods and to improve for the exporters of manufactured products.

[8]For detailed explanation of these reasons, see Bird [25] and Kindleberger [26].

[9]Engel's Law suggests that the larger a family's income, the smaller the proportion of that income spent on food and other necessities. Therefore, by analogy, the larger per capita income is (worldwide) the smaller the proportion of that income spent on food, hence, on primary products.

[10]The studies that are the basis for his argument are: Industrialization and Foreign Trade, League of Nations, Secretariate, Economic Financial and Transit Department, 1945 (this is reprinted by UN in 1948), and Relative Prices of Exports and Imports of Underdeveloped Countries, Department of Economic Affairs, UN, NY, 1949.

[11]These countries are: United States, India, Japan, New Zealand, South Africa and Brazil.

[12]See Antony J. Dolman, Reshaping the International Order, A Report to the Club of Rome, E.P. Dutton and Co., Inc., N.Y., 1976.

[13]The deterioration in the terms of trade for NODC's has been understated due to the inclusion of such net oil exporters as Mexico, Peru, Egypt and Tunisia.

[14]For more on the policy recommendations, see Prebisch [42] and Kindleberger [32].

[15]The balance of payments transactions is classified into four major categories: (1) the current account, (2) unilateral transfers, (3) the capital account, and (4) the gold account. This breakdown is commonly known as the "horizontal" division as the balance of payments, as distinguished from its "vertical" division of credits and debits. For a detailed discussion of these components of the balance of payments, see Wexler [44].

[16]According to Hein [48], "it would indeed be unrealistic in the present situation to expect exchange rate adjustments to make more than a very limited contribution toward reducing the oil-consuming countries' large deficits since what any one of them would gain by such action would largely be at the expense of the others." [pp. 8-9].

[17]For a complete explanation of the advantages and disadvantages of these methods, see Host-Madsen [49] and Agmon and Loffer [50].

[18]See Chambers and Gordon [10], Emery [51], Syron and Walsh [52], Severn [53], Voinodos [54], Michaely [55], Heller and Porter [56], Balassa [57], Lawson [58], Lim [59], Metwally and Tamaschke [60].

[19]The middle-income NODC's have been remarkably successful in avoiding the effects of both recession and their worsened terms of trade through increased international borrowing. For detailed explanation of this, see Holsen [61].

[20]ODA from OPEC benefited more the non-oil Arab Countries and those that are politically important (and Moslem) countries such as India and Pakistan.

# CHAPTER III

# TERMS OF TRADE CONCEPTS USED TO MEASURE GAINS FROM INTERNATIONAL TRADE

## Introduction

An important aspect of this study is the effect of higher oil prices on the terms of trade and thus the direct and indirect effects on growth and development. As defined previously, the terms of trade is the ratio at which exports and imports are exchanged. The more favorable a country's terms of trade, the greater are the expected gains from international trade. A country that faces long term unfavorable terms of trade (secular deterioration) is expected to grow more slowly in comparison to a country whose terms of trade is stable or improving over time.

Several alternative measures are used to evaluate the gains from trade. The purpose of this chapter is, first, to define and present the methods of calculating the different concepts of the terms of trade. Second, the sample countries used in the study are identified. Finally, the study period selected and data sources are discussed.

## The Different Concepts of the Terms of Trade[1]

The different concepts or measures of the terms of trade include net barter[2] or commodity, gross barter, income, single-factoral, double-factoral, real cost and utility. These concepts fall into three

groups: (1) those related to the ratio of exchange between commodities (net barter, gross barter and income terms of trade); (2) those related to the interchange between productivity resources (the single-factoral and double-factoral terms of trade); and (3) those related to the gains from trade in terms of utility analysis (the real cost and utility terms of trade).

Net Barter Terms of Trade

The net barter terms of trade (N) refer to the merchandise transactions with other countries. This concept was first introduced by Taussig [71] and is the simplest and most commonly used measure. It is calculated by dividing the index of export prices, $P_x$, by the index of import prices, $P_m$, or alternatively by dividing the index of unit-values of exports, $UV_x$, by the index of unit-values of imports, $UV_m$. The difference between these two methods of indexes is explained in the section on price versus unit value.

Symbolically the net barter terms of trade is expressed as:

$$N = \frac{P_x}{P_m} \quad \text{or} \quad \frac{UV_x}{UV_m}$$

A rise in N indicates a favorable movement of terms of trade (i.e., a larger volume of imports could be received in exchange for a given volume of exports) while a fall in N indicates an opposite movement. However, according to Taussig [71], the net barter terms of trade is relevant only when trade between countries consists of sales and purchases of merchandise, which excludes non-merchandise transactions such as tributes and immigrant remittances. Therefore, the net barter terms of trade is not a completely reliable index of the "gains" or "losses" in international trade.

## Gross Barter Terms of Trade

In order to correct for non-merchandise or unilateral transactions, Taussig introduced the gross barter terms of trade.[3] This measure is equally as simple as the net barter terms of trade showing the relation between changes in volume of exports and the volume of imports. It is derived by dividing the index of quantity or volume of imports by the corresponding index of quantity or volume of exports:

$$G = \frac{Q_m}{Q_x}$$

A rise in G shows a favorable change in the gross barter terms of trade, i.e., more imports are received for a given volume of exports. The gross barter terms of trade, Taussig argues, is a more reliable index of the "gains" or "losses" in international trade than the net barter terms of trade. Thus, he suggests that the gross barter terms of trade should be used whenever a country's balance-of-payments contain unilateral payments, i.e., more than goods and services.

As long as all trade is balanced in each period, i.e., the value of imports is equal to the value of exports in each and every period, the index of N and G will be identical. That is, if $V_m$ and $V_x$ are index numbers of value of imports and exports, respectively, then:

$$\frac{G}{N} = \frac{Q_m}{Q_x} \cdot \frac{P_m}{P_x} = \frac{V_m}{V_x}$$

When a difference exists between N and G, however, the choice depends on what use is to be made of the measures by the researcher.

## Income Terms of Trade[4]

If the purpose of the terms of trade index is to measure the

capacity to import (i.e., to determine the volume of imports obtainable for the actual value of exports) a combination of N and G is used. This measure is called the income terms of trade (I) or the purchasing power of exports.[5]

The purchasing power of exports is calculated by multiplying N by the quantity or volume of export index and is expressed as:

$$I = \frac{P_x}{P_m} \cdot Q_x$$

or simply

$$N \cdot Q_x$$

What the above foluma does is to correct for shifts in the net barter terms of trade by changes in the volume of trade. Or saying it in another way, a deterioration in net barter terms of trade (N) brought about by a decline in the price of exports ($P_x$) can be offset by an increase in quantity of exports ($Q_x$) so that an unfavorable N can be turned into a favorable I.

An increase in I indicates a country can obtain a larger volume of imports from the sale of its exports (i.e., its capacity to import based on exports is increased). It should be borne in mind, however, that this concept is concerned with the export-based capacity to import but not total capacity to import because total capacity to import depends not only on the sale of exports but also on capital inflow and other invisible exchange receipts. The use of the income terms of trade is especially important for developing countries since they have to take into account changes in their volume of exports.

Double-Factoral Terms of Trade

This concept may be regarded as the fundamental classical concept. It is derived by multiplying N by the reciprocal of changes in technical coefficients for imports and exports, i.e., N corrected for changes in productivity in producing imports as well as exports. It is given as:

$$D = N \cdot \frac{Z_x}{Z_m}$$

where $Z_m$ is an import productivity index and $Z_x$ is an export productivity index.

The double-factoral terms of trade (D) will equal N when constant returns to scale are assumed and there are no historical changes in costs. However, if the above assumptions do not hold the two measures diverge.

Single-Factoral Terms of Trade

If the concern is to determine the implication of the terms of trade on a country's gain from trade, the concept of the single-factoral terms of trade(s) is used.[6] This concept is a modification of the classical double-factoral as explained above.

This measure is obtained by multiplying N by an index of productivity in the export industries and expressed as:

$$S = N \cdot Z_x$$

where $Z_x$ is an export productivity index. This formula corrects N for changes in productivity and is particularly appropriate if the changes in the world price of the country's exports are compensated or brought about by changes in productivity in the export sector.

The intent of this measure is to provide an indication of the trend of imports obtainable per unit of the factors of production employed in the export industries. The measure can be used as a general indicator of the "real cost" of acquiring imports in terms of factor time given up to produce exports. Single-factoral terms of trade for a country can be improving over time even though N is deteriorating.

A comparison of D and S shows that the two concepts diverge when there is a change in the factor cost of producing exports. But such divergence between the two would have no welfare significance for the importing country, it would merely indicate a change in productivity in the other country from which commodities are imported.

Real Cost Terms of Trade

To proceed more directly to welfare analysis, the concept of real cost terms of trade (R) is sometimes used. This concept is derived by multiplying S by the reciprocal of an index of the "disutility coefficients" per unit of the technical coefficients of the export commodities. That is, S is corrected for the utility consequences of changing the methods of production and the proportion of resources used. If R rises as a result of a change in the factor proportions used in exports, this would indicate that the amount of imports obtained per unit of real cost was greater.

The amount of gains from trade depends, however, not only on the amount of foreign goods obtained per unit of real cost involved in the production of the export commodities, but also on the relative desirability of the import commodities as compared to the commodities which could have been produced for home consumption with the productive resources now devoted to production for export.

Utility Terms of Trade

An adjustment is necessary when changes in the relative desirability of import commodities and domestic commodities are taken into account. Internal consumption of domestic commodities is precluded by the allocation of production resources to production for export when such changes in relative desirability are due to changes in tastes.

The adjustment is done by incorporating into R an index of the relative average utility per unit of imported commodities and of the foregone domestic commodities. Or stated differently, R is corrected for the displacement of domestic production by concentration on exports and increased reliance on even cheaper imports. The result of this incorporation is the utility terms of trade concept (U).

The use of R and U poses problems because of the difficulty of calculating the disuility involved in export production or the relative average utility of various commodities.

## Limitations of Terms of Trade

Given the complexity of the forces operating on the prices of imports and exports and on the volume of foreign trade, it is doubtful that any single measure of the terms of trade will isolate all of the relevant forces or solve all of the problems of measuring the gains from trade.

In fact, according to Yotopoulos and Nugent [74],[7] the terms of trade encounters a number of limitations that may distort the results of measurements. They have the following as some of the limitations:

1. The terms of trade measures reflect almost exclusively trade in commodities. Unilateral transactions and trade in invisibles are accounted for only be the gross

barter terms of trade and the income terms of trade, and even in these instances only very imperfectly.

2. Since $P_x$ is usually measured at f.o.b. prices (excluding international transport cost) and $P_m$ at c.i.f. prices (including international transport costs), all measures involving prices of imports and exports are subject to an unfortunate asymmetry with respect to transport costs. Thus, the terms of trade may reflect changes in international transport costs rather than real changes in the prices received for exports in different countries.

3. Changes in the quality of exports and imports are ignored.

4. Even when the productivity adjustment is introduced, as in S, the index still does not account for changes in internal transport costs, such as those incurred in getting exports from the point of production to the point of export or imports from the point of entry to the point of consumption.

5. The factoral terms of trade become further complicated by the problems that attend the measurement of productivity. Partial productivity indexes are extremely restrictive, while total productivity indexes run into the problem of appropriately weighting input and output. Constructing the productivity index from sectoral data would be preferable, although even then it is difficult to confine the index to exports since the individual sectors usually produce output both for the domestic and the foreign markets.

6. The weighting problem arises in connection not only with the factoral terms of trade but also with the individual commodities or countries when aggregate indexes are involved. In connection with time trends, no single set of weights--generally those of the initial period as in the Laspeyres index, or of the final period as in the Paasche index (see the next section for their formulas and explanations)--is entirely valid. The results may therefore be sensitive to the arbitrary choice of base period [p. 342].

As explained previously, concepts of R and U are difficult to calculate and the significance of changes in G and D are very minimal. Thus we are left with S, N and I as the most relevant concepts of the terms of trade (particularly for the countries under study). This study uses the latter two concepts in determining the movements of the terms of trade and their consequences for the development of the NODC's.

As noted above, measurement of the terms of trade requires the use of index numbers. There are two types of index numbers used in the construction of the terms of trade, index numbers based on prices and index numbers based on unit values. The main differences between these two indexes are discussed by Kindleberger [32]. A summary of his points follows.

## Price Versus Unit Value

The main differences between price and unit value indexes lie in accuracy, coverage and timing. Indexes based on price quotations in general are regarded as more accurate reflections of changes in price than those using unit values. A unit value is derived by dividing the value reported in the trade statistics by the reported quantity. If the commodity class is heterogeneous, changes in the unit value may reflect changes in the commodity composition of the group as well as price. When the character of goods priced changes, as in manufactured goods when quality has improved over time, price data may be distorted. However, this objection also applies to primary commodity classes that are reported in trade statistics. Generally, price data refers to classes of greater homogeneity than do unit values. For this reason, price indexes are considered to have greater accuracy.

Unit values have several factors operating in their favor. According to Kindleberger, changes in the price at which goods are bought from and sold to foreign markets are the main focus in the study of a country's terms of trade. For example, wholesale prices reported domestically may vary from the actual prices paid and received internationally. This is because of taxes and subsidies, price

discrimination, and changes in transport. In comparing import unit values with prices of domestic goods, on the one hand it is necessary to add tariffs. On the other hand, in comparing domestic wholesale prices with prices paid externally, it is necessary to subtract tariffs. Similarly, if significant tranpsort charges are incurred in moving the commodity from the domestic market to the foreign market, or if different prices are charged between the internal and external market, unit values in foreign trade are more accurate than wholesale prices as a measure of prices received from external markets.

In periods of considerable price changes there may be differences in timing between price and unit values because of the lag of shipment relative to the date of contract. For example, an increase in prices within a given year may not be reflected in the unit value until one year later. However, under ordinary circumstances, this difference is of little importance. Differences in coverage also favors the measurement of terms of trade through unit values since more data are available for unit values than for prices.

For the reasons just given above, there is more data available on NODC's for computing unit value indexes than price indexes. Therefore, this study will use the unit value index data for individual developing countries under study. This data will be supplemented by price indexes with respect to countries for which unit value indexes are not available.

## The Sample Countries

The general objective of this study is to quantify the impact of higher oil prices on the terms of trade and economic development of

NODC's that are accounting for four-fifths of the population of the developing countries. It is beyond the scope of this study to do an individual examination of the behavior and consequences of the terms of trade for all 100 plus countries currently listed as underdeveloped. Therefore, a randomly drawn sample of 30 countries, 15 of which were selected from low-income and 15 from middle-income NODC's, are used for this study. The selected countries are given in Table IX.

In addition to covering a wide range of income these countries also cover a wide range of economic structure. For example, Jamaica is a primary exporter; South Africa, Portugal, Yugoslavia and Spain are more developed primary producing countries; Sudan and Dominican Republic are agricultural countries. These countries represent all geographic areas of the world.

These groups also cover those nations which have the highest debt service ratios and whose prospects for further borrowing look most uncertain because of the fragility of their economies. In addition the balance of trade of these countries in the 1970's was at a deficit, creating a balance-of-payments problem. This sample, therefore, forms the basis for comparison between and among groups of NODC's with widely varying characteristics.

## Study Period Selected and Data Sources

The time period for analysis needed to be long enough to be representative of the pattern of behavior of the terms of trade. At the time data collection was initiated, the latest figures reported were for the year 1979. A review of data indicated that prior to 1960 sufficient data of the nature necessary for studying the terms of trade in the

TABLE IX

STUDY SAMPLES OF LOW AND MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES

| Low-Income | Middle-Income |
|---|---|
| Malawi | Ghana |
| Sri Lanka | Jamaica |
| Benin | Ivory Coast |
| Burma | Uruguay |
| Central African Republic | Lebanon |
| Mozambique | South Africa |
| Mauritania | Thailand |
| Pakistan | Peru |
| Senegal | Dominican Republic |
| Chad | Guatemala |
| Niger | Panama |
| Sudan | Israel |
| Upper Volta | Portugal |
| Uganda | Zambia |
| Bangladesh | Spain |

Source: World Development Report, The World Bank, Washington, D.C., 1980.

majority of the sample countries were not available. Given these considerations, the period chosen for study is 1960 to 1979. Since the major interest is to examine the effect of higher oil prices on the terms of trade of NODC's and its subsequent effect on the economic development, the early part of the period represents relatively stable oil prices with the latter representing increasing oil prices.

Apart from the fact that the period is sufficiently long to permit evaluation of the pre- and post-price increases of oil, this period has a number of other features. The period represents important world economic history, comparable to the world depression of the 1920's. Aided by the rapid increase in oil prices, the world went through a period of slowing down in economic growth. The average annual growth went from 5.4 percent in 1961-73 to 3.6 percent in 1974-79, a 1.8 percent decline in just a few years (see Chapter I). Simultaneously, there was a significant increase in the inflation rate for virtually every country, developed and developing, and this led to an increase in prices of manufactured goods imported by NODC's.

It was a time of stagnation in agricultural output for most of the NODC's that are largely dependent on agriculture for export earnings. Also, it covers the two development decades (1961-70, 1971-80) set out by the UN. The targets set for growth in the two decades were not fulfilled and thus this study will give us a chance to see how much the decline in the terms of trade contributed to the failure in achieving the growth targets.

The data necessary for the terms of trade study were obtained directly from the following three sources: (1) The International Financial Statistics (IFS) of the International Monetary Fund (IMF);

(2) the United Nations Yearbook of International Trade Statistics (YITS); and (3) Handbook of International Trade and Development Statistics (HOITADS), Supplement 1980, of the United Nations Conference on Trade and Development (UNCOTAD). In the major source of data for this study (HOITADS), the weights for both the export and import unit value indexes are the observed or estimated trade structures of individual countries for the years 1962, 1968, 1970, 1972, and 1975. Moreover, freight costs were explicitly taken into account by assigning them proper weights in each major import sector. The resulting import unit value index, thus, reflects changes in import prices as well as changes in transport costs.[8]

The indexes in IFS are calculated from data reported in national sources. The total export volume and unit value indexes are calculated from commodity volume and unit value indexes using export values as weights.[9]

To facilitate comparison, the indexes in YITS have been adjusted, where possible, so that the calendar year 1975 is the base period. In calculating the volume (Quantum) and unit value indexes, the following formulas were used in YITS:

| Quantum Index | | Unit Value Index | |
|---|---|---|---|
| $\frac{\Sigma P_o Q_n}{\Sigma P_o Q_o}$ | Laspeyres | $\frac{\Sigma P_n Q_o}{\Sigma P_o Q_o}$ | Laspeyres |
| $\frac{\Sigma P_n Q_n}{\Sigma P_n Q_o}$ | Paasche | $\frac{\Sigma P_n Q_n}{\Sigma P_o Q_n}$ | Paasche |

where the subscripts o and n refer to the base period and the current period, respectively.[10]

In both IFS and YITS the data for imports and exports are either reported as f.o.b. (free on board) or c.i.f. (cost, insurance and freight) according to the country's practice. Import data are generally found on a c.i.f. basis. Some data were missing or unpublished so it was impossible to collect complete 20 year data for all sample countries included in the study.

## Summary

In this chapter, several alternative measures of the terms of trade used to evaluate the gains from trade were defined and a step-by-step approach was presented to explain the methods of calculating these measures. The measurement of the terms of trade requires the use of index numbers. The indexes were based on prices and unit values.

The difference between price and unit value indexes lie in accuracy, coverage and timing. Indexes based on prices in general are considered to have greater accuracy than the unit value indexes. However, if the costs of transportation in moving the commodity from the domestic market to the international market are large or if prices charged are different between domestic and foreign markets, unit values are more accuracte than prices in measuring gains from trade. Since more data is available for unit value indexes than for price indexes, the measurement of the terms of trade with regard to coverage favors the use of the unit value indexes.

The most relevant measures of the terms of trade for the countries under study were identified to be the net barter terms of trade (NBTT) and the purchasing power of exports (PPOE) which is also called the income terms of trade. The NBTT is a ratio of export price index to

import price index. A rise in NBTT indicates an improvement in the terms of trade, while a fall in NBTT indicates an opposite movement. The PPOE is used to measure the capacity to import, i.e., to determine the volume of imports obtainable for the actual value of exports. This measure is calculated by multiplying NBTT by the quantity or volume of exports index. An increase in PPOE indicates a country can obtain a larger volume of imports from the sale of its exports.

A number of limitations are encountered in calculating the terms of trade that may distort the results of measurement. For example, changes in quality of exports and imports are ignored. Also terms of trade may reflect changes in international transport costs rather than real changes in the prices received for exports. This is caused because $P_x$ is usually measured at f.o.b. prices and $P_m$ at c.i.f. prices. Given the complexity of the forces operating on the prices of imports and exports, it is doubtful that any single measure of the terms of trade will solve all of the problems of measuring the gains from trade.

## FOOTNOTES

[1]The explanation and methods of calculation of the different concepts of the terms of trade in this chapter are based on the discussions by Haberler [68], Viner [69], Meier [70], Rostow [23], Taussig [71], and Wexler [44].

[2]In this study the net barter terms of trade will be used instead of the commodity terms of trade.

[3]For criticism of this concept see Haberler [68].

[4]The income terms of trade concept was introduced by Dorrance [72] in 1948. For additional explanation of this concept see Wilson, Sihna, and Castree [73].

[5]This study will use the term purchasing power of exports.

[6]In view of the importance of single-factoral terms of trade in determining the gains from trade for a country's economy, it is interesting that little empirical work has been done worth it.

[7]For similar views, see Morgan [30].

[8]For a further explanation of the computation of the indexes, see explanatory notes on page 442 of HDITADS.

[9]For explanation of how the data are compiled see IFS 1980 Yearbook, pp. 8-9, and 432.

[10]Further explanation of how the data in YITS is compiled is given in YITS publication, Vol. 1, 1979, pp. 4-7.

# CHAPTER IV

# COMPOSITION OF EXPORTS AND IMPORTS AND EMPIRICAL RESULTS OF THE TERMS OF TRADE

## Introduction

Over the past two decades demand for most primary products,[1] with a few exceptions including petroleum, either decreased or remained stagnant.[2] Developing countries (DC's) frequently rely on primary commodity exports for most of their foreign exchange earnings. Some countries depend on two or three commodities for most of their export earnings. There are countries whose export structure, and in some cases production structure, is such that they are heavily concentrated on one commodity.

The general consequence of this dependence on a few primary commodities for the bulk of export earnings is a weak performance in world trade. The export share of DC's in world trade has either declined or remained about the same in the past two decades. In 1960 the share amounted to about 22 percent, but in 1964 and in 1970 it had fallen below 20 percent. By the mid-1970's, it improved over what it was in 1965 and 1970, but the increase was due to increases in the shares of exports by oil producing countries.

With the exception of a slight decline in 1965 and 1970, the import share in world trade by the DC's for the decades of 1960 and 1970 was about the same. Although the DC's import share for 1960 and 1970 did not change much, the costs of these imports increased. The higher price of oil particularly affected the NODC's, increasing their net import bill for oil by about $22 billion in 1975.

Like the DC's, the developed and centrally planned countries' share in the world trade showed little change throughout the study period. Even though the pattern of world trade was similar for both developed and developing countries in the 1960's and 1970's, the percentage share of the developed countries was about twice that of the DC's.

The result of high import prices and a decline in demand for most primary products was an adverse movement in the terms of trade of DC's in general and NODC's in particular. Using the sample of NODC's of this study, the purpose of this chapter is to analyze: (1) the composition and growth of exports; (2) the composition and growth of imports; and (3) the terms of trade behavior. Analyzing the terms of trade in this manner not only sheds light on the applicability of the deterioration hypothesis but more importantly, it gives some indication of the quantitative importance of such movements.

## Composition and Growth of Exports

### Composition of Exports

Over the years, 80 to 90 percent of the NODC's export earnings was derived from primary product sales. A survey of the export structure of the 30 countries under study for 1965 and 1977 indicate that 13, almost one-half, depended on one commodity for more than 50 percent of their

total exports. Furthermore, about three-fourths of these countries derived more than 60 percent of their total export earnings from three or less primary commodities (Tables X and XI).

In both the 1960's and the 1970's, the countries that were more heavily dependent on one commodity for export earnings were the LINODC's. Out of a total of 15 countries in this group, 11 in the 1960's and eight in the 1970's were dependent on one commodity for 50 percent or more of their export earnings. In contrast, there were only three countries in both the 1960's and the 1970's that were dependent on one commodity for 50 percent or more of their export earnings in the group of MINODC's.

From Tables X and XI it is noticable that the vast majority of the LINODC's and MINODC's continue to show great dependency on a very narrow range of primary commodities. However, within this range the composition of exports of individual countries has been changing in response to international market conditions for particular commodities and domestic resource availabilities.

In some countries, export concentrations on one commodity diminished in 1977 compared to 1965. Some examples are Sri Lanka, Burma, Dominican Republic, Thailand and Mauritania. In contrast, export concentration on one commodity increased in some countries including Malawi, Chad, Upper Volta and Ghana. In general, however, the concentration declined, but the decline was slight. The result of dependence on a few primary commodities by the NODC's has been a constraint on the ability of these countries to improve the trend of their share in world trade in the past two decades.

# TABLE X

## COMMODITY CONCENTRATION IN EXPORT TRADE OF DEVELOPING COUNTRIES, 1965

| Country | Percent Share of Commodities in Total Export Earnings | Three Commodities as Percent Share of Total Export Earnings |
|---|---|---|
| | LINODC's | |
| Malawi | Tobacco 38, Tea 28, Oilseeds and Veg. Oils 15 | 81 |
| Sri Lanka (Ceylon)[a] | Tea 63, Rubber 16, Coconut Prod. 14 | 93 |
| Benin (Dahomey)[a] | Oilseeds and Veg. Oils 78, Cotton 5, Coffee 3 | 86 |
| Burma[a] | Rice 62, Teak 13, Oilseeds 5 | 80 |
| Cen. Afr. Rep.[a] | Diamonds 54, Cotton 20, Coffee 15 | 89 |
| Mozambique | Cotton 18, Cashew Nuts 16, Sugar 9 | 43 |
| Mauritania[a] | Iron Ore 99, Fish 1 | 100 |
| Pakistan[a] | Jute and Products 51, Cotton 12, Rice 5 | 68 |
| Senegal[a] | Oilseeds and Veg. Oils 79, Phosphate 8, Fish 4 | 91 |
| Chad[a] | Cotton 77, Livestock 8, Petroleum Prod. 4 | 89 |
| Niger[a] | Oilseeds and Veg. Oils 64, Livestock 16, Pulses 5 | 85 |
| Sudan[a] | Cotton 46, Oilseeds and Veg. Oils 30, Gum Arb. 11 | 87 |
| Upper Volta[a] | Livestock 58, Oilseeds and Veg. Oils 12, Cotton 7 | 77 |
| Uganda | Coffee 48, Cotton 27, Copper 13 | 88 |
| Bangladesh | (see note at bottom of table) | |

TABLE X (Continued)

| Country | Percent Share of Commodities in Total Export Earnings | Three Commodities as Percent Share of Total Export Earnings |
|---|---|---|
| | MINODC's | |
| Ghana[a] | Cocoa Beans 66, Timber 12, Diamonds 7 | 85 |
| Jamaica | Aluminum and Baux. 47, Sugar 23, Bananas 8 | 78 |
| Ivory Coast | Coffee 38, Timber 27, Cocoa Beans 16 | 81 |
| Uruguay | Wool 47, Meat 32, Hides 8 | 87 |
| Lebanon | Citrus 8, Other Fresh Fruit 8, Pulses 8 | 24 |
| South Africa | Pearls 13, Wool 13, Fresh Fruit 6 | 32 |
| Thailand | Rice 34, Rubber 16, Tin 9 | 59 |
| Peru | Fish Meal 22, Copper 18, Cotton 13 | 53 |
| Dominican Rep. | Sugar 49, Bauxite and Conc. 9, Coffee 6 | 64 |
| Guatemala | Coffee 49, Cotton 18, Sugar 3 | 70 |
| Panama[a] | Bananas 51, Petroleum Pro. 30, Fish 10 | 91 |
| Israel | Fresh Fruit 17, Copper 3, Veg. Oils 2 | 22 |
| Portugal | Alc. Bever. 8, Fish 7, Cork 4 | 19 |
| Zambia[a] | Copper 92, Tobacco 1, Corn 1 | 94 |
| Spain | Fresh Fruit 19, Alc. Bever. 5, Veg. Oils 2 | 26 |

[a]Indicates that more than 50 percent of Total Exports is derived from one commodity or closely related commodity group.

Note: No data for Bangladesh as a separate country for 1965 was available since it was part of Pakistan and did not become an independent country until 1971.

Source: United Nations Yearbook of International Trade Statistics, UN, New York, 1965, and International Financial Statistics, 1965.

# TABLE XI

## COMMODITY CONCENTRATION IN EXPORT TRADE OF DEVELOPING COUNTRIES, 1977

| Country | Percent Share of Commodities in Total Export Earnings | Three Commodities as Percent Share of Total Export Earnings |
|---|---|---|
| | LINODC's | |
| Malawi* | Tobacco 50, Tea 24, Sugar 9 | 83 |
| Sri Lanka* | Tea 53, Rubber 14, Fresh Fruit 9 | 76 |
| Benin | Cotton 18, Oilseeds and Veg. Oils 20, Cocoa 11 | 49 |
| Burma* | Rice 50, Wood Products 23, Animal Feeds 7 | 80 |
| Cen. Afr. Rep. | Coffee 41, Pearl 23, Wood Products 18 | 82 |
| Mozambique | Fresh Fruit 31, Maize 14, Cotton 14 | 59 |
| Mauritania* | Iron ore 80, Fish 13, Monfer Base Mtl. 6 | 99 |
| Pakistan | Textiles 38, Rice 19, Cotton 3 | 60 |
| Senegal | Oilseeds and Veg. Oils 34, Phosphate 14, Animal Feed 11 | 59 |
| Chad* | Cotton 83, Livestock 11, Oilseeds and Veg. Oils 2 | 96 |
| Niger* | Mineral 64, Livestock 15, Fresh Veg. 9 | 88 |
| Sudan* | Cotton 57, Oilseeds and Veg. Oils 22, Fresh Veg. 5 | 84 |
| Upper Volta | Cotton 40, Livestock 29, Oilseeds and Veg. Oils 17 | 86 |
| Uganda* | Coffee 93, Cotton 3, Tea 2 | 98 |
| Bangladesh | Jute 28, Woven Textiles 23, Textiles etc. 18 | 69 |

TABLE XI (Continued)

| Country | Percent Share of Commodities in Total Export Earnings | Three Commodities as Percent Share of Total Export Earnings |
|---|---|---|
| | MINODC's | |
| Ghana* | Cocoa 74, Nonfer. Base Mtl. 11, Wood Products 8 | 93 |
| Jamaica* | Inorg. Elements 50, Nonfer. Base Mtl. 21, Sugar 10 | 81 |
| Ivory Coast | Coffee 38, Cocoa 25, Wood Products 16 | 79 |
| Uruguay | Wool 21, Meat 18, Textiles 17 | 56 |
| Lebanon | Fresh Fruits 13, Fresh Veg. 2, Eggs 2 | 17 |
| South Africa | Nonfer. Base Mtl. 29, Sugar 4, Wool 4 | 33 |
| Thailand | Rice 19, Fresh Veg. 12, Sugar 12 | 43 |
| Peru | Nonfer. Base Mtl. 34, Coffee 11, Animal Feed 11 | 56 |
| Dominican Rep. | Sugar 32, Coffee 26, Cocoa 13 | 71 |
| Guatemala | Coffee 44, Cotton 13, Sugar 7 | 64 |
| Panama | Petroleum Prod. 27, Fresh Fruit 29, Fish 13 | 69 |
| Israel | Pearls 36, Cotton 2, Fresh Fruit 10 | 48 |
| Portugal | Textile 25, Alc. Bever. 7, Cork 6 | 38 |
| Zambia* | Copper 91, Tobacco 1, Maize 1 | 93 |
| Spain | Fruit 5, Rubber 2, Fresh Veg. 2 | 9 |

Source: UNCOTAD, Handbook of International Trade and Statistics, Supplement 1980, UN, New York, 1980.

Growth of Exports

The NODC's share in world trade declined slightly or remained about the same during the period of 1960 to 1979 (Table XII). Their share declined from about 15 percent in 1960 to a little over 10 percent in 1975. Although some changes took place within this group of countries, their share in world trade varied very little for the remainder of the 1970's. The counterpart to this growth in the NODC's was an increase in that of the oil producing countries share in the world market, particularly in the 1970's. The value of their exports represented 6.4 percent of the world total in 1965 and rose to a high of 15 percent in 1976. However, their share declined between 1977 and 1978 and then recovered to about 13 percent in 1979.

The volume of exports of the NODC's, taken together, show an expansion between 1960 and 1979. The index of the volume of exports increased about 12 percent annually between 1975 and 1979 (Table XIII). The benefits of this rise in exports, however, were very unevenly shared. Only a small group of fast growing exporters of manufacturers among the NODC's managed to expand in the volume of exports at a rapid rate. In the case of the other NODC's, the volume of their exports showed a decline over the study period.[3] The main factor contributing to the decline in export volumes of these countries was the decline in agricultural production.[4]

Despite the increase in the volume index of exports, the unit value index of exports of the NODC's is below that of the unit value indexes of the developed and oil producing countries owing to the decline in world prices of primary commodities, excluding petroleum. Compared to the average annual increase in volume index of exports of 12 percent

TABLE XII

EXPORT AND IMPORT SHARES IN WORLD TRADE
BY COUNTRY GROUP, 1960 TO 1979

| Country Group | 1960 | 1965 | 1970 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|
| | Percent | | | | | | | |
| | Export | | | | | | | |
| World | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Developed Countries | 66.8 | 68.8 | 71.3 | 66.0 | 64.7 | 64.7 | 67.1 | 65.8 |
| Developing Countries | 21.7 | 19.6 | 18.1 | 24.3 | 25.9 | 25.8 | 23.4 | 25.0 |
| Oil Producing | 6.8 | 6.4 | 6.2 | 13.7 | 14.6 | 14.1 | 11.8 | 13.4 |
| Non-Oil Producing | 14.9 | 13.2 | 11.7 | 10.6 | 11.3 | 11.7 | 11.6 | 11.6 |
| Centrally-Planned Countries | 11.7 | 11.6 | 10.6 | 9.7 | 9.4 | 9.6 | 9.6 | 9.2 |
| | Import | | | | | | | |
| World | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Developed Countries | 65.9 | 69.4 | 72.3 | 67.6 | 69.1 | 68.4 | 68.0 | 70.4 |
| Developing Countries | 22.2 | 18.9 | 17.1 | 20.8 | 20.6 | 21.6 | 21.8 | 20.1 |
| Oil Producing | 4.6 | 3.7 | 3.3 | 6.1 | 6.7 | 7.7 | 7.7 | 6.2 |
| Non-Oil Producing | 17.6 | 15.2 | 13.8 | 14.7 | 13.9 | 13.9 | 14.1 | 13.8 |
| Centrally-Planned Countries | 11.9 | 11.6 | 10.5 | 11.1 | 10.3 | 9.9 | 10.2 | 9.4 |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1980, UN, New York, 1980.

TABLE XIII

INDEXES OF EXPORT GROWTH BY COUNTRY GROUP
1960 TO 1979

| Country Group | 1960 | 1965 | 1970 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|
| | ----------Percent---------- | | | | | | | |
| Volume of Exports | | | | | | | | |
| Developed Countries | 33 | 47 | 74 | 100 | 111 | 116 | 123 | 133 |
| Developing Countries | 50 | 69 | 96 | 100 | 116 | 117 | 121 | 133 |
| Oil Producing | 48 | 71 | 109 | 100 | 113 | 113 | 109 | 109 |
| Non-Oil Producing | 48 | 61 | 78 | 100 | 119 | 120 | 136 | 148 |
| Unit Value of Exports | | | | | | | | |
| Developed Countries | 45 | 47 | 52 | 100 | 100 | 109 | 123 | 140 |
| Developing Countries | 26 | 25 | 28 | 100 | 104 | 117 | 118 | 144 |
| Oil Producing | 15 | 14 | 15 | 100 | 107 | 118 | 118 | 168 |
| Non-Oil Producing | 43 | 44 | 51 | 100 | 102 | 118 | 119 | 138 |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1980, UN, New York, 1980.

between 1975 and 1979, the average annual increase of the unit value index of exports was only 9.5 percent.

## Composition and Growth of Imports

### Composition of Imports

The NODC's depend heavily on imports of manufactured goods for their industrialization. A review of the composition of imports of the 30 countries under study for 1967 and 1975 indicate that, with few exceptions, more than 50 percent of these countries' imports consist of manufactured goods (Tables XIV and XV). In the majority of the MINODC's and in about one-half of the LINODC's, the percentage share of this import declined in the 1970's from what it was in the 1960's.

The second most important import in the economy of both groups of countries in the 1960's was food items. However, the percentage share of this import was larger in the LINODC's than in the MINODC's. In the 1970's, the group of countries that showed food items to be still the second important import was the LINODC's. Out of a total of 15 countries in this group, 11 were importing more the 15 percent of their food items in this period. For countries such as Sri Lanka and Bangladesh, the percentage share of food was greater than any of the other two major imports. This was a result of the short fall in domestic food production, which in recent years has reached critical levels owing to the drought and higher price of fertilizers. In contrast, there were only six countries that were importing more than 15 percent of their food items in the MINODC's.

Except in a few cases, the MINODC's second most important import in the decade of the 1970's was fuels. Compared to the 1960's, the

TABLE XIV

COMPOSITION OF IMPORTS OF LINODC'S BY MAJOR CATEGORIES, 1967 AND 1975

| Country | Percent | | | | | |
|---|---|---|---|---|---|---|
| | 1967 | | | 1975 | | |
| | All Food Items | Fuels | Manufactured Goods | All Food Items | Fuels | Manufactured Goods |
| Malawi | 16.91 | 5.21 | 70.09 | 9.41 | 9.95 | 71.55 |
| Sri Lanka[a] | 45.65 | 7.06 | 40.37 | 36.28 | 24.88 | 31.63 |
| Benin[b] | 21.84 | 4.35 | 67.82 | 17.85 | 9.78 | 66.73 |
| Burma | 14.49 | 9.21 | 67.65 | 7.35 | 7.70 | 68.82 |
| Cent. Afr. Rep.[a] | 13.78 | 4.83 | 76.85 | 17.42 | 1.43 | 76.64 |
| Mozambique | 20.46 | 8.45 | 52.15 | 15.93 | 12.92 | 47.03 |
| Mauritina | 17.14 | 3.66 | 73.64 | 30.63 | 8.00 | 53.78 |
| Pakistan[a] | 30.36 | 24.29 | 69.95 | 20.90 | 18.19 | 48.25 |
| Senegal | 38.42 | 0.73 | 53.15 | 24.70 | 11.91 | 54.28 |
| Chad | 15.55 | 14.73 | 62.85 | 14.52 | 14.17 | 65.61 |
| Niger | 16.21 | 5.94 | 66.53 | 21.61 | 12.57 | 50.88 |
| Sudan | 21.46 | 4.55 | 79.45 | 18.67 | 3.69 | 70.65 |
| Upper Volta | 29.98 | 6.53 | 53.95 | 21.17 | 8.84 | 62.94 |
| Uganda | 7.46 | 1.48 | 78.84 | 5.80 | 1.52 | 84.19 |
| Bangladesh | c | c | c | 52.55 | 7.56 | 26.56 |

[a]Data for 1976 were used.

[b]Data for 1974 were used.

[c]No data for Bangladesh as a separate country for 1965 was available since it was part of Pakistan and did not become an independent country until 1971.

Source: UNCOTAD, Handbook of International Trade and Development, UN, New York, 1977, and Yearbook of International Trade Statistics, UN, New York, 1970.

TABLE XV

COMPOSITION OF IMPORTS OF MINODC'S BY MAJOR CATAGORIES, 1967 AND 1975

| Country | 1967 Percent | | | 1975 Percent | | |
|---|---|---|---|---|---|---|
| | All Food Items | Fuels | Manufactured Goods | All Food Items | Fuels | Manufactured Goods |
| Ghana | 19.34 | 5.98 | 69.49 | 13.42 | 16.65 | 59.01 |
| Jamaica | 18.30 | 18.28 | 61.53 | 20.17 | 19.18 | 53.35 |
| Ivory Coast | 15.84 | 5.47 | 72.00 | 14.70 | 13.90 | 63.83 |
| Uruguay | 7.98 | 21.12 | 50.21 | 8.08 | 31.21 | 44.34 |
| Lebanon | 30.37 | 6.18 | 50.26 | 17.59 | 2.19 | 66.96 |
| South Africa | 5.77 | 5.84 | 72.08 | 4.95 | 0.25 | 81.70 |
| Thailand | 6.24 | 7.21 | 70.82 | 4.34 | 21.59 | 59.03 |
| Peru | 14.90 | 3.07 | 66.06 | 15.75 | 12.11 | 59.66 |
| Dominican Rep. | 15.25 | 20.35 | 62.09 | 16.15 | 18.97 | 55.70 |
| Guatemala | 12.69 | 3.81 | 75.31 | 9.49 | 14.10 | 69.85 |
| Panama | 10.01 | 20.19 | 64.66 | 8.82 | 40.41 | 47.25 |
| Israel | 18.99 | 6.09 | 58.21 | 15.53 | 15.30 | 55.75 |
| Portugal[a] | 18.96 | 8.56 | 53.42 | 19.98 | 16.04 | 47.74 |
| Zambia | 8.41 | 10.20 | 74.30 | 7.76 | 13.57 | 69.62 |
| Spain[a] | 19.62 | 12.37 | 48.86 | 13.18 | 29.46 | 40.10 |

[a] Data for 1976 were used.

Source: UNCOTAD, Handbook of International Trade and Development, UN, New York, 1977, and Yearbook of International Trade Statistics, UN, New York, 1970.

percentage share of imported fuels of these countries in the 1970's increased drastically. The percentage share of imported fuels in the LINODC's also increased in this time period, but it remained the third important import for this group of countries.

Growth of Imports

The import share of DC's, as a whole, in world trade was about the same for the decade of 1960 and 1970 (Table XII). For the NODC's, in particular, the import share in world trade was larger in the 1960's compared to the 1970's. In contrast, the oil producing countries import share in world trade in the 1970's improved compared to the 1960's. In particular, since 1975 and thereafter, the share of these countries imports greatly increased due to the increase in oil prices. That is, as a result of higher oil prices in the 1970's, the purchasing power of exports of these countries increased and, hence, their import share. For example, the share of their imports represented 3.3 percent of the world trade in 1970 and rose to a high of 7.7 percent in 1977 and 1978 for an increase of 133 percent. With respect to the NODC's, there was virtually no change in their import share of the world trade for the decade of the 1970's.

Taken as a group, the NODC's index of the volume of imports rose far more slowly than that of the oil producing or developed countries in the 1970's (Table XVI). Between 1975 and 1979, the volume index of these countries' imports rose by about 3.3 percent annually while the increase in the oil producing countries was about seven percent annually. The unit value index of the NODC's imports, on the other hand, grew by about 13.5 percent between 1975 and 1979. Given the 3.3 percent increase

TABLE XVI

INDEXES OF IMPORT GROWTH BY COUNTRY GROUP
1960 TO 1979

| Country Group | Percent | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1960 | 1965 | 1970 | 1975 | 1976 | 1977 | 1978 | 1979 |
| Volume of Imports | | | | | | | | |
| Developed Countries | 35 | 52 | 82 | 100 | 113 | 117 | 123 | 132 |
| Developing Countries | 38 | 45 | 63 | 100 | 108 | 121 | 127 | 118 |
| Oil Producing | 25 | 28 | | 100 | 122 | 146 | 149 | 128 |
| Non-Oil Producing | 45 | 54 | 75 | 100 | 103 | 108 | 118 | 113 |
| Unit Value of Imports | | | | | | | | |
| Developed Countries | 42 | 43 | 47 | 100 | 101 | 111 | 122 | 144 |
| Developing Countries | 42 | 44 | 47 | 100 | 102 | 111 | 122 | 150 |
| Oil Producing | 45 | 47 | 50 | 100 | 101 | 110 | 125 | 147 |
| Non-Oil Producing | 40 | 42 | 45 | 100 | 103 | 112 | 121 | 154 |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1980, UN, New York, 1980.

in the unit value index of imports can be attributed mainly to the rise in oil and manufactured good prices.

The changes in the unit values of both imports and exports led to a significant decline in the terms of trade of the NODC's (Table XVII). In these countries, taken together, the net barter terms of trade index deteriorated by about three percentage points in 1965 from what it was in 1960. However, the terms of trade improved by eight percentage points in 1970 over 1965. For the decade of the 1970's, the terms of trade of the NODC's, in general, shows a deterioration. In 1975, the terms of trade index declined by 13 percentage points from what it was in 1970. Between 1975 and 1979, however, the average annual decline was 2.5 percentage points. The main exceptions were the oil producing countries, which benefited from the increase of export price of oil. Their terms of trade index improved by 70 percentage points in 1975 over what it was in 1970, but the average annual increase between 1975 and 1979 was only 3.5 percentage points which was still larger than that of the NODC's.

The purchasing power of exports of the NODC's increased by about 22 percentage points in 1975 compared to 1970. Between 1975 and 1979, it increased at an average annual rate of only 8.3 percentage points. The rise in the purchasing power of exports in the 1970's, in general, was due to an increase in volume of exports in some of the NODC's.

The general picture of recent trends in the terms of trade of the NODC's inevitably conceal great differences in the movements of the terms of trade for individual countries. Thus, an explanation of the net barter terms of trade (NBTT) and the purchasing power of exports (PPOE) of both LINODC's and MINODC's is presented.

TABLE XVII

THE TERMS OF TRADE INDEX BY COUNTRY GROUP
1960 TO 1979

| Country Group | 1960 | 1965 | 1970 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|
| | Percent | | | | | | | |
| | Net Barter | | | | | | | |
| Developed Countries | 107 | 109 | 111 | 100 | 99 | 98 | 101 | 97 |
| Developing Countries | 62 | 57 | 60 | 100 | 102 | 105 | 97 | 96 |
| Oil Producing | 33 | 30 | 30 | 100 | 106 | 107 | 94 | 114 |
| Non-Oil Producing | 108 | 105 | 113 | 100 | 99 | 105 | 98 | 90 |
| | Purchasing Power of Exports | | | | | | | |
| Developed Countries | 35 | 51 | 82 | 100 | 110 | 114 | 124 | 129 |
| Developing Countries | 31 | 39 | 58 | 100 | 118 | 123 | 117 | 128 |
| Oil Producing | 16 | 21 | 33 | 100 | 120 | 121 | 102 | 124 |
| Non-Oil Producing | 52 | 64 | 88 | 100 | 118 | 126 | 133 | 133 |

Source: Calculated from Tables XVI and XIX using the methods discussed in Chapter III.

## Terms of Trade of Low- and Middle-Income Non-Oil Developing Countries

### Net Barter Terms of Trade

The indexes of the NBTT for LINODC's and MINODC's were calculated from the Unit Value indexes of exports and imports shown in Tables XVIII, XIX, XX, and XXI. A brief description of these indexes is presented in this section. Along with this description some analysis pertaining to the behavior of particular commodities is given which were the most influential in the price index movements.

The LINODC's. For the entire decade of the 1960's the NBTT for the majority of this group of countries fluctuated (Table XXII). Three countries (Malawi, Sri Lanka, and Mauritania) showed a steady decline in their NBTT, while two countries (Burma and Pakistan) showed increases in their NBTT. Many of the countries had NBTT indexes above 100 at some point in the decade. The only exceptions were Mozambique, Senegal, Chad and Sudan, even though their NBTT fluctuated.

Differential movements in the NBTT among this group of countries reflects the different commodity composition of their exports and imports and the differential price movements of these commodities. The import price indexes for the group as a whole increased steadily from 1960 to 1969 (Table XIX). However, export price indexes for most countries fluctuated, with a slight downward trend (Table XVIII). This can be attributed to low price levels for many important food and agricultural raw materials in this period. For example, excess supplies of sugar and tropical beverage crops resulted in substantial price declines. Prices of other raw materials, both agricultural and mineral, had also

## TABLE XVIII

## UNIT VALUE INDEX OF EXPORTS OF LOW-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Malawi | Sir-Lanka | Benin | Burma | Central African Republic | Mozam-bique | Maurit-ania | Pakis-tan | Senegal | Chad | Niger | Sudan | Upper Volta | Uganda | Bangla-desh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 52 | 77 | 51 | 51 | 50 | 37 | 66 | 42 | 30 | 43 | 44 | 36 | 40 | 54 | 87 |
| 1961 | 53 | 70 | 49 | 52 | 48 | 36 | 67 | 42 | 30 | 44 | 45 | 34 | 39 | 50 | 70 |
| 1962 | 50 | 64 | 47 | 54 | 48 | 35 | 68 | 42 | 28 | 42 | 42 | 30 | 35 | 49 | 58 |
| 1963 | 48 | 60 | 51 | 55 | 49 | 36 | 66 | 42 | 27 | 43 | 43 | 33 | 40 | 48 | 45 |
| 1964 | 45 | 52 | 53 | 58 | 53 | 36 | 67 | 41 | 29 | 45 | 45 | 32 | 47 | 51 | 51 |
| 1965 | 46 | 54 | 60 | 58 | 49 | 37 | 69 | 44 | 31 | 45 | 54 | 35 | 60 | 49 | 57 |
| 1966 | 47 | 49 | 52 | 63 | 53 | 37 | 70 | 46 | 29 | 45 | 51 | 34 | 49 | 57 | 57 |
| 1967 | 42 | 40 | 52 | 69 | 57 | 36 | 67 | 47 | 32 | 46 | 49 | 34 | 54 | 56 | 59 |
| 1968 | 42 | 48 | 59 | 75 | 54 | 39 | 63 | 48 | 31 | 46 | 42 | 34 | 44 | 57 | 65 |
| 1969 | 42 | 37 | 56 | 75 | 58 | 37 | 61 | 49 | 34 | 46 | 51 | 38 | 57 | 57 | 61 |
| 1970 | 51 | 49 | 64 | 55 | 61 | 41 | 67 | 50 | 37 | 50 | 56 | 40 | 61 | 65 | 61 |
| 1971 | 62 | 59 | 72 | 55 | 68 | 47 | 70 | 53 | 42 | 62 | 63 | 43 | 66 | 69 | 64 |
| 1972 | 65 | 61 | 66 | 54 | 65 | 47 | 70 | 64 | 46 | 68 | 76 | 46 | 74 | 68 | 71 |
| 1973 | 73 | 73 | 84 | 74 | 78 | 57 | 75 | 68 | 50 | 88 | 88 | 59 | 85 | 82 | 78 |
| 1974 | 91 | 116 | 118 | 105 | 92 | 93 | 87 | 96 | 87 | 89 | 107 | 105 | 103 | 95 | 91 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 95 | 102 | 117 | 93 | 126 | 94 | 105 | 100 | 96 | 137 | 98 | 94 | 110 | 139 | 98 |
| 1977 | 119 | 172 | 128 | 123 | 167 | 100 | 104 | 123 | 115 | 139 | 113 | 118 | 121 | 246 | 107 |
| 1978 | 130 | 177 | 124 | 139 | 147 | 100 | 98 | 122 | 114 | 137 | 127 | 105 | 131 | 181 | 123 |
| 1979 | 127 | 179 | 145 | 157 | 170 | 117 | 116 | 139 | 116 | 154 | 139 | 119 | 143 | 213 | 140 |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1980, UN, NY, 1980.

TABLE XIX

UNIT VALUE INDEX OF IMPORTS OF LOW-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Malawi | Sir-Lanka | Benin | Burma | Central African Republic | Mozam-bique | Maurit-ania | Pakis-tan | Senegal | Chad | Niger | Sudan | Upper Volta | Uganda | Bangla-desh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 45 | 38 | 44 | 44 | 45 | 41 | 44 | 41 | 42 | 44 | 45 | 43 | 46 | 44 | 43 |
| 1961 | 45 | 38 | 44 | 44 | 46 | 41 | 45 | 41 | 42 | 44 | 45 | 43 | 46 | 44 | 43 |
| 1962 | 45 | 38 | 44 | 43 | 45 | 41 | 44 | 41 | 42 | 44 | 45 | 43 | 46 | 44 | 43 |
| 1963 | 46 | 39 | 45 | 55 | 47 | 42 | 45 | 41 | 43 | 46 | 46 | 44 | 47 | 45 | 43 |
| 1964 | 47 | 40 | 46 | 45 | 47 | 43 | 46 | 42 | 44 | 47 | 47 | 45 | 48 | 45 | 44 |
| 1965 | 48 | 40 | 47 | 46 | 48 | 43 | 47 | 43 | 44 | 48 | 48 | 45 | 48 | 47 | 45 |
| 1966 | 49 | 40 | 47 | 47 | 49 | 44 | 47 | 43 | 45 | 48 | 49 | 46 | 49 | 47 | 45 |
| 1967 | 50 | 41 | 48 | 47 | 51 | 45 | 49 | 44 | 45 | 53 | 50 | 47 | 51 | 48 | 46 |
| 1968 | 50 | 41 | 48 | 47 | 51 | 45 | 49 | 44 | 45 | 52 | 50 | 46 | 50 | 48 | 45 |
| 1969 | 51 | 41 | 49 | 48 | 51 | 45 | 49 | 44 | 46 | 51 | 50 | 47 | 50 | 49 | 46 |
| 1970 | 52 | 42 | 50 | 49 | 52 | 46 | 50 | 45 | 47 | 54 | 51 | 48 | 52 | 50 | 47 |
| 1971 | 56 | 44 | 52 | 52 | 56 | 50 | 54 | 49 | 50 | 58 | 55 | 51 | 56 | 54 | 50 |
| 1972 | 60 | 48 | 57 | 56 | 61 | 54 | 59 | 53 | 54 | 60 | 59 | 55 | 60 | 57 | 54 |
| 1973 | 74 | 62 | 71 | 69 | 74 | 67 | 73 | 66 | 68 | 75 | 72 | 69 | 74 | 70 | 69 |
| 1974 | 94 | 95 | 93 | 93 | 96 | 93 | 94 | 95 | 94 | 96 | 95 | 94 | 95 | 95 | 9( |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 101 | 103 | 101 | 102 | 103 | 103 | 101 | 101 | 102 | 102 | 102 | 102 | 101 | 103 | 102 |
| 1977 | 111 | 112 | 111 | 111 | 111 | 112 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 112 |
| 1978 | 124 | 119 | 124 | 123 | 123 | 120 | 124 | 122 | 121 | 123 | 124 | 123 | 124 | 123 | 123 |
| 1979 | 150 | 154 | 149 | 154 | 157 | 157 | 149 | 151 | 152 | 155 | 153 | 153 | 151 | 157 | 155 |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1980, UN, NY, 1980.

TABLE XX

UNIT VALUE INDEX OF EXPORTS OF MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Ghana | Jamaica | Ivory Coast | Urug-guay | Lebanon | South Africa | Thail-and | Peru | Domi-nican Republic | Guate-mala | Panama | Israel | Portugal | Zambia | Spain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 45 | 34 | 46 | 46 | 39 | 52 | 48 | 38 | 21 | 55 | 39 | 14 | 30 | 52 | 49 |
| 1961 | 39 | 33 | 42 | 45 | 37 | 52 | 45 | 37 | 21 | 52 | 40 | 15 | 29 | 48 | 48 |
| 1962 | 36 | 32 | 42 | 44 | 39 | 52 | 47 | 37 | 24 | 48 | 35 | 23 | 30 | 49 | 52 |
| 1963 | 37 | 34 | 43 | 48 | 44 | 53 | 46 | 39 | 28 | 49 | 32 | 25 | 33 | 49 | 55 |
| 1964 | 38 | 35 | 47 | 50 | 46 | 55 | 44 | 42 | 28 | 53 | 40 | 25 | 31 | 52 | 52 |
| 1965 | 32 | 33 | 43 | 52 | 43 | 56 | 46 | 44 | 25 | 57 | 45 | 26 | 32 | 61 | 55 |
| 1966 | 32 | 35 | 46 | 53 | 51 | 56 | 48 | 55 | 27 | 56 | 46 | 28 | 30 | 91 | 58 |
| 1967 | 39 | 33 | 50 | 51 | 50 | 55 | 50 | 50 | 27 | 55 | 50 | 27 | 33 | 85 | 61 |
| 1968 | 41 | 35 | 50 | 50 | 50 | 55 | 52 | 54 | 29 | 54 | 49 | 31 | 35 | 95 | 67 |
| 1969 | 49 | 36 | 53 | 49 | 51 | 57 | 50 | 61 | 32 | 55 | 52 | 33 | 36 | 117 | 65 |
| 1970 | 55 | 38 | 59 | 52 | 55 | 58 | 45 | 66 | 31 | 62 | 51 | 32 | 40 | 118 | 66 |
| 1971 | 44 | 37 | 56 | 60 | 55 | 56 | 44 | 60 | 30 | 64 | 54 | 36 | 61 | 85 | 67 |
| 1972 | 42 | 38 | 56 | 83 | 60 | 60 | 47 | 60 | 32 | 69 | 58 | 43 | 62 | 83 | 71 |
| 1973 | 56 | 38 | 69 | 135 | 103 | 73 | 73 | 105 | 40 | 86 | 66 | 53 | 72 | 139 | 77 |
| 1974 | 90 | 66 | 97 | 133 | 91 | 90 | 117 | 125 | 62 | 100 | 91 | 67 | 98 | 170 | 96 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 96 | 93 | 115 | 98 | 99 | 119 | 85 | 129 | 61 | 141 | 102 | 127 | 158 | 112 | 110 |
| 1977 | 169 | 116 | 183 | 128 | 108 | 127 | 91 | 134 | 70 | 202 | 112 | 196 | 173 | 105 | 104 |
| 1978 | 239 | 129 | 188 | 143 | 122 | 136 | 108 | 126 | 61 | 170 | 109 | 435 | -- | 105 | 100 |
| 1979 | 219 | 146 | 199 | 201 | 128 | 154 | 114 | 148 | 59 | 164 | 135 | 733 | -- | 152 | -- |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1980, UN, NY, 1980.

TABLE XXI

UNIT VALUE INDEX OF IMPORTS OF MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Ghana | Jamaica | Ivory Coast | Uru-guay | Lebanon | South Africa | Thail-and | Peru | Domi-nican Republic | Guate-mala | Panama | Israel | Portugal | Zambia | Spain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 41 | 40 | 41 | 35 | 44 | 47 | 39 | 43 | 46 | 44 | 33 | 13 | 49 | 45 | 40 |
| 1961 | 41 | 40 | 41 | 35 | 44 | 47 | 39 | 43 | 46 | 43 | 33 | 13 | 49 | 45 | 40 |
| 1962 | 40 | 40 | 41 | 35 | 44 | 47 | 39 | 42 | 45 | 43 | 33 | 20 | 48 | 45 | 40 |
| 1963 | 41 | 40 | 42 | 35 | 45 | 47 | 40 | 43 | 46 | 44 | 33 | 21 | 49 | 46 | 40 |
| 1964 | 42 | 41 | 43 | 36 | 46 | 48 | 40 | 44 | 47 | 45 | 34 | 22 | 53 | 47 | 41 |
| 1965 | 43 | 42 | 43 | 37 | 47 | 50 | 41 | 45 | 48 | 46 | 34 | 22 | 55 | 48 | 43 |
| 1966 | 43 | 42 | 44 | 37 | 47 | 52 | 42 | 45 | 48 | 46 | 35 | 23 | 55 | 48 | 42 |
| 1967 | 44 | 43 | 45 | 39 | 48 | 51 | 43 | 46 | 49 | 47 | 36 | 23 | 62 | 50 | 42 |
| 1968 | 44 | 43 | 45 | 38 | 48 | 49 | 43 | 46 | 49 | 46 | 36 | 26 | 53 | 50 | 45 |
| 1969 | 44 | 43 | 45 | 38 | 48 | 51 | 43 | 46 | 49 | 47 | 36 | 27 | 52 | 50 | 47 |
| 1970 | 45 | 45 | 46 | 39 | 49 | 52 | 44 | 47 | 50 | 48 | 37 | 27 | 54 | 52 | 51 |
| 1971 | 48 | 48 | 50 | 43 | 52 | 54 | 47 | 50 | 54 | 51 | 41 | 30 | 45 | 56 | 54 |
| 1972 | 52 | 52 | 54 | 45 | 56 | 62 | 51 | 55 | 58 | 55 | 44 | 36 | 46 | 60 | 53 |
| 1973 | 66 | 65 | 67 | 57 | 71 | 68 | 63 | 68 | 72 | 68 | 55 | 46 | 53 | 73 | 61 |
| 1974 | 93 | 94 | 93 | 94 | 95 | 80 | 93 | 93 | 93 | 93 | 93 | 68 | 76 | 94 | 95 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 102 | 103 | 103 | 104 | 101 | 123 | 104 | 102 | 101 | 102 | 105 | 124 | 100 | 101 | 115 |
| 1977 | 111 | 112 | 111 | 112 | 111 | 140 | 112 | 111 | 111 | 111 | 112 | 177 | 153 | 111 | 149 |
| 1978 | 121 | 120 | 121 | 118 | 124 | 166 | 120 | 122 | 125 | 124 | 117 | 364 | -- | 125 | 152 |
| 1979 | 152 | 156 | 154 | 160 | 151 | 189 | 157 | 153 | 149 | 153 | 160 | 653 | -- | 152 | -- |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1080, UN, NY, 1980.

## TABLE XXII

## NET BARTER TERMS OF TRADE OF LOW-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Malawi | Sri-Lanka | Benin | Burma | African Republic | Mozam-bique | Maurit-ania | Pakis-tan | Senegal | Chad | Niger | Sudan | Upper Volta | Uganda | Bangla-desh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 116 | 203 | 116 | 116 | 111 | 90 | 150 | 102 | 71 | 98 | 98 | 84 | 87 | 123 | 202 |
| 1961 | 118 | 184 | 111 | 118 | 104 | 88 | 149 | 102 | 71 | 100 | 100 | 79 | 85 | 114 | 163 |
| 1962 | 111 | 168 | 107 | 126 | 107 | 85 | 155 | 102 | 67 | 95 | 93 | 70 | 76 | 111 | 135 |
| 1963 | 104 | 154 | 113 | 125 | 104 | 86 | 147 | 102 | 63 | 93 | 93 | 75 | 85 | 107 | 105 |
| 1964 | 96 | 130 | 115 | 129 | 113 | 84 | 146 | 98 | 66 | 96 | 96 | 71 | 98 | 113 | 116 |
| 1965 | 96 | 135 | 128 | 126 | 102 | 86 | 147 | 102 | 70 | 94 | 113 | 78 | 125 | 104 | 127 |
| 1966 | 96 | 122 | 111 | 134 | 108 | 84 | 149 | 107 | 64 | 94 | 104 | 74 | 100 | 121 | 127 |
| 1967 | 84 | 98 | 108 | 147 | 112 | 80 | 137 | 107 | 71 | 87 | 98 | 72 | 106 | 117 | 128 |
| 1968 | 84 | 117 | 123 | 160 | 106 | 87 | 129 | 109 | 69 | 88 | 84 | 74 | 88 | 119 | 144 |
| 1969 | 82 | 90 | 114 | 156 | 114 | 82 | 124 | 111 | 74 | 90 | 102 | 81 | 114 | 116 | 133 |
| 1970 | 98 | 117 | 128 | 112 | 117 | 89 | 134 | 111 | 79 | 93 | 110 | 83 | 117 | 130 | 130 |
| 1971 | 111 | 134 | 138 | 106 | 121 | 94 | 130 | 108 | 84 | 107 | 115 | 84 | 118 | 128 | 128 |
| 1972 | 108 | 127 | 116 | 96 | 107 | 87 | 119 | 121 | 85 | 113 | 129 | 84 | 123 | 119 | 131 |
| 1973 | 99 | 118 | 118 | 107 | 105 | 85 | 103 | 103 | 74 | 117 | 122 | 86 | 115 | 117 | 113 |
| 1974 | 97 | 122 | 127 | 113 | 96 | 100 | 93 | 101 | 93 | 93 | 113 | 112 | 108 | 100 | 95 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 94 | 99 | 116 | 91 | 122 | 91 | 104 | 99 | 94 | 134 | 96 | 92 | 109 | 135 | 96 |
| 1977 | 107 | 154 | 115 | 111 | 150 | 89 | 94 | 111 | 104 | 125 | 102 | 106 | 109 | 222 | 96 |
| 1978 | 105 | 149 | 100 | 113 | 120 | 83 | 79 | 100 | 94 | 111 | 102 | 85 | 106 | 147 | 100 |
| 1979 | 85 | 116 | 97 | 102 | 108 | 75 | 78 | 92 | 76 | 99 | 91 | 78 | 95 | 136 | 90 |

Source: Calculated from Tables XXI and XXII.

fallen as demand for these commodities contracted due to a decrease in economic growth of developed countries. Although the movement in the price indexes of exports was generally downward, they were higher than the import price indexes for eight of the 15 countries.

The next period to be observed for the LINODC's covers the years of 1970 to 1979. This series of years can be characterized as one in which the NBTT fluctuated with a slightly upward trend for most of the countries. In particular, there were more countries that had improved NBTT in the early part of the 1970's than during the middle and latter years. The NBTT indexes were lowest in 1973-76 and in 1978-79. It fell sharply in nine of the 15 countries in 1973-74 as depicted in Table XXII. Alghouth the NBTT improved in 1977, it declined for all countries in 1978-79.

The deterioration in NBTT in these years can be attributed to depressed markets for exports and to higher cost of imported manufactured goods and oil. During the 1970's, both the export and import price indexes were generally moving upward, and at faster rates than the 1960's (Tables XVIII and XIX). The import price index rose even faster after 1974. For example, the rise in import price indexes in 1979 was larger (by about 25 percent) compared to the previous year and even much larger (by about 50 percent) compared to the base year. Export price indexes rose at a slower rate than the import price indexes after 1974. This caused the NBTT indexes to be lower in the second half of the 1970's than in the first half.

The MINODC's. About half of the countries in this group showed an improvement in their NBTT in the 1960's. The NBTT of the other half either declined or fluctuated with a downward trend (Table XXIII).

## TABLE XXIII

## NET BARTER TERMS OF TRADE OF MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Ghana | Jamaica | Ivory Coast | Uru-guay | Lebanon | South Africa | Thail-and | Peru | Domi-nican Republic | Guate-mala | Panama | Israel | Portugal | Zambia | Spain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 110 | 85 | 112 | 131 | 89 | 111 | 123 | 88 | 46 | 125 | 118 | 108 | 61 | 116 | 122 |
| 1961 | 95 | 82 | 102 | 129 | 84 | 111 | 115 | 86 | 46 | 121 | 121 | 115 | 59 | 107 | 120 |
| 1962 | 90 | 80 | 102 | 126 | 89 | 111 | 121 | 88 | 53 | 112 | 106 | 115 | 63 | 109 | 130 |
| 1963 | 90 | 85 | 102 | 137 | 98 | 113 | 115 | 91 | 61 | 111 | 97 | 119 | 67 | 107 | 138 |
| 1964 | 90 | 85 | 109 | 139 | 100 | 115 | 110 | 95 | 60 | 118 | 118 | 114 | 58 | 111 | 127 |
| 1965 | 74 | 79 | 100 | 141 | 91 | 112 | 112 | 98 | 52 | 124 | 132 | 118 | 58 | 127 | 128 |
| 1966 | 74 | 83 | 105 | 143 | 109 | 108 | 114 | 122 | 56 | 122 | 131 | 122 | 55 | 190 | 138 |
| 1967 | 89 | 77 | 111 | 131 | 104 | 108 | 116 | 109 | 55 | 117 | 139 | 117 | 53 | 170 | 145 |
| 1968 | 93 | 81 | 111 | 132 | 104 | 112 | 121 | 117 | 59 | 117 | 136 | 119 | 66 | 190 | 149 |
| 1969 | 111 | 84 | 118 | 129 | 106 | 112 | 116 | 133 | 65 | 117 | 144 | 122 | 69 | 234 | 138 |
| 1970 | 122 | 84 | 128 | 133 | 112 | 112 | 102 | 140 | 62 | 129 | 138 | 119 | 74 | 227 | 129 |
| 1971 | 92 | 77 | 112 | 140 | 106 | 104 | 94 | 120 | 56 | 125 | 132 | 120 | 136 | 152 | 124 |
| 1972 | 81 | 73 | 104 | 184 | 107 | 97 | 92 | 109 | 55 | 125 | 132 | 119 | 135 | 138 | 134 |
| 1973 | 85 | 58 | 103 | 237 | 145 | 107 | 116 | 154 | 56 | 126 | 120 | 115 | 136 | 190 | 126 |
| 1974 | 97 | 70 | 104 | 141 | 96 | 113 | 126 | 134 | 67 | 108 | 98 | 99 | 129 | 181 | 101 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 94 | 90 | 112 | 94 | 98 | 97 | 82 | 126 | 60 | 138 | 97 | 102 | 158 | 111 | 96 |
| 1977 | 152 | 104 | 165 | 114 | 97 | 91 | 81 | 121 | 63 | 182 | 100 | 111 | 113 | 95 | 70 |
| 1978 | 198 | 107 | 155 | 121 | 98 | 82 | 90 | 103 | 49 | 137 | 93 | 120 | -- | 84 | 66 |
| 1979 | 144 | 94 | 129 | 126 | 85 | 81 | 73 | 97 | 40 | 107 | 84 | 112 | -- | 100 | -- |

Source: Calculated from Tables XXIII and XXIV.

Ghana, for instance, showed a sharp decline for the decade even though in 1969 the NBTT rose to 111 as compared to 110 in 1960. Guatemala's NBTT also declined to a degree although not as significantly as Ghana's. Nine countries had NBTT over 100, while the rest remained below 100 whether the NBTT improved or not. For example, the Dominican Republic's NBTT rose from 46 in 1960 to 65 in 1969, a definite increase, but below that of the base year.

With respect to the export and import price indexes for the decade of the 1960's, both were below the base year (Tables XX and XXI). In fact, most of these indexes were between the range of 30 and 50. However, both indexes rose roughtly in similar proportions during this period. Export price indexes for some countries rose slightly faster than the import price indexes, producing an improvement in the NBTT. In contrast, those countries whose export price indexes were lower than the import price indexes showed a deterioration of the NBTT.

The picture for the 1970's in the MINODC's is somewhat different than the decade discussed above. Despite some fluctuation, this group of countries in general showed a steady decline in their NBTT from 1970 to 1979. The years when the deterioration was the worst were from 1974 to 1979. The cause was an increase in import prices that resulted from an increase in oil prices.

Some countries whose NBTT was below 100 in the 1960-69 period improved significantly in the 1970's. For example, Peru's and Portugal's NBTT rose from below 100 in the 1960's to well above 100 in the early 1970's. Even though NBTT in these countries remained above 100 for most of the decade, the NBTT declined slightly.

As during the 1960's, both the export and import price indexes rose in the 1970's (Tables XX and XXI). With a few exceptions, however, the latter rose more sharply in the second half of the decade than in the first half. The export indexes which were at a level between 50 and 60 for most of the countries in 1970, increased relatively fast through 1974, ranging in the 90's in 1974. After 1974, the increased up rapidly reaching 120 to 140 in 1979 for most countries. In some countries such as Ghana, Ivory Coast, Uruguay and Israel, the increase in 1979 was even larger than the range given above.

A similar pattern emerged for the import indexes. This index, which was between 40 and 50 in 1970 for most countries, increased relatively fast reaching the 90's in 1974. Between 1974 and 1979 this index increased rather sharply, climbing to more than 150 in 1979 for most of the MINODC's and producing a deterioration in their NBTT. Important commodities causing the rise in the import price indexes were manufactured goods, food items, and oil.

## The Purchasing Power of Exports

The NBTT discussed above allows for changes in the price of exports but does not allow for changes in the volume of exports (VOE). However, a decline in export prices, and thus a deterioration in the NBTT, can be offset by an expansion in VOE. This is an important element in the assessment of the impact of price changes on the international position of DC's in general and NODC's in particular.[5] Multiplying the NBTT by the VOE gives the income terms of trade, also called the "capacity to import" or "the purchasing power of exports" (PPOE). The VOE indexes used to calculate the PPOE of the LINODC's and MINODC's are shown in

Tables XXIV and XXV, respectively. A discussion of the PPOE of LINODC's and MINODC's follows.

The LINODC's. In the 1960's the PPOE of the majority of the LINODC's improved (Table XXVI). However, only six countries (Sri Lanka, Burma, Mozambique, Chad, Uganda and Bangladesh) consistently had a PPOE over 100. Of these six, Sri Lanka and Burma showed a deterioration in their PPOE. With the exception of Pakistan and Sudan during some years, the PPOE for the rest of the countries, including those that showed an improvement, remained in the 50 to 80 level.

Since changes in their NBTT over this decade were relatively small, the increase in the PPOE for the majority of these countries almost entirely reflects an expansion in the VOE (Table XXIV). The VOE indexes for most of the countries increased from 1960 to 1969. The PPOE of six countries (Benin, Central African Rep., Senegal, Niger, Sudan and Upper Volta) fluctuated, four having an upward trend. The only country that showed a steady decline was Burma.

The PPOE in the 1970's for the LINODC's was different than that of the 1960's. In this decade, the PPOE either declined or fluctuated for almost all of the LINODC's. The years 1973-74 and 1978-79 were the periods of the most significant deterioration. For example, the PPOE index for Uganda dropped from 185 in 1972 to 128 in 1974. Similarly, Uganda's PPOE fell in 1978 to 107 from 199 in 1977. This is clearly in opposition to Morgan's speculation that the PPOE's are likely to show a more favorable position for the DC's than the NBTT [30].

Since the NBTT of these countries showed a slight upward trend in the 1970's, the deterioration in their PPOE for the same time period can be attributed to a general decline in VOE in the 1970's (Table XXIV).

TABLE XXIV

VOLUME OF EXPORTS INDEX OF LOW-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Malawi | Sri-Lanka | Benin | Burma | African Republic | Mozam-bique | Maurit-ania | Pakis-tan | Senegal | Chad | Niger | Sudan | Upper Volta | Uganda | Bangla-desh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 35 | 89 | 111 | 260 | 59 | 98 | 2 | 70 | 72 | 63 | 33 | 116 | 23 | 96 | 123 |
| 1961 | 35 | 93 | 96 | 250 | 60 | 131 | 2 | 69 | 90 | 100 | 39 | 120 | 17 | 101 | 171 |
| 1962 | 41 | 107 | 73 | 285 | 65 | 129 | 3 | 74 | 97 | 84 | 52 | 173 | 45 | 103 | 200 |
| 1963 | 45 | 108 | 80 | 286 | 93 | 139 | 14 | 85 | 89 | 110 | 56 | 157 | 63 | 136 | 257 |
| 1964 | 56 | 134 | 77 | 238 | 113 | 146 | 40 | 98 | 93 | 126 | 52 | 141 | 63 | 155 | 248 |
| 1965 | 62 | 135 | 73 | 226 | 111 | 143 | 48 | 97 | 91 | 125 | 51 | 127 | 53 | 156 | 218 |
| 1966 | 76 | 131 | 66 | 180 | 121 | 148 | 57 | 103 | 111 | 112 | 76 | 136 | 74 | 144 | 262 |
| 1967 | 99 | 154 | 90 | 105 | 105 | 166 | 61 | 111 | 94 | 123 | 74 | 145 | 76 | 147 | 270 |
| 1968 | 82 | 129 | 117 | 85 | 140 | 199 | 66 | 136 | 107 | 128 | 75 | 156 | 108 | 142 | 254 |
| 1969 | 90 | 154 | 157 | 102 | 130 | 188 | 71 | 138 | 81 | 146 | 52 | 150 | 84 | 152 | 282 |
| 1970 | 84 | 126 | 161 | 114 | 105 | 189 | 77 | 140 | 90 | 125 | 63 | 169 | 67 | 163 | 279 |
| 1971 | 82 | 98 | 183 | 135 | 98 | 172 | 74 | 123 | 65 | 94 | 67 | 176 | 55 | 142 | 175 |
| 1972 | 87 | 99 | 171 | 128 | 125 | 186 | 88 | 103 | 103 | 110 | 78 | 176 | 61 | 155 | 149 |
| 1973 | 97 | 100 | 163 | 113 | 98 | 198 | 120 | 136 | 86 | 90 | 77 | 168 | 67 | 143 | 139 |
| 1974 | 96 | 81 | 114 | 109 | 108 | 159 | 120 | 110 | 97 | 78 | 54 | 76 | 80 | 128 | 138 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 117 | 100 | 61 | 150 | 96 | 82 | 98 | 113 | 108 | 90 | 150 | 134 | 112 | 95 | 145 |
| 1977 | 115 | 79 | 76 | 110 | 104 | 64 | 87 | 92 | 118 | 105 | 114 | 128 | 103 | 90 | 139 |
| 1978 | 99 | 86 | 66 | 102 | 102 | 55 | 69 | 117 | 75 | 76 | 137 | 116 | 73 | 73 | 154 |
| 1979 | 132 | 86 | 86 | 135 | 104 | 42 | 73 | 142 | 60 | 78 | 166 | 134 | 111 | 116 | 153 |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1980, UN, NY, 1980.

TABLE XXV

VOLUME OF EXPORTS INDEX OF MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Ghana | Jamaica | Ivory Coast | Urug-guay | Lebanon | South Africa | Thail-and | Peru | Domi-nican Republic | Guate-mala | Panama | Israel | Portugal | Zambia | Spain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 80 | 60 | 28 | 73 | 9 | 49 | 36 | 87 | 91 | 33 | 25 | 34 | 55 | 87 | 20 |
| 1961 | 92 | 67 | 38 | 102 | 10 | 51 | 44 | 102 | 78 | 34 | 26 | 38 | 57 | 86 | 20 |
| 1962 | 100 | 72 | 39 | 91 | 12 | 52 | 42 | 110 | 79 | 38 | 48 | 44 | 68 | 85 | 19 |
| 1963 | 91 | 73 | 45 | 90 | 12 | 53 | 43 | 106 | 69 | 49 | 65 | 53 | 72 | 91 | 18 |
| 1964 | 95 | 78 | 55 | 93 | 12 | 54 | 56 | 121 | 72 | 48 | 61 | 56 | 85 | 111 | 25 |
| 1965 | 111 | 81 | 54 | 96 | 18 | 55 | 57 | 114 | 57 | 52 | 61 | 62 | 87 | 109 | 23 |
| 1966 | 93 | 99 | 57 | 81 | 18 | 61 | 60 | 105 | 56 | 64 | 68 | 69 | 92 | 93 | 28 |
| 1967 | 87 | 86 | 56 | 81 | 21 | 71 | 58 | 115 | 65 | 58 | 66 | 77 | 107 | 96 | 32 |
| 1968 | 93 | 78 | 72 | 94 | 26 | 79 | 53 | 123 | 63 | 67 | 71 | 90 | 121 | 99 | 38 |
| 1969 | 76 | 88 | 72 | 107 | 30 | 79 | 59 | 107 | 65 | 74 | 77 | 96 | 123 | 113 | 46 |
| 1970 | 103 | 113 | 67 | 117 | 32 | 77 | 66 | 120 | 78 | 75 | 72 | 106 | 133 | 105 | 58 |
| 1971 | 99 | 112 | 69 | 89 | 41 | 79 | 80 | 113 | 91 | 71 | 75 | 127 | 110 | 99 | 69 |
| 1972 | 127 | 121 | 83 | 67 | 52 | 97 | 97 | 119 | 121 | 76 | 73 | 90 | 124 | 112 | 79 |
| 1973 | 140 | 125 | 105 | 62 | 43 | 99 | 90 | 76 | 123 | 81 | 70 | 92 | 101 | 102 | 91 |
| 1974 | 101 | 133 | 106 | 75 | 71 | 101 | 89 | 92 | 115 | 91 | 81 | 98 | 120 | 102 | 97 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 104 | 84 | 120 | 146 | 45 | 107 | 147 | 77 | 132 | 84 | 82 | 123 | 97 | 115 | 115 |
| 1977 | 71 | 79 | 99 | 123 | 53 | 128 | 161 | 91 | 125 | 90 | 71 | 134 | 101 | 106 | 119 |
| 1978 | 60 | 71 | 105 | 124 | 46 | 141 | 159 | 118 | 123 | 100 | 78 | 134 | -- | 100 | 148 |
| 1979 | 59 | 66 | 107 | 102 | 42 | 161 | 195 | 181 | 164 | 114 | 74 | 138 | -- | 91 | -- |

Source: UNCOTAD, Handbook of International Trade and Development, Supplement 1980, UN, NY, 1980.

TABLE XXVI

THE PURCHASING POWER OF EXPORTS OF LOW-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Malawi | Sir-Lanka | Benin | Burma | Central African Republic | Mozam-bique | Maurit-ania | Pakis-tan | Senegal | Chad | Niger | Sudan | Upper Volta | Uganda | Bangla-desh |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 40 | 180 | 129 | 301 | 66 | 88 | 3 | 72 | 51 | 62 | 32 | 97 | 20 | 118 | 249 |
| 1961 | 41 | 171 | 107 | 295 | 63 | 115 | 3 | 71 | 64 | 100 | 39 | 95 | 14 | 115 | 278 |
| 1962 | 46 | 180 | 78 | 358 | 69 | 110 | 5 | 76 | 65 | 80 | 49 | 121 | 34 | 115 | 270 |
| 1963 | 47 | 166 | 91 | 358 | 97 | 119 | 21 | 87 | 56 | 103 | 52 | 118 | 54 | 145 | 269 |
| 1964 | 54 | 174 | 89 | 307 | 127 | 122 | 58 | 96 | 61 | 121 | 50 | 100 | 62 | 176 | 287 |
| 1965 | 59 | 182 | 93 | 285 | 113 | 123 | 70 | 99 | 64 | 117 | 57 | 99 | 66 | 163 | 276 |
| 1966 | 73 | 160 | 73 | 241 | 131 | 124 | 85 | 110 | 72 | 105 | 79 | 101 | 74 | 175 | 332 |
| 1967 | 83 | 150 | 97 | 154 | 117 | 133 | 83 | 119 | 67 | 107 | 73 | 105 | 80 | 171 | 346 |
| 1968 | 69 | 151 | 144 | 136 | 148 | 172 | 85 | 148 | 74 | 113 | 63 | 115 | 95 | 169 | 367 |
| 1969 | 74 | 139 | 179 | 159 | 148 | 155 | 88 | 154 | 60 | 132 | 53 | 121 | 96 | 177 | 374 |
| 1970 | 82 | 147 | 206 | 128 | 123 | 168 | 103 | 156 | 71 | 116 | 69 | 141 | 79 | 212 | 362 |
| 1971 | 91 | 131 | 253 | 143 | 119 | 163 | 96 | 133 | 55 | 100 | 77 | 148 | 65 | 181 | 224 |
| 1972 | 94 | 126 | 198 | 123 | 133 | 162 | 104 | 124 | 88 | 125 | 100 | 147 | 75 | 185 | 196 |
| 1973 | 96 | 118 | 193 | 121 | 103 | 168 | 123 | 140 | 63 | 106 | 94 | 144 | 77 | 168 | 157 |
| 1974 | 93 | 99 | 145 | 123 | 103 | 159 | 111 | 111 | 90 | 72 | 61 | 85 | 87 | 128 | 131 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 110 | 99 | 71 | 137 | 117 | 75 | 102 | 112 | 102 | 121 | 144 | 123 | 122 | 128 | 139 |
| 1977 | 123 | 121 | 88 | 122 | 156 | 57 | 82 | 102 | 122 | 131 | 116 | 136 | 112 | 199 | 133 |
| 1978 | 104 | 128 | 66 | 115 | 122 | 46 | 55 | 117 | 71 | 85 | 140 | 99 | 77 | 107 | 154 |
| 1979 | 112 | 100 | 84 | 138 | 113 | 31 | 57 | 131 | 46 | 77 | 151 | 104 | 105 | 157 | 138 |

Source : Calculated from Tables XXV and XXVII.

All of the countries, Malawi being the most notable exception, showed a drop in VOE for the decade, although some fluctuation occurred. The pattern of decline in VOE for the years 1973-74 and 1978-79 parallels that of the PPOE for the same years in most countries. Again, Uganda can serve as an illustration of the movements of VOE in this time period. The VOE index which was 155 in 1972 dropped to 128 by 1974. In 1978 the VOE was down sharply to 73, the lowest index for the decade.

The MINODC's. The PPOE generally increased for almost all of the countries in this group in the 1960's (Table XXVII). Thailand and Guatemala illustrate this upward trend. In 1960 the PPOE index for Thailand was 44, but by 1969 it had risen to 69. Guatemala shows a similar pattern, having an index of 41 in 1960, rising to 87 in 1969. In spite of these increases, only three countries, Uruguay, Peru and Zambia had PPOE indexes above the base year. Two countries, Ghana and Dominican Republic, showed no improvement during the decade. The indexes for both fluctuated within the 20 percent range. Ghana's index remained below 90, while the index for Dominican Republic stayed below 42.

The improvement in the PPOE indexes for MINODC's is directly related to movements in the VOE indexes for the same time period (Table XXV). As with the PPOE, the VOE indexes in the 1960's increased for the majority of the countries in this group. Only four countries (Ghana, Uruguay, Peru and Zambia) did not show a steady improvement in the VOE for the decade. The VOE indexes were not extremely high for most MINODC's. Only Peru consistently maintained an index above 100. Guatemala provides a representative example of the movements of the VOE index. It had an index of 33 in 1960 rising to 74 in 1969. Since

## TABLE XXVII

## THE PURCHASING POWER OF EXPORTS OF MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79 (1975=100)

| Year | Ghana | Jamaica | Ivory Coast | Urug-guay | Lebanon | South Africa | Thail-and | Peru | Domi-nican Republic | Guate-mala | Panama | Israel | Portugal | Zambia | Spain |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 88 | 51 | 31 | 96 | 8 | 54 | 44 | 77 | 42 | 41 | 30 | 37 | 34 | 101 | 24 |
| 1961 | 88 | 55 | 39 | 131 | 8 | 56 | 51 | 88 | 36 | 41 | 32 | 44 | 34 | 92 | 24 |
| 1962 | 90 | 58 | 40 | 114 | 11 | 58 | 51 | 97 | 42 | 42 | 51 | 51 | 43 | 93 | 25 |
| 1963 | 82 | 62 | 46 | 123 | 12 | 60 | 49 | 96 | 42 | 55 | 63 | 63 | 48 | 97 | 25 |
| 1964 | 86 | 67 | 60 | 129 | 12 | 62 | 62 | 115 | 43 | 57 | 72 | 64 | 50 | 123 | 32 |
| 1965 | 83 | 64 | 54 | 135 | 16 | 62 | 64 | 111 | 30 | 64 | 81 | 73 | 51 | 139 | 29 |
| 1966 | 69 | 82 | 60 | 130 | 20 | 66 | 69 | 128 | 32 | 78 | 89 | 84 | 50 | 176 | 39 |
| 1967 | 77 | 66 | 62 | 106 | 22 | 77 | 67 | 125 | 36 | 68 | 92 | 90 | 57 | 163 | 46 |
| 1968 | 87 | 63 | 80 | 124 | 27 | 89 | 64 | 144 | 37 | 79 | 97 | 107 | 80 | 188 | 57 |
| 1969 | 85 | 74 | 85 | 138 | 32 | 88 | 69 | 142 | 42 | 87 | 111 | 117 | 85 | 264 | 64 |
| 1970 | 126 | 95 | 86 | 156 | 36 | 86 | 67 | 169 | 48 | 97 | 99 | 126 | 99 | 238 | 75 |
| 1971 | 91 | 86 | 77 | 124 | 43 | 82 | 75 | 136 | 51 | 89 | 99 | 152 | 149 | 150 | 86 |
| 1972 | 103 | 88 | 86 | 124 | 56 | 94 | 89 | 130 | 67 | 95 | 96 | 107 | 167 | 155 | 106 |
| 1973 | 119 | 73 | 108 | 147 | 62 | 106 | 104 | 117 | 68 | 102 | 84 | 106 | 137 | 194 | 115 |
| 1974 | 98 | 93 | 111 | 106 | 68 | 114 | 112 | 124 | 77 | 98 | 79 | 97 | 155 | 184 | 98 |
| 1975 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1976 | 98 | 76 | 134 | 138 | 44 | 104 | 120 | 97 | 80 | 116 | 80 | 126 | 153 | 128 | 110 |
| 1977 | 108 | 82 | 163 | 141 | 52 | 116 | 131 | 110 | 79 | 164 | 71 | 148 | 114 | 100 | 83 |
| 1978 | 119 | 76 | 163 | 150 | 45 | 116 | 143 | 122 | 60 | 137 | 73 | 160 | -- | 84 | 97 |
| 1979 | 85 | 62 | 138 | 128 | 36 | 131 | 142 | 175 | 65 | 122 | 62 | 155 | -- | 91 | -- |

Source: Calculated from Tables XXVI and XXVIII.

the NBTT of this country declined by eight percent for the same time period, the improvement in the PPOE was due to an increase in the VOE. Most of the other countries followed this pattern.

The pattern of the PPOE in the MINODC's in the 1970's was considerably different than that of the 1960's. Only three countries (Ivory Coast, South Africa, and Thailand) showed a steady improvement from 1970 to 1979. The indexes for most of the countries fluctuated erratically through the decade. Most of the variation occurred between 1974 and 1979. The indexes for 1977 generally showed an improvement over 1976, but tended to drop significantly in 1978 and 1979. Despite this up and down movement, a majority of the countries' indexes stayed over 100 in the 1970's in contrast to the 1960's. Two exceptions to the pattern of fluctuation were Panama and Zambia both of whom showed a steady decline in their PPOE for the decade.

Fluctuation in the VOE was also the most common trend for this group of countries in the 1970's. While four countries (South Africa, Thailand, Guatemala and Spain) witnessed an increase in their VOE, the remaining countries' indexes moved up and down throughout the decade. This parallels the trend in the PPOE for the 1970's. For example, South Africa's VOE improved by 84 percent from 1970 to 1979 and its PPOE improved 45 percent. Given the 31 percent decline in the NBTT for this country for the same time period, it is evident that the increase in PPOE is due almost entirely to the VOE. This is also true for those countries whose VOE indexes fluctuated during the 1970's. Ghana, for instance, showed a rise in both PPOE and VOE from 1972 to 1973, then a drop in 1974. In 1978 the VOE for this country dropped from the previous year but showed an increase for the PPOE. In almost

all the countries the movement of the PPOE closely followed that of the VOE.

## Summary

In the first part of this chapter the composition and growth of both exports and imports were analyzed. In the NODC's under study, primary product sales constituted 30 to 90 percent of their export earnings in the 1960's and 1970's. Some of these countries, mostly LINODC's, depended on one primary commodity for more than 50 percent of their export earnings. Although dependency on a narrow range of primary commodities declined slightly in the 1970's, the majority of LINODC's and MINODC's continued to concentrate on only a few primary products. This dependence has resulted in a constraint on the ability of NODC's to improve their share in world trade. The share in world trade by NODC's decreased in the 1970's compared to the 1960's.

The composition of imports of these countries included manufactured goods, food items and fuels. The most important of these imports is that of manufactured goods. Although the share of this import declined in the 1970's, it still remains the number one import of both the LINODC's and MINODC's. For these two groups of countries, food items were the second most important import in the 1960's. However, this changed in the 1970's to fuels for the MINODC's. In general, the share of world imports by the NODC's remained constant over the two decades.

In the second part of this chapter a brief explanation of the NBTT and PPOE of both LINODC's and MINODC's for the 1960's and 1970's was given. In the 1960's, the LINODC's NBTT, in general, fluctuated while

the NBTT for about half of the MINODC's showed an overall improvement. In the LINODC's the export price indexes for most countries 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. For the MINODC's, export and import price indexes rose proportionally for the 1960's. The export price indexes were slightly higher for some countries resulting in an improved NBTT.

In the 1970's, the NBTT of most LINODC's in general improved slightly, particularly in the early part of the decade, resulting from some primary commodity price increases in this part of the decade. The situation in the 1970's for the MINODC's was somewhat different than that of the LINODC's. The NBTT indexes for these countries showed a steady decline. In contrast to the 1960's, both the import and export price indexes for LINODC's increased during the 1970's. Export price indexes did not rise as fast as import price indexes, particularly after 1974. The MINODC's import and export price indexes increased in the 1970's, however, the former rose faster in the second half of the decade. The increase in the import price indexes in the second half of the 1970's for both the LINODC's and MINODC's can be attributed to higher costs of imported manufactured goods and oil.

With a few exceptions, the VOE indexes in the 1960's improved for both the LINODC's and MINODC's. Like the VOE indexes the PPOE for both groups of countries 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.

Although some fluctuation occurred, almost all LINODC's showed a drop in the VOE indexes in the 1970's, while the MINODC's VOE indexes tended to fluctuate for the same time period. The PPOE indexes in the 1970's for LINODC's fluctuated or declined, while the indexes for the MINODC's fluctuated erratically, as did the VOE. Almost all the LINODC's showed a drop in their PPOE indexes in the last part of the decade, which parallels the VOE indexes for the same time period.

Along with the explanation of the trend in the NBTT, some comments pertaining to the behavior of some commodities which were influential in the price index movement were given in this chapter. However, the explanation does not include a statistical analysis to identify the most influential commodities in the price index movement. The following chapter, therefore, is designed to give such an explanation.

## FOOTNOTES

[1]For a definition of primary commodities see footnote 4 in Chapter I.

[2]The following are examples of primary commodities for which the world market situation for most of the past two decades were unfavorable: cotton, rubber, jute, wool, hide and skins, copper and sugar.

[3]See, Review of International Trade and Development, 1977, UNCOTAD, UN, New York, 1978.

[4]Other factors responsible for slow growth in volume of exports of the NODC's are: technological developments, e.g., the development of synthetic substitutes; protectionism in the developed countries, and a decrease in growth rates of developed countries who are importers of these commodities.

[5]Even though the PPOE is a better assessment of the ability of a country or a group of countries to import needed development goods than the more limited measure of NBTT, some writers have argued that even this measure is not adequate for development purposes. For example, Fink [75] argues that economists should emphasize the per capita capacity to import, i.e., the PPOE divided by an index of population size.

# CHAPTER V

# EMPIRICAL ANALYSIS OF THE EFFECT OF WORLD COMMODITY PRICES ON THE TERMS OF TRADE

## Introduction

The previous chapter examined movements in the terms of trade over the study period. Also noted were some of the important economic factors determining the trend of the terms of trade. However, no systematic statistical model was used to identify those factors most important in determining net barter terms of trade (NBTT) for the decades of the 1960's and 1970's in both low-income and middle-income country groups. This chapter presents such an analysis. First, a model is developed which relates the export price index and the import price index to a set of expalantory variables for each individual country in the group of LINODC's and MINODC's. Second, the estimation procedure and source of data are explained. Third, statistical results of the model are presented and analyzed.

## The Model

The NBTT are defined as 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 a reflection of weighted world prices. The weights for a particular country are

determined by the quantities of exports and imports for that country. Analysis of the previous chapter identified major export and import commodities of the sample of LINODC's and MINODC's. Our interest now turns to how the NBTT are affected by international price movements.

The factors that are hypothesized to contribute to a quantitative explanation of the LINODC's and MINODC's 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 expected export and import price index functions are expressed as follows:

$$EPI_{it} = f(WAGPI_t, WMIPI_t) \quad (5.1)$$

$$EPI_{it} = f(WAGPI_t, WMIPI_t, WNFMPI_t) \quad (5.2)$$

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

Equation (5.1) and (5.2) represent the export equations for LINODC's and MINODC's, respectively, while equation (5.3) represents the import equation for both groups of countries.

The endogenous variables are:

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

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

The exogenous variables are:

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

$WMIPI_t$ = the world price index of minerals in year t

$WNFMPI_t$ = the world price index of non-ferrous metals in year t

$WCERSPI_t$ = the world price index of cereals in year t

$WCRPETPI_t$ = the world price index of crude petroleum in year t

$WMANGOPI_t$ = the world price index of manufactured goods in year t.

Equations (5.1) and (5.2) represent the export price index of country i at time t. These equations measure the net impact of changes in the world price level of agricultural products, minerals and non-ferrous metals on the export price index of country i at time t. It measures the net impact of changes in the world price level of cereals, crude petroleum and manufactured goods on the import price index of the individual country.

## Estimation Procedure

The parameters of the static model in equations (5.1) through (5.3) can be estimated using ordinary least squares procedures (OLS). Each equation was estimated based on time series data in two algebraic forms, linear and logarithmic. The form with higher determination coefficient and lower probability levels for the statistical significance of the estimated parameters (t-test) was found to be the linear form. The choice of the linear form was supported by examination of the residuals which revealed no evidence of autocorrelation and suggested that the linear relationship provides a satisfactory fit to the data.

Ignoring the i and t subscript for simplicity and assuming a linear relationship, expressions (5.1), (5.2) and (5.3) may be rewritten as follows:

$$EPI = \beta_o + \beta_1 WAGPI + \beta_2 WMIPI + U \qquad (5.4)$$

$$EPI = \beta_o + \beta_1 WAGPI + \beta_2 WMIPI + \beta_3 WNFMPI + U \qquad (5.5)$$

$$MPI = A_o + A_1 WCERSPI + A_2 WCRPETPI + A_3 WMANGOPI + U \quad (5.6)$$

where all variables are as previously defined and U is a stochastic disturbance term.

Under normal conditions the relationship of the independent variables to the dependent variables in equations (5.4), (5.5) and (5.6) is expected to be positive. The assumptions of the model are:

1. U is normally distributed with mean equal to zero and the variance equal to $\sigma^2$, i.e., U N $(0, \sigma^2)$.

2. The explanatory variables are nonstochastic and independent or have fixed values in repeated samples with no measurement error.

3. The number of observations exceeds the number of coefficients to be estimated so as to have enough degrees of freedom in the estimation.

4. No exact linear relation exists between any of the explanatory variables and thus avoiding autocorrelation problems.

There is no apriori reason to expect that any of the assumptions would be violated in the estimation of equations (5.4) through (5.6).

A first hypothesis tested was that for a given world commodity price change, all countries in each group would be affected the same way. That is, there is no difference in structure among the countries in each group under study. Failure to reject the null hypothesis would imply that as far as policy prescription is concerned there would be no difference among countries in their NBTT from a change in world prices. The empirical interpretation would be that the data for all countries in each group could be combined and one equation estimated for the export and import indexes. The null hypothesis was rejected after a structural stability test, Chow test [76], indicated that the individual countries in each group under study behave differently when changes occur in any

one of the world price indexes. The null hypothesis was rejected at the 0.05 probability level. The result implies that differences exist among countries in response to changes in world prices which justifies estimating the export and import equations separately for each country.

A second hypothesis was tested that structural changes took place in the determination of export and import price indexes after 1973 due to the world oil price increases. A dummy variable was used to identify the two time periods. However, to assume that the dummy variable measures the structural change requires the ceteris paribus assumption that other factors included in the model are not correlated with the dummy variable during the period 1960-79. The results showed that the estimated coefficients were different in some cases. However, the differences were not significant at the 0.01 probability level. In most cases, the underlying structural relationships described in the more basic forms (equations 5.4, 5.5 and 5.6) were affected by the addition of the dummy variable. The statistical results achieved based on the other independent variables are discussed after the explanation of the source of data.

## Data Sources

Observations on the dependent variables (EPI, MPI) for each country in the sample were obtained directly from publications of the United Nations Conference on Trade and Development (UNCOTAD) [77]. Both dependent variables are expressed in an index form with 1975=100. With the exception of the world price index of manufactured goods, the information for all the exogenous variables was obtained from United Nations Statistical Papers [78]. The data for manufactured goods was obtained from Monthly Bulletin of Statistics [79].

The data for agriculture includes both food and non-food products. Since the interest of this study is to see the effect of oil prices, the data for crude petroleum was separated from the minerals data. The world price index data for minerals includes iron ore, manganese ore, chrome ore and crude fertilizer.

## Empirical Results

### Export Equations

The estimated coefficients of the export equation, coefficients of determination ($R^2$), and the Durbin Watson statistic (DW) for each country in the LINODC's and MINODC's are presented in Tables XXVIII and XXIX, respectively. On the basis of our expectation, the coefficients for all the variables should be positive. The empirical results show that, with some exceptions, the signs on the variables are what is expected. The coefficients with wrong signs in both groups are in general not statistically significant from zero or represent price variables not important for export commodities of that country. Since these variables were not significant or representative of a countries' exports or imports, they were dropped and the coefficients reestimated with the remaining variables. The results indicated no autocorrelation in the residuals.

The percent of total variation in the export price index accounted for by the collective independent variables ranges from 80 percent for Uganda to 98 percent for Mozambique in the LINODC's. With regard to the MINODC's, the range is between 67 percent for Israel to 97 percent for Peru. The variable WAGPI is highly significant (0.01) for all the countries in both groups, indicating a considerable positive relationship

TABLE XXVIII

STATISTICAL PARAMETERS OF THE ESTIMATED EXPORT PRICE INDEX EQUATION FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES[a]

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

[a]The figures in parentheses are the t-values.

[b]Significant at .01 level.

[c]Significant at .05 level.

[d]Significant at .10 level.

TABLE XXIX

STATISTICAL PARAMETERS OF THE ESTIMATED EXPORT PRICE INDEX EQUATION FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES

| Country | Estimated Equations | | | | $R^2$ % | DW |
|---|---|---|---|---|---|---|
| | CONSTANT | WAGPI | WMIPI | WNFMPI | | |
| Ghana | -60.6859[b] | 0.9330[d] | 1.1380[d] | -- | 91 | 0.76 |
| | (-2.8949) | (1.7194) | (1.3880) | -- | | |
| Jamaica | -43.5536[b] | -- | 1.3774[b] | 0.1899 | 93 | 0.98 |
| | (-6.2836) | -- | (7.3970) | (1.4777) | | |
| Ivory Coast | -30.7590[c] | 1.1175[b] | 0.5076 | -- | 87 | 0.70 |
| | (-2.1289) | (2.9881) | (0.8983) | -- | | |
| Uruguay | -20.1359[b] | 0.7851[b] | -- | 0.5379[c] | 93 | 0.98 |
| | (-2.3336) | (3.2364 | -- | (2.1269) | | |
| Lebanon | 3.0357 | 0.7438[b] | -- | 0.1531 | 95 | 2.21 |
| | (0.6387) | (5.5664) | | (1.0993) | | |
| South Africa | -1.3041 | 0.5457[b] | 0.6297[b] | -- | 95 | 0.71 |
| | (-0.2219) | (3.5877) | (2.7401) | -- | | |
| Thailand | 5.8759 | 0.5616[b] | 0.3182[d] | -- | 93 | 1.52 |
| | (1.0968) | (4.0495) | (1.5184) | -- | | |
| Peru | -12.1802[b] | 0.7237[b] | -- | 0.4301[b] | 97 | 1.18 |
| | (-2.5401) | (5.3686) | | (3.0603) | | |
| Dominican Rep. | 3.7587 | 0.5194[b] | -- | -- | 69 | 1.64 |
| | (0.5924) | (6.3760) | -- | -- | | |
| Guatemala | -5.7924 | 1.2813[b] | -- | -- | 85 | 1.02 |
| | (-0.5893) | (10.1541) | -- | -- | | |
| Panama | -3.6220 | 0.6507[b] | 0.3755[c] | -- | 95 | 0.97 |
| | (-0.7009) | (4.8639) | (1.8577) | -- | | |
| Israel | -297.0499[b] | -- | 3.0449[d] | 2.5290[c] | 67 | 0.45 |
| | (-4.0428) | -- | (1.5425) | (1.8568) | | |
| Portugal | -68.1582[b] | -- | 1.4371[b] | 0.5956[b] | 86 | 1.33 |
| | (-4.8369) | -- | (3.7961) | (2.2800) | | |
| Zambia | 11.9769 | -- | -- | 0.9562[b] | 76 | 0.67 |
| | (1.0582) | -- | -- | (7.6751) | | |
| Spain | 17.4488[b] | -- | 0.4614[b] | 0.3179[b] | 87 | 0.78 |
| | (3.1883) | -- | (3.1380) | (3.1335) | | |

[a]The figures in parentheses are t-values.

[b]Significant at .01 level.

[c]Significant at .05 level.

[d]Significant at .10 level.

with the export price index of these countries. Most of the other variables in the export price index of each country are also significant at different significant levels which are indicated at the bottom of each table.

Import Equations

The estimated import equations for the LINODC's and MINODC's are presented in Tables XXX and XXXI, respectively. All of the relationships appear to fit well over the historical period for both groups of countries. Signs on the coefficients are what is expected. Variables that were negative and not significant in explaining the import price index equation for some countries were dropped. The coefficients for cereals are significant for only a few countries, while the other two variables were highly significant in almost all the countries in both the LINODC's and MINODC's.

The results of the standardized coefficients show that the world manufactured goods price index accounts for a greater proportion of the import price index than the other two world price indexes. In other words, over half of the import price index for the LINODC's under study is accounted for by the price index of manufactured goods, while about 20 percent of the import price index is accounted for by the world crude petroleum price index. With regard to MINODC's, while the world manufactured goods price index accounted for the largest proportion in determining the import price index, the world crude petroleum price index was a very close second. The percent of total variation in the import price index accounted for by the variables in the model ranges from 93 percent to 99 percent for the LINODC's, while the range is between 76

TABLE XXX

STATISTICAL PARAMETERS OF THE ESTIMATED IMPORT PRICE INDEX EQUATION FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES[a]

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

[a]The figures in parentheses are t-values.

[b]Significant at .01 level.

[c]Significant at .05 level.

[d]Significant at .10 level.

TABLE XXXI

STATISTICAL PARAMETERS OF THE ESTIMATED IMPORT PRICE INDEX EQUATION FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| Country | Estimated Coefficients | | | | $R^2$ % | DW |
|---|---|---|---|---|---|---|
| | CONSTANT | WCERSPI | WCRPETPI | WMANGOPI | | |
| Ghana | 6.3621[b] | 0.0295 | 0.2832[b] | 0.6369[b] | 99 | 1.59 |
| | (2.3663) | (0.8206) | (7.2010) | (10.7463) | | |
| Jamaica | 7.0014[b] | 0.0135 | 0.3280[b] | 0.6088[b] | 99 | 1.79 |
| | (2.2352) | (0.3213) | (7.1591) | (8.8164) | | |
| Ivory Coast | 6.1542[c] | 0.0158 | 0.2648[b] | 0.6767[b] | 97 | 1.72 |
| | (2.0757) | (0.3974) | (6.1058) | (10.3541) | | |
| Uruguay | 7.2111[b] | -- | 0.4799[b] | 0.4619[b] | 99 | 1.89 |
| | (2.5549) | | (11.4569) | (6.7937) | | |
| Lebanon | 6.0841[c] | 0.0628[d] | 0.1820[b] | 0.7218[b] | 99 | 1.15 |
| | (2.1069) | (1.6243) | (4.3095) | (11.3382) | | |
| South Africa | -20.4510[b] | -- | -- | 1.3980[b] | 95 | 0.54 |
| | (-3.7833) | -- | -- | (19.4658) | | |
| Thailand | 7.2862[b] | -- | 0.3533[b] | 0.5932[b] | 99 | 1.78 |
| | (2.6092) | -- | (8.5239) | (8.8182) | | |
| Peru | 7.4244[b] | 0.0152 | 0.2505[b] | 0.6794[b] | 97 | 1.34 |
| | (2.3802) | (0.3648) | (5.4909) | (9.8814) | | |
| Dominican Rep. | 6.4413[b] | 0.0347 | 0.1394[b] | 0.7812[b] | 99 | 1.05 |
| | (2.2709) | (0.9168) | (3.3285) | (12.5382) | | |
| Guatemala | 7.6442[b] | 0.0038 | 0.2379[b] | 0.7041[b] | 99 | 1.14 |
| | (2.4822) | (0.0919) | (5.2817) | (10.3712) | | |
| Panama | 5.2607[c] | -- | 0.5032[b] | 0.4524[b] | 99 | 2.12 |
| | (1.9350) | -- | (12.4726) | (6.9081) | | |
| Israel | -179.8178[d] | 2.0504 | 0.8600 | 5.3084[c] | 76 | 0.80 |
| | (1.5690) | (1.2190) | (0.5520) | (2.1580) | | |
| Portugal | 34.0272[c] | 0.6976[b] | 0.5035[b] | 0.8350[b] | 89 | 1.63 |
| | (1.8120) | (2.6850) | (1.8580) | (2.0240) | | |
| Zambia | 4.4275[d] | 0.0309 | 0.1134[b] | 0.8415[b] | 99 | 1.19 |
| | (1.3840) | (0.7214) | (2.4230) | (11.9328) | | |
| Spain | 3.8454 | 0.4412[b] | 0.3965[b] | 1.0982[b] | 98 | 1.82 |
| | (0.3550) | (3.0930) | (2.4910) | (4.5970) | | |

[a]The figures in parentheses are t-values.

[b]Significant at .01 level.

[c]Significant at .05 level.

[d]Significant at .10 level.

percent and 99 percent for the MINODC's. With the exception of the price index for cereals for some countries, the performance of the import equation was particularly satisfactory.

## Elasticities of the Terms of Trade

Once the export and import price indexes have been estimated, it is possible to calculate corresponding elasticities of NBTT. The elasticities are then used to evaluate the most important price changes in determining the trend of the terms of trade for each country for the years under study. The following procedure was used to calculate the elasticity of NBTT with respect to the relevant world price indexes. Substituting the estimated equations for EPI and MPI into the equation defining NBTT for the LINODC's and MINODC's, respectively, yields:

$$NBTT = \frac{\hat{\beta}_o + \hat{\beta}_1 \text{ WAGPI} + \hat{\beta}_2 \text{ WMIPI}}{\hat{A}_o + \hat{A}_1 \text{ WCERSPI} + \hat{A}_2 \text{ WCRPETPI} + \hat{A}_3 \text{ WMANGOPI}} \tag{5.7}$$

$$NBTT = \frac{\hat{\beta}_o + \hat{\beta}_1 \text{ WAGPI} + \hat{\beta}_2 \text{ WMIPI} + \hat{\beta}_3 \text{ WNFMPI}}{\hat{A}_o + \hat{A}_1 \text{ WCERSPI} + \hat{A}_2 \text{ WCRPETPI} + \hat{A}_3 \text{ WMANGOPI}} \tag{5.8}$$

The elasticity of NBTT with respect to the world agricultural price index equals:

$$E = \frac{\delta NBTT}{\delta WAGPI} \cdot \frac{WAGPI}{NBTT} \tag{5.9}$$

$$= \frac{\hat{\beta}_1}{A_o + A_1 \text{ WCERSPI} + A_2 \text{ WCRPETPI} + A_3 \text{ WMANGOPI}} \cdot \frac{WAGPI}{NBTT} \tag{5.10}$$

where:

$\hat{\beta}_1$ = the estimated coefficient of WAGPI

E = the elasticity of NBTT with respect to WAGPI or the percentage change in NBTT associated with a one percent change in the world price index of agricultural products.

A similar result is obtained for WMIPI and WNFMPI. The elasticities of NBTT with respect to the world price index for cereals in the LINODC's is:

$$E = \frac{-\hat{A}_1 \left[\hat{\beta}_o + \hat{\beta}_1 \text{ WAGPI} + \hat{\beta}_2 \text{ WMIPI}\right]}{\left[\hat{A}_o + \hat{A}_1 \text{ WCERSPI} + \hat{A}_2 \text{ WCRPETPI} + \hat{A}_3 \text{ WMANGOPI}\right]^2} \cdot \frac{\text{WCERSPI}}{\text{NBTT}} \quad (5.11)$$

For MINODC's the elasticity result is:

$$E = \frac{-\hat{A}_1 \left[\hat{\beta}_o + \hat{\beta}_1 \text{ WAGPI} + \hat{\beta}_2 \text{ WMIPI} + \hat{\beta}_3 \text{ WNFMPI}\right]}{\left[\hat{A}_o + \hat{A}_1 \text{ WCERSPI} + \hat{A}_2 \text{ WCRPETPI} + \hat{A}_3 \text{ WMANGOPI}\right]^2} \cdot \frac{\text{WCERSPI}}{\text{NBTT}} \quad (5.12)$$

The results for WCRPETPI and WMANGOPI are similarly obtained.

Since the variables in equations (5.9) through (5.12) above must represent points on the estimated import and export functions, actual observations (from the original sample) cannot be used because such observations typically are not on the regression line. Therefore, in applying the above formulas the usual practice was used of evaluating the NBTT elasticities at the mean values of the variables involved.

The elasticities of NBTT with respect to world price index levels for each country in the group of LINODC's and MINODC's are presented in Tables XXXII and XXXIII, respectively. The direct economic interpretation of the elasticities is that a one percent change in the world price index of the commodity in question will cause the tabular change in the NBTT for a particular country. That is, a one percent change in WAGPI is associated with a change of about 0.62 percent in the NBTT for Malawi assuming all other world prices are constant.

TABLE XXXII

ESTIMATED ELASTICITIES OF NBTT WITH RESPECT TO WORLD PRICE INDEXES FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES

| Country | Estimated Elasticities W.R.T.[a] | | | | |
|---|---|---|---|---|---|
| | Export Equation | | Import Equation | | |
| | WAGPI | WMIPI | WCERSPI | WCRPETPI | WMANGOPI |
| Malawi | 0.6169 | 0.3573 | -0.0445 | -0.0666 | -0.8195 |
| Sri Lanka | 0.6903 | 0.3720 | -0.0336 | -0.2442 | -0.4507 |
| Benin | 0.8336 | -- | -0.0330 | -0.1069 | -0.7623 |
| Burma | 0.5200 | 0.3235 | -0.0015 | -0.1507 | -0.7003 |
| Cen. Afr. Rep. | 0.8740 | 0.2036 | -0.0398 | -0.1063 | -0.7692 |
| Mozambique | 0.5982 | 0.6040 | -- | -0.2116 | -0.6571 |
| Mauritania | 0.1375 | 0.3583 | -0.0514 | -0.0730 | -0.7405 |
| Pakistan | 0.7561 | 0.2933 | -0.0588 | -0.2130 | -0.7406 |
| Senegal | 0.7823 | 0.7579 | -0.0484 | -0.1810 | -0.7222 |
| Chad | 0.9530 | 0.2055 | -0.0624 | -0.0654 | -0.8448 |
| Niger | 0.9041 | -- | -0.0307 | -0.1103 | -0.7514 |
| Sudan | 1.0148 | 0.3749 | -0.0304 | -0.1647 | -0.7376 |
| Upper Volta | 0.9409 | -- | -0.0491 | -0.0826 | -0.7835 |
| Uganda | 1.2809 | -- | -0.0153 | -0.1605 | -0.7471 |
| Bangladesh | 0.3100 | 0.3840 | -0.0464 | -0.1695 | -0.6128 |

[a]with respect to

TABLE XXXIII

ESTIMATED ELASTICITIES OF NBTT WITH RESPECT TO WORLD PRICE INDEXES FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES

| | Estimated Elasticities W.R.T.[a] | | | | | |
|---|---|---|---|---|---|---|
| | Export Equation | | | Import Equation | | |
| Country | WAGPI | WMIPI | WNFMPI | WCERSPI | WCRPETPI | WMANGOPI |
| Ghana | 0.9624 | 1.0189 | -- | -0.0304 | -0.2229 | -0.7369 |
| Jamaica | -- | 1.5359 | 0.2941 | -0.0151 | -0.2481 | -0.6732 |
| Ivory Coast | 1.0382 | 0.4097 | -- | -0.0166 | -0.1947 | -0.7316 |
| Uruguay | 0.6567 | -- | 0.5429 | -- | -0.3530 | -0.4965 |
| Lebanon | 0.7586 | -- | 0.1394 | -0.0565 | -0.1267 | -0.7209 |
| South Africa | 0.4853 | 0.4860 | -- | -- | -- | -1.4060 |
| Thailand | 0.5752 | 0.2832 | -- | -- | -0.2428 | -0.5951 |
| Peru | 0.6806 | -- | 0.4882 | -0.0170 | -0.1781 | -0.7055 |
| Dominican Rep. | 0.9124 | -- | -- | -0.0327 | -0.0980 | -0.7864 |
| Guatemala | 1.0829 | -- | -- | -0.0036 | -0.1692 | -0.7296 |
| Panama | 0.6510 | 0.3264 | -- | -- | -0.3656 | -0.4797 |
| Israel | -- | 0.4567 | 0.5269 | -0.0926 | -0.0290 | -0.2616 |
| Portugal | -- | 0.6243 | 0.3594 | -0.1384 | -0.0747 | -0.1809 |
| Zambia | -- | -- | 0.8212 | -0.0268 | -0.0734 | -0.7843 |
| Spain | -- | 0.1838 | 0.1783 | -0.1059 | -0.0712 | -0.2879 |

[a] with respect to

The estimated elasticities of NBTT are generally less than one. The estimated elasticities of NBTT with respect to WAGPI range from 0.1375 to 1.2809 for the LINODC's, while the range varies between 0.0840 to 1.7807 for the MINODC's. For the LINODC's the elasticities of WAGPI are consistently larger than the elasticities for WMIPI. This suggests that the most influential commodity in the movements of the terms of trade for the LINODC's in the export side has been the world price of agricultural products. With regard to the MINODC's, the world agricultural price index was the most important export price variable in determining changes in the terms of trade for eight countries while the world price indexes for minerals and non-ferrous metals were the most important export price variables for the remaining countries.

For the three variables involved in the import equation, the most important variable in the movements of NBTT is the world price index for manufactured goods. The range of the elasticity of NBTT with respect to WMANGOPI is between -0.6128 and -0.8448 for LINODC's and between -0.1809 and -1.4060 for the MINODC's.

The second most important import price variable in influencing the NBTT for both country groups is crude pertroleum. The influence of this variable on NBTT is greater for the MINODC's than for the LINODC's. This implies that the increase in oil prices was more crucial for the MINODC's than it was for the LINODC's. This is also why most of the countries in the 1970's, particularly in 1974 and 1979, shoed a decline in the NBTT.

## Estimated Net Changes in Net Barter Terms of Trade

Tables XXXIV, XXXV, XXXVI and XXXVII report the estimated net changes in NBTT with respect to the variables in both the export and import equations of the NODC's. The estimated change was calculated by multiplying the expected percentage change of the variable in question by the elasticities given in Tables XXXII AND XXXIII in the previous section. Tables XXXIV and XXXV report these estimated net changes for LINODC's for the decade of the 1960's and 1970's, respectively, while Tables XXXVI and XXXVII represent the results for MINODC's.

Changes in the 1960's. The larger share in the estimated net changes in NBTT in the 1960's came from WMANGOPI, representing more than 10 percent of the share in most of the countries in both groups. The impact of changes in this variable on NBTT ranges from -8.4 percent to -15.8 percent for the LINODC's, while the range varies between -3.5 percent and -26.3 percent in the MINODC's. The contribution of the remaining two variables in the import equation to the total changes in NBTT was insignificant for almost all of the countries under study, with a few exceptions in the group of MINODC's. With respect to the variable WMIPI, its contribution in the LINODC's and the MINODC's change of NBTT was negative, indicating an overall price decrease in the world market for this commodity in the 1960's.

Although the contribution to the total change in the NBTT by WAGPI was positive for both groups of countries, the magnitude of negative changes in WMANGOPI was so great this positive contribution by the WAGPI was overshadowed. In contrast, the WNFMPI in the MINODC's was with a

TABLE XXXIV

ESTIMATED NET CHANGES IN NBTT FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-69

| Country | Estimated Changes Associated With | | | | |
|---|---|---|---|---|---|
| | Export Variables | | Import Variables | | |
| | WAGPI | WMIPI | WCERSPI | WCRPETPI | WMANGOPI |
| Malawi | 3.4746 | -3.7257 | -0.4865 | 0.2131 | -15.3269 |
| Sri Lanka | 3.8880 | -3.8790 | -0.3673 | 0.7813 | - 8.4294 |
| Benin | 4.6952 | -- | -0.3608 | 0.3420 | -14.2571 |
| Burma | 2.9288 | -3.3732 | -0.0164 | 0.4822 | -13.0976 |
| Cen. Afr. Rep. | 4.9227 | -2.1230 | -0.4351 | 0.3401 | -14.3862 |
| Mozambique | 3.3693 | -6.2981 | -- | 0.6770 | -12.2896 |
| Mauritania | 0.7745 | -3.7361 | -0.5619 | 0.2336 | -13.8494 |
| Pakistan | 4.2587 | -3.0583 | -0.6428 | 0.6815 | -13.8513 |
| Senegal | 4.4062 | -7.9029 | -0.5291 | 0.5791 | -13.5072 |
| Chad | 5.3677 | -- | -0.3356 | 0.3529 | -14.0533 |
| Sudan | 5.7158 | -3.9092 | -0.3324 | 0.5270 | -13.7952 |
| Upper Volta | 5.2995 | -- | -0.5368 | 0.2643 | -14.6536 |
| Uganda | 7.2145 | -- | -0.1673 | 0.5135 | -13.9729 |
| Bangladesh | 1.7460 | -4.0041 | -0.5073 | 0.5423 | -11.4611 |

TABLE XXXV

ESTIMATED NET CHANGES IN NBTT FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES, 1970-79

| Country | Estimated Changes Associated With | | | | |
|---|---|---|---|---|---|
| | Export Variables | | Import Variables | | |
| | WAGPI | WMIPI | WCERSPI | WCRPETPI | WMANGOPI |
| Malawi | 114.6385 | 61.3192 | -6.6314 | -275.3465 | -153.1955 |
| Sri Lanka | 128.2785 | 63.8420 | -5.0071 | -1009.6038 | - 84.2528 |
| Benin | 154.9079 | -- | -4.9176 | -441.9601 | -142.5026 |
| Burma | 96.6316 | 55.5185 | -0.2233 | -623.0438 | -130.9125 |
| Cen. Afr. Rep. | 162.4154 | 34.9415 | -5.9310 | -439.4795 | -143.7925 |
| Mozambique | 111.1635 | 103.6575 | -- | -874.8246 | -122.8368 |
| Mauritania | 25.5516 | 61.4908 | -7.6596 | -301.8062 | -138.4274 |
| Pakistan | 140.5061 | 50.3356 | -8.7623 | -880.6126 | -138.4461 |
| Senegal | 145.3748 | 130.0695 | -7.2125 | -748.3140 | -135.0064 |
| Chad | 177.0960 | 35.2676 | -9.2988 | -270.3853 | -157.9250 |
| Niger | 168.0099 | -- | -4.5749 | -456.0168 | -140.4650 |
| Sudan | 188.5803 | 64.3397 | -4.5302 | -680.9244 | -137.8853 |
| Upper Volta | 174.8475 | -- | -7.3169 | -341.4958 | -146.4657 |
| Uganda | 238.0297 | -- | -2.2800 | -663.5602 | -139.6612 |
| Bangladesh | 57.6073 | 65.9014 | -6.9145 | -700.7692 | -114.5554 |

TABLE XXXVI

ESTIMATED NET CHANGES IN NBTT FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-69

| Country | Estimated Changes Associated With | | | | | |
|---|---|---|---|---|---|---|
| | Export Variables | | | Import Variables | | |
| | WAGPI | WMIPI | WNFMPI | WCERSPI | WCRPETPI | WMANGOPI |
| Ghana | 5.4206 | -10.6244 | -- | -0.3324 | 0.7132 | -13.7821 |
| Jamaica | -- | -16.0153 | 22.7562 | -0.1651 | 0.7938 | -12.5907 |
| Ivory Coast | 5.8476 | -4.2721 | -- | -0.1815 | 0.6230 | -13.6830 |
| Uruguay | 3.6988 | -- | 42.0072 | -- | 1.1295 | -9.2859 |
| Lebanon | 4.2727 | -- | 10.7862 | -0.6177 | 0.4054 | -13.4828 |
| South Africa | 2.7334 | -5.0677 | -- | -- | -- | -26.2961 |
| Thailand | 3.2398 | -2.9530 | -- | -- | 0.7769 | -11.1300 |
| Peru | 3.8334 | -- | 37.7748 | -0.1859 | 0.5698 | -13.1948 |
| Dominican Rep. | 5.1390 | -- | -- | -0.3575 | 0.3136 | -14.7079 |
| Guatemala | 6.0993 | -- | -- | -0.0394 | 0.5414 | -13.6456 |
| Panama | 3.6667 | -3.4035 | -- | -- | 1.1698 | -8.9717 |
| Israel | -- | -4.7621 | 40.7692 | -1.0124 | 0.0928 | -4.8927 |
| Portugal | -- | -6.5098 | 27.8088 | -1.5131 | 0.2390 | -3.3833 |
| Zambia | -- | -- | 63.5408 | -0.2930 | 0.2349 | -14.6686 |
| Spain | -- | -1.9165 | 13.7961 | -1.1578 | 0.2278 | -5.3845 |

TABLE XXXVII

ESTIMATED NET CHANGES IN NBTT FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES, 1970-79

| Country | Estimated Changes Associated With | | | | | |
|---|---|---|---|---|---|---|
| | Export Variables | | | Import Variables | | |
| | WAGPI | WMIPI | WNFMPI | WCERSPI | WCRPETPI | WMANGOPI |
| Ghana | 178.8428 | 174.8619 | -- | -4.5302 | -921.5425 | -137.7544 |
| Jamaica | -- | 263.5886 | 27.9058 | -2.2502 | -1025.7277 | -125.8465 |
| Ivory Coast | 192.9287 | 70.3120 | -- | -2.4737 | -804.9544 | -136.7636 |
| Uruguay | 122.0346 | -- | 51.5133 | -- | -1459.4191 | -92.8146 |
| Lebanon | 140.9706 | -- | 13.2270 | -8.4196 | -523.8198 | -134.7634 |
| South Africa | 90.1833 | 83.4065 | -- | -- | -- | -262.8344 |
| Thailand | 106.8894 | 48.6023 | -- | -- | -1003.8157 | -111.2466 |
| Peru | 126.4759 | -- | 46.3231 | -2.5333 | -736.3245 | -131.8846 |
| Dominican Rep. | 169.5513 | -- | -- | -4.8729 | -405.1645 | -147.0078 |
| Guatemala | 201.2353 | -- | -- | -0.5365 | -699.5289 | -136.3898 |
| Panama | 120.9753 | 56.0162 | -- | -- | -1511.5116 | -89.6740 |
| Israel | -- | 78.3781 | 49.9952 | -13.7992 | -119.8956 | -48.9029 |
| Portugal | -- | 107.1413 | 34.1018 | -20.6243 | -308.8346 | -33.8170 |
| Zambia | -- | -- | 77.9200 | -3.9937 | -303.4599 | -146.6152 |
| Spain | -- | 31.5434 | 16.9181 | -15.7811 | -294.3644 | -53.8194 |

larger magnitude than that of the WMANGOPI producing a positive change for about half of the countries in this group. However, the overall conclusion for the 1960's is that an increase in price indexes of world manufactured goods caused a decline in the NBTT of most of the countries under study.

Changes in the 1970's. The largest contribution to the deterioration of NBTT for both groups of countries came from WCRPETPI. The range for the estimated net changes in NBTT associated with this variable for the LINODC's is between -270.4 percent and -1009.6 percent. For the MINODC's the range lies between -119.9 percent and -1511.5 percent. In contrast, the estimated change of this variable on NBTT for both groups in the 1960's was insignificant. This supports the hypothesis that higher oil prices in the 1970's had an adverse effect on the terms of trade of NODC's.

The WMANGOPI contribution to the net change in NBTT in the 1970's was also negative for both LINODC's and MINODC's as it was in the 1960's. However, the net effect of this variable on NBTT was greater in the 1970's as opposed to the 1960's. The estimated change of this variable on NBTT ranged as high as -157.9 percent for the LINODC's and -262.8 percent for the MINODC's. The effect of WCERSPI on net change in NBTT for both groups of countries, although negative, was very small compared with the other two import variables.

The effect of WMIPI on net change in NBTT in both groups of countries was positive, as opposed to the negative effect in the 1960's. The contribution of this variable to changes in the NBTT of the MINODC's was larger than that of the WNFMPI. The remaining variable in the export equation, WAGPI, positively contributed to net changes in NBTT of the

countries under study. In comparison to the 1960's, the contribution of WAGPI was considerably larger, indicating the short lived commodity price boom (excluding petroleum) in the early part of the 1970's. In fact, the positive contribution to net changes in the NBTT in LINODC's and MINODC's of WAGPI was comparable to that of WMANGOPI. Although the positive contribution of the export variables in the 1970's was considerably larger than the 1960's, their impact on the net changes in NBTT was weakened by the effect of higher oil prices in the same time period.

## Summary

The main objective of this chapter was to identify empirically the major factors that have contributed to the movement in the terms of trade in the 1960's and 1970's. To achieve this objective a model which relates the export and import price indexes with a set of exogenous variables for the countries under study was developed. In constructing the model it was presumed that the individual countries are price takers, hence, their export and import price indexes are a reflection of weighted world prices. The weights for a country were determined based on the composition of imports and exports of the particular country.

It was hypothesized that factors contributing to a quantitative explanation of the export price indexes of the LINODC's and MINODC's were the world price indexes of agricultural products (WAGPI), minerals (WMIPI) and non-ferrous metals (WNFMPI). On the import side it was hypothesized the explanation came from world price indexes of cereals (WCERSPI), crude petroleum (WCRPETPI) and manufactured goods (WMANGOPI).

Once the model was constructed, a hypothesis that the structure of the countries under study is the same was tested. That is, for a given

world commodity price change, all countries in each group would be affected the same way. It was shown, however, that differences exist among countries in response to change in world prices which justified estimating the export and import equations separately for each country.

Based on the theoretical framework above, statistical results were obtained for each country under study. The empirical results show that all the signs on the variables in both the export and import price index equations are what was expected. In addition, all of the relationships appeared to fit well over the study period for both groups of countries. From the estimated export and import equations the corresponding elasticities of the terms of trade were calculated. The results of the estimated elasticities of the terms of trade were generally found to be less than one in both the LINODC's and MINODC's. That is, a one percent change in the world price index of the commodity in question resulted in a less than one percent change in the terms of trade in the past two decades.

An application of the estimated elasticities to the expected percentage changes of the world commodity in question helped to evaluate the most important price changes in determining the trend of the terms of trade for each country during the 1960's and the 1970's. The results showed that in the 1960's the largest contribution to the movements in the terms of trade of both groups of countries came from WMANCGOPI. In the 1970's the largest contribution to the deterioration in the terms of trade of the countries under study came from WCRPETPI. This supports the hypothesis that higher oil prices in the decade of the 1970's resulted in an adverse movement in the terms of trade of NODC's. The effect on

net change in the terms of trade of the other variables in both the import and export price index equations were either insignificant or very small compared to the two variables explained above.

# CHAPTER VI

# CONSTRAINTS ON ECONOMIC GROWTH OF THE NON-OIL DEVELOPING COUNTRIES

## Introduction

In recent years it has been widely acknowledged that many developing countries (DC's) desiring to accerlerate their economic growth are unable to achieve this goal because of the obstacles or constraints imposed by savings and foreign exchange or trade [80]. The mechanism of these constraints can be summarized as follows.

The process of economic growth and development requires an accelerated rate of capital formation. One way to attain this is through investment, which in turn, requires savings. The desired savings can be generated domestically (public or private) or through foreign aid. Thus investment may be limited by the availability of domestic savings. Even if domestic savings is adequate, a lack of foreign exchange may inhibit investment. This is due to the limited ability of countries to produce capital goods domestically, hence requiring a certain level of imports of capital goods needed to sustain a desired level of investment. Under a system of fixed exchange rates, there is a limit to how much domestic saving can be converted into needed foreign exchange. In the absence of external financing, a developing country can only pay for imports of investment goods through exports. The import requirements of capital

goods on the one hand, and the structural inability of a developing economy to produce capital goods on the other hand, affect investment thereby constraining the desired rate of growth.

The resulting "two-gap" analysis in terms of independent savings and trade constraints has been used by Prebisch [34] in his article "Towards a New Trade Policy for Development". It has also formed the basis of the theoretical models of, among others, Chenery-Strout [80] and McKinnon [81]. Although the theoretical reasons for these two independent resource constraints on the growth of a developing country are well established, there have been few empirical studies to determine which of the two constraints have been the most dominant for a particular country for a given time period. A more recent empirical study in which the two-gap model was used to draw inferences about the dominant growth constraint is that of Weisskopf [82].

This study develops a systematic econometric model to classify countries according to their dominant constraint over varying periods of time. Closely following the approach by Weisskopf, Applegate [83] examined the importance of the export sector in the Dominican Republic economy. This study benefits from the approach he used, especially for incorporating the terms of trade effect in the model.

Identification of economic growth constraints is considered a basic step in adopting successful economic policies. The purpose of this chapter is to introduce the conceptual model used to identify the dominant constraints to economic growth. This theoretical model was used to identify empirically the dominant constraints on economic growth for the sample of NODC's under study. The behavior of the dominant constraint and the policy implications for the country in question also were analyzed.

## The Model

The basic concept of the model is that there are two factors limiting the economic growth of a developing country: the availability of domestic saving needed for investment and the availability of foreign exchange for importing the necessary capital goods required for the current level of production and investment.

The model is a simple aggregative model based on standard macroeconomic accounting identities of an ex ante (potential) savings function and an ex ante (required) import function. The variables and parameters of the model are defined as follows:

Endogenous Variables:

$Y$ = Gross domestic product,

$C$ = Total observed consumption,

$I$ = Total investment expenditure,

$M$ = Total imports of goods and services,

$S$ = Total observed savings,

$S^*$ = Potential or desired savings,

$M^*$ = Required imports to maintain current levels of production and investment.

Exogenous Variables:

$\overline{E}$ = Total real value of exports,

$\overline{\Pi}$ = The terms of trade effect,[1]

$\overline{Y}$ = Real capacity of gross domestic product,

$\overline{F}$ = Net real foreign capital inflow (excluding the terms of trade effect).[2]

Parameters:

$b$ = Marginal propensity to save out of gross domestic product,

$d$ = Marginal propensity to save out of export earnings,

c = The marginal response of saving to net foreign capital inflow,

e = The marginal response of saving to the terms of trade effect,

$\beta$ = The marginal import content of gross domestic product,

$\gamma$ = The marginal import content of investment.

The model introduces the following three national income accounting identities:[3]

$$Y = C + I + \bar{E} - M \tag{6.1}$$

$$S = Y - C \tag{6.2}$$

$$\bar{F} = M - \bar{E} - \bar{\Pi} \tag{6.3}$$

The ex ante saving is defined as domestically earned income available for investment and is determined by the following behavioral equation:

$$S^* = a + bY + c\bar{F} + d\bar{E} + e\bar{\Pi} \tag{6.4}$$

Equation (6.4) assumes that saving depends on income, net real foreign capital inflow, total real value of exports, and terms of trade. It is expected that b and d are non-negative. Net foreign capital inflow and proceeds from the terms of trade effect can be used either for consumption or investment purposes and thus may be positive or negative. To the extent that these resources are used for increasing consumption, savings will decline. Therefore, c and e will be non-positive. However, the decision will depend upon weights placed on present benefits derived from current consumption and future benefits derived from the investment of current saving (this is the reason that foreign capital inflow is included in the ex ante saving function).

Equation (6.5) specifies ex ante imports:

$$M^* = \alpha + \beta Y + \gamma I \tag{6.5}$$

M* is defined as the minimum level of imports required to maintain the current or a given level of production and investment. This equation allows for a differential marginal propensity to import between production and investment goods.

The model treats exports, net capital inflow and the terms of trade effect as exogenously determined variables.

$$E = \overline{E} \tag{6.6}$$

$$F = \overline{F} \tag{6.7}$$

$$\Pi = \overline{\Pi} \tag{6.8}$$

Export earnings as well as the terms of trade effect of most DC's depends on such things as world demand, weather conditions and trade policies. The countries under study are good examples where the price of their primary commodities depends on the world demand for these commodities. For these reasons the level of export earnings and the terms of trade effect are treated as exogenous variables in the model. Exogenously determined net capital inflow is based on a weaker theoretical assumption. However, there is evidence that in the short-run, political and strategic factors affect aid, private investment, and lending, thus the model treats this variable as exogenously determined.

The model also includes the following three inequalities:

$$S \leq S^* \tag{6.9}$$

$$M \geq M^* \tag{6.10}$$

$$Y \leq \overline{Y} \tag{6.11}$$

Inequality (6.9) represents the saving constraint which states that actual savings can be no greater than potential or desired savings. Inequality (6.10) is the trade constraint which implies that actual imports have to be at least as great as the levels of imports required

for current consumption and investment. Inequality (6.11) is the capacity constraint which states that gross domestic product cannot exceed the exogenously given productive capacity of the economy. This is because it is assumed that capacity is determined by past investment, not current investment, and therefore exogenously determined for the current period.

If all the constraints are binding the model will be overdetermined. This is because the model has one more equation (or inequality) than there are endogenous variables. Therefore, at any given point in time only two of the three inequalities can be binding. If inequalities (6.9) and (6.11) are binding, investment and income are constrained by domestic savings and capacity, which is identified as the saving constraint. If inequalities (6.10) and (6.11) are binding, investment and income are constrained by capacity and the availability of foreign exchange, which is identified as the trade constraint. Where inequalities (6.9) and (6.10) are binding, the economy is operating at less than full capacity and investment and income are constrained by saving and trade; this is identified as the saving and trade constraints.

In order to study the implications of the model of equations (6.1) to (6.11) the following reduced form equations are obtained. By substitution into (6.9), (6.10) and (6.11) we can express the systems in terms of two endogenous variables (I and Y) and four exogenous variables ($\overline{Y}$, $\overline{F}$, $\overline{E}$ and $\overline{\Pi}$), and we have:

$$I - bY \leq a + (1 + c)\,\overline{F} + d\overline{E} + (1 + e)\,\overline{\Pi} \qquad (6.9')$$

$$I + \beta/\gamma\, Y \leq -\alpha/\gamma + 1/\gamma\,\overline{F} + 1/\gamma\,\overline{E} + 1/\gamma\,\overline{\Pi} \qquad (6.10')$$

$$Y \leq \overline{Y} \qquad (6.11)$$

The above constraints along with the two non-negative constraints:

$I \geq 0$

$Y \geq 0$

define a feasible region within the I and Y two dimensional space. A graphic representation of the feasible region is shown by the shaded area in Figure 2. This is a simplified version of Weisskopf's diagram.

The slope of the saving constraint (6.9') is determined by the marginal propensity to save out of gross domestic product (b) and is non-negative, therefore, the saving constraint in Figure 2 slopes upward and to the right. The trade constraint (6.10') is a line with slope equal to $(-\beta/\gamma)$, and since $\beta$ and $\gamma$ are positive, the line is downward sloping. The capacity constraint (6.11) is the vertical line crossing the Y-axis at the point of full productive capacity $\overline{Y}$.

The feasible region defines the set of all possible values of I and Y which satisfy all constraints. Based on these constraints, there are three possible solutions to the model: saving and capacity constraints binding (point B in the figure, in this case the trade constraint has to lie at point B); trade and capacity constraints binding (point C in the figure); and saving and trade constraints binding (point A in the figure). The three alternative solutions have different implications for the role of foreign capital inflow and the terms of trade effect and their impact on gross investment. These implications can be explored by solving in each case the two simultaneous equations I and Y corresponding to the binding constraints. Designating them as Case I, Case II and Case III, respectively, we have the following:

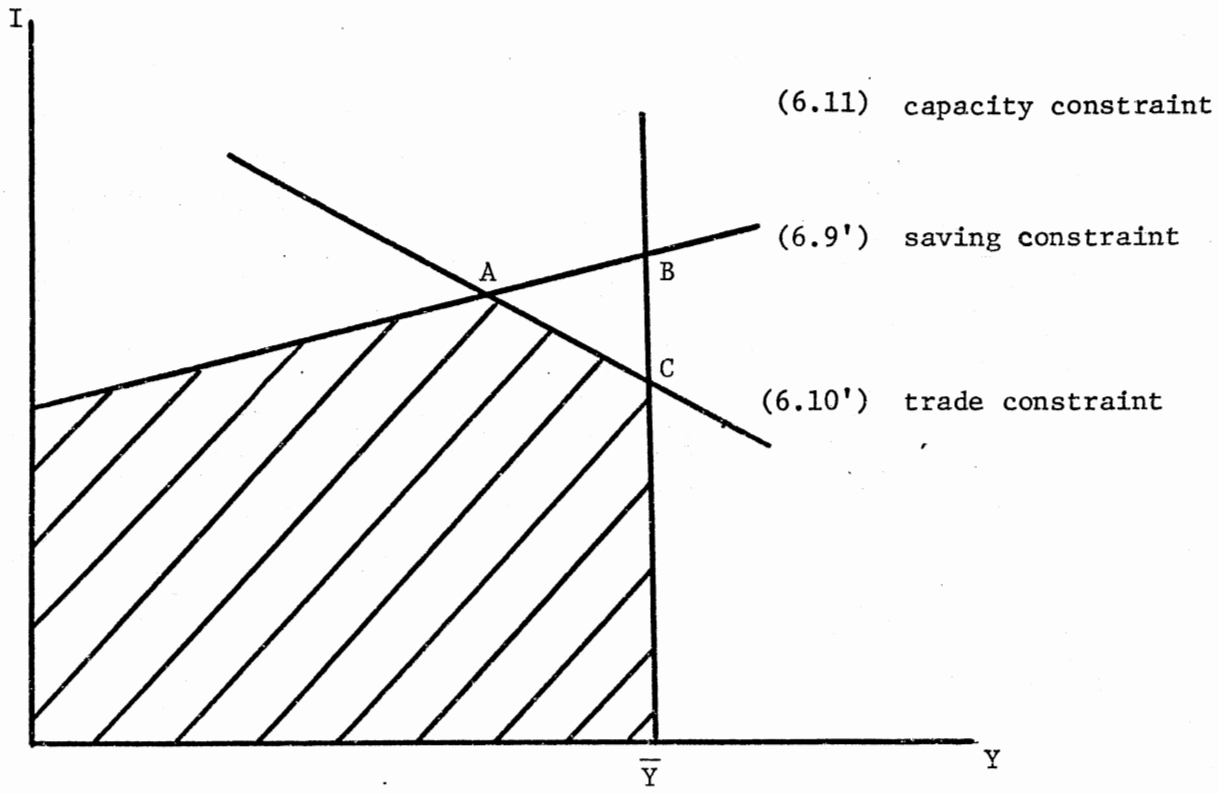



Figure 2. A Graphic Representation of the Feasible Region of the "Two-Gap" Model

Case I

This case is where the economy is at full capacity and the saving constraint is binding. Equations (6.9') and (6.11) are equalities. Solving these two simultaneous equations for I results:

$$I = a + b\overline{Y} + (1 + c)\ \overline{F} + d\overline{E} + (1 + e)\ \overline{\Pi} \qquad (6.12)$$

Case II

The economy is at full capacity and the trade constraint is binding. The equalities are (6.10') and (6.11). By substitution we get:

$$I = -\alpha/\gamma - \beta/\gamma\ \ \overline{Y} + 1/\gamma\ \overline{F} + 1/\gamma\ \overline{E} + 1/\gamma\ \overline{\Pi} \qquad (6.13)$$

This function can be further simplified by substituting in equation (6.3) for which the import variable also becomes exogenous:

$$I = -\alpha/\gamma - \beta/\gamma\ \overline{Y} + 1/\gamma\ \overline{M} \qquad (6.14)$$

Case III

In this case both the saving and trade constraints are binding. Equations (6.9') and (6.10') are equalities. Solving them simultaneously leads to:

$$I = \ \ + n\overline{F} + v\overline{E} + k\overline{\Pi} \qquad (6.15)$$

where:

$$\lambda = \frac{a\beta\ -\ \alpha b}{\beta + \gamma} \qquad n = \frac{(1 + c)\ \beta + b}{\beta + b}$$

$$v = \frac{d\beta + b}{\beta + b} \qquad k = \frac{(1 + e)\ \beta + b}{\beta + b\gamma}$$

The partial derivatives of the investment functions in the three possible cases above are given in Table XXXVIII. Examination of the permissible values for the original coefficients b, d, c, e, $\beta$ and $\gamma$, from

TABLE XXXVIII

PARTIAL DERIVATIVES OF INVESTMENT WITH RESPECT TO THE EXOGENOUS VARIABLES OF THE MODEL FOR THE THREE POSSIBLE CASES

| Case | $\partial I/\partial \overline{Y}$ | $\partial I/\partial \overline{F}$ | $\partial I/\partial \overline{E}$ | $\partial I/\partial \overline{\pi}$ | $\partial I/\partial \overline{M}$ |
|---|---|---|---|---|---|
| I | $b$ | $1+c$ | $d$ | $1+e$ | - |
| II | $-\beta/\gamma$ | - | - | - | $1/\gamma$ |
| III | - | $\frac{(1+c)\ \beta+b}{\beta + b\gamma}$ | $\frac{d\beta\ + b}{\beta + b\gamma}$ | $\frac{(1+e)\ \beta + b}{\beta + b\gamma}$ | - |

TABLE XXXIX

THE CORRESPONDING RANGES OF THE RESPECTIVE PARTIAL DERIVATIVES

| Case | $\partial I/\partial \overline{Y}$ | $\partial I/\partial \overline{F}$ | $\partial I/\partial \overline{E}$ | $\partial I/\partial \pi$ | $\partial I/\partial \overline{M}$ |
|---|---|---|---|---|---|
| I | $\geq 0$ | $\leq 1$ | $\geq 0$ | $\leq 1$ | - |
| II | $< 0$ | - | - | - | $\geq 1$ |
| III | - | $\geq 0$ | $\geq 0$ | $\geq 0$ | - |

equations (6.4) and (6.5) enables us to assign corresponding ranges to the values for the partial derivatives (Table XXXIX). The interpretation of these two tables can be summarized as follows. The marginal propensity to save out of gross domestic product, b, and the marginal propensity to save out of export earnings, d, are expected to be non-negative. The marginal response of saving to net foreign capital inflow, c, and the marginal response of saving to the terms of trade effect, e, may only assume non-positive values. In the limiting case when all of the capital inflow and the terms of trade are destined for investment, c and e are equal to zero. If any part of the capital inflow and the terms of trade are used for consumption, the influence of capital inflow and the terms of trade effect on real domestic saving becomes negative; therefore, c and e are $\leq 0$. As a result the partial derivatives with respect to $\overline{F}$ and $\overline{\Pi}$ in Case I must be less than or equal to one.

In an economy where most capital goods are imported (which is the case for the countries under study) $\beta$ is expected to be less than $\gamma$ so that $0 \leq \beta \leq \gamma \leq 1$. Hence, the partial derivatives with respect to $\overline{Y}$ and $\overline{M}$ in Case II are expected to be negative and positive (and greater than unity), respectively. In Case III investment is a function of $\overline{F}$, $\overline{E}$ and $\overline{\Pi}$ with all the partial derivatives expected to be positive, i.e., $\geq 0$.

Since the signs and magnitudes of the partial derivatives vary for each case, it is possible to test which case is applicable over time by comparing the estimated coefficients with the expected values in Table XXXIX. To accomplish this objective, the three equations were estimated in the following section which represents the empirical analysis of the model for the NODC's in our study.

## Empirical Results

This section provides the empirical results of the theoretical framework and is composed of two parts: first, the variables are defined and the source of data is given and, second, the constraints to growth are examined and identified for both the LINODC's and MINODC's. Four different time periods are evaluated for constraints. The first period covers the entire period from 1960 to 1979. The second and third time periods analyze the decades of the 1960's and the 1970's.

This was undertaken for the following reasons: (1) to determine what constraints to growth were binding for each decade; (b) to determine if the constraints in each decade are similar to the entire study period; and (c) to identify the constraints common for each country in the two time periods. The fourth time period covers the years of 1973 to 1979. This period is examined to identify the dominant constraints for the NODC's during the time of rapid oil price increases. Detailed regression results of each country are given only for the first time period. For the other time periods only a summary of the constraints are presented.

### Definition of Variables and Sources of Data

The dominant constraints to economic growth using the macroeconomic two-gap model were identified as three possible cases in the previous section. Assuming linear relationships and using ordinary least squares procedures (OLS), time series data were used to estimate three investment equations representing Case I, Case II and Case III, respectively.

$$I_t = \theta_0 + \theta_1 \bar{Y}_t + \theta_2 \bar{F}_t + \theta_3 \bar{E}_t + \theta_4 \bar{\Pi}_t + U_t \quad (6.16)$$

$$I_t = \theta_0 + \theta_1 \bar{Y}_t + \theta_5 \bar{M}_t + U_t \quad (6.17)$$

$$I_t = \theta_0 + \theta_2 \bar{F}_t + \theta_3 \bar{E}_t + \theta_4 \bar{\Pi} + U_t \quad (6.18)$$

where U is the error term, t is the time period, $\theta$'s are estimated parameters and the variables are as defined in the previous section. The bar on the variables indicates exogenously determined.

Data used in this section cover the period 1960 to 1979 (with some exceptions). Data for some of the variables were not directly available and had to be constructed. Data and data sources are as follows:

Investment (I)

Total investment expenditure is defined as gross capital formation plus stocks. The annual data are obtained from the 1981 yearbook of International Financial Statistics (IFS) of the International Monetary Fund (IMF).

Gross Domestic Product ($\bar{Y}$)

Gross domestic product is defined as the sum of total observed consumption (C) and total observed savings (S). However, the model does not distinguish whether this saving and consumption comes from the private or public sector. This source of data is the same as that for investment.

Imports ($\bar{M}$)

This variable represents the total imports of goods and services. $\bar{M}$ is treated as an exogenous variable in equation (6.17). The source of data is the same as above.

Exports ($\bar{E}$)

The export variable is defined as the total exports of goods and services. The source of data is the same as for the other variables.

Net Foreign Capital Inflow ($\bar{F}$)

This variable is defined as the difference between imports and exports minus the terms of trade effect. The logic of the two-gap model clearly does not apply to a situation where the net flow of capital is outward. Under such circumstances it is concluded that it is the savings constraint, not the trade constraint, that limits growth. This variable, as well as the export variable, is treated as exogenously determined.

Out of the 15 LINODC's only five were found to have complete data for all of the variables in the entire study period. For the MINODC's there were 14 with complete data over the 1960 to 1979 time period.

The data were then screened for each country to determine whether or not there was a net inflow of foreign capital. Of the five LINODC's, only two were found to run an occasional surplus but, in general, all were receiving foreign capital inflow. Hence, the regressions for all of these countries were carried out for the entire study period.

In the case of the MINODC's, three were found to have a continuous trade surplus and were excluded from the analysis. For the remaining 11 countries, some years for some countries were found to show surplus but, in general, most were dependent on foreign capital inflows and hence the analysis was carried out for the entire study period.

Values for all the relevant variables defined above were first compiled at current prices for each country and then converted to constant

prices using the gross domestic product deflator for each country. The deflator was based upon the gross domestic product in 1975 prices given for each country in the same data source referred to above.

Identification of the Constraints

For the period 1960-79, three separate regressions were carried out. The results represent Case I, Case II, and Case III and are given in Tables XL and XLI for the LINODC's and MINODC's, respectively. These tables also include the values for the coefficients of determination ($R^2$), the Durbin-Watson (DW) statistic, and the t statistic. The equation for each case was tested for autocorrelation since estimating an equation with OLS when autocorrelation is present results in biased estimates of the standard errors of the estimated coefficients and, therefore, biased t statistics.

The tests for autocorrelation included both the first order autocorrelation and the Durbin-Watson test. Whenever the test indicated the presence of serial correlation, the correction was made and results of the corrected equation are reported. These equations are identified in all the tables by CSC (corrected for serial correlation).

Case I

Case I represents saving and capacity constraints where the values for $\partial I/\partial \overline{Y}$ and $\partial I/\partial \overline{E}$ must be positive (i.e. $\geq 0$) while the values for $\partial I/\partial \overline{F}$ and $\partial I/\partial \overline{\pi}$ must be less than or equal to one. To see if such is the case, the values of the estimated coefficients of each country in Tables XL and XLI were compared with the expected values and ranges in Tables XXXVIII and XXXIX respectively. Out of the five LINODC's, three (Malawi,

TABLE XL

ESTIMATED INVESTMENT FUNCTIONS FOR THE LOW-INCOME NON-OIL DEVELOPING COUNTRIES FOR THE PERIOD 1960-79[a]

| Country and Case | $0_0$ | $0_1$ $\partial I/\partial \bar{Y}$ | $0_2$ $\partial I/\partial \bar{F}$ | $0_3$ $\partial I/\partial \bar{E}$ | $0_4$ $\partial I/\partial \bar{\pi}$ | $0_5$ $\partial I/\partial \bar{M}$ | $R_2$ % | DW |
|---|---|---|---|---|---|---|---|---|
| Malawi | | | | | | | | |
| I CSC | 0.0258 | 0.0003 | 0.6172[b] | 0.3719 | 0.7107 | -- | 81 | 1.25 |
| | (1.2120) | (0.0030) | (2.1640) | (1.0390) | (1.0360) | | | |
| II CSC | 0.0225 | -0.0171 | -- | -- | -- | 0.5351[b] | 81 | 1.55 |
| | (1.0940) | (-0.2810) | -- | -- | -- | (3.2260) | | |
| III | 0.0009 | -- | 0.2250 | 0.7956[b] | 0.0776 | -- | 79 | 0.91 |
| | (0.0427) | -- | (0.8939) | (3.2444) | (0.1102) | | | |
| Sri Lanka | | | | | | | | |
| I CSC | -1.3349 | 0.1919[d] | 0.5353[b] | 0.0748 | 0.5471[b] | -- | 94 | 1.06 |
| | (-1.0750) | (1.6180) | (4.9400) | (0.2750) | (3.5220) | | | |
| II CSC | -0.6639 | 0.0639 | -- | -- | -- | 0.4425[b] | 91 | 1.33 |
| | (-0.8720) | (0.9870) | -- | -- | -- | (3.9240) | | |
| III CSC | 0.5517 | -- | 0.5836[b] | 0.5003[b] | 0.4637[b] | -- | 93 | 1.25 |
| | (1.2170) | -- | (5.3250) | (7.2920) | (3.0250) | | | |
| Burma | | | | | | | | |
| I | -1.7232[c] | 0.1446[b] | 1.5714[b] | 0.5940[b] | 1.2527[b] | -- | 92 | 1.51 |
| | (-1.7997) | (3.6356) | (7.4653) | (3.5305) | (2.5189) | -- | | |
| II | -4.1271[b] | 0.2368[b] | -- | -- | -- | 0.8914 | 83 | 1.60 |
| | (-5.3736) | (7.4402) | -- | -- | -- | (5.7920) | | |
| III | 1.6708[b] | -- | 1.9318[b] | 0.5968[b] | 0.5339 | -- | 84 | 1.16 |
| | (4.3528) | -- | (7.8330) | (2.6711) | (0.8809) | -- | | |

TABLE XL (Continued)

| Country and Case | $0_0$ | $0_1$ $\partial I/\partial \bar{Y}$ | $0_2$ $\partial I/\partial \bar{F}$ | $0_3$ $\partial I/\partial \bar{E}$ | $0_4$ $\partial I/\bar{\pi}$ | $0_5$ $\partial I/\partial \bar{M}$ | $R_2$ % | DW |
|---|---|---|---|---|---|---|---|---|
| Pakistan | | | | | | | | |
| I | -2.2490 | 0.1812[b] | 0.3703[b] | -0.2393 | 0.3916 | -- | 97 | 1.37 |
| | (-1.3354) | (4.7199) | (2.5695) | (-1.5533) | (0.6482) | -- | | |
| II CSC | -1.6390 | 0.1564[b] | -- | -- | -- | 0.1191 | 82 | 1.39 |
| | (-0.6010) | (3.7650) | -- | -- | -- | (0.9770) | | |
| III | 5.2521[b] | -- | 0.9648[b] | 0.4336[b] | 2.8476[b] | -- | 93 | 1.73 |
| | (6.1720) | -- | (9.0329) | (4.8638) | (6.0778) | -- | | |
| Sudan | | | | | | | | |
| I | -0.0610 | 0.9042[b] | 0.4456[d] | 0.0485 | 0.0259 | -- | 98 | 2.20 |
| | (-0.8646) | (11.6715) | (1.5168) | (0.1306) | (0.0417) | -- | | |
| II | -0.0473 | 0.8565[b] | -- | -- | -- | 0.4140 | 98 | 2.15 |
| | (-1.2387) | (13.8733) | -- | -- | -- | (1.4557) | | |
| III | 0.4740[b] | -- | 2.9750[b] | 3.1826[b] | 6.0809[b] | -- | 82 | 1.47 |
| | (2.7928) | -- | (4.7396) | (3.9177) | (5.7179) | -- | | |

[a] t values are in parentheses

[b] significant at .01 level

[c] significant at .05 level

[d] significant at .10 level

TABLE XLI

ESTIMATED INVESTMENT FUNCTIONS FOR THE MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES FOR THE PERIOD 1960-79a

| Country and Cases | $0_0$ | $0_1$ $\partial I/\partial \bar{Y}$ | $0_2$ $\partial I/\partial \bar{F}$ | $0_3$ $\partial I/\partial \bar{E}$ | $0_4$ $\partial I/\partial \bar{\pi}$ | $0_5$ $\partial I/\partial \bar{M}$ | $R^2$ % | DW |
|---|---|---|---|---|---|---|---|---|
| Ghana | | | | | | | | |
| I | 0.5040[b] | -0.0410 | 0.5857[b] | 0.3146[b] | 0.8266[b] | -- | 64 | 1.43 |
| | (2.2846) | (-0.9005) | (4.1588) | (2.2196) | (3.9991) | -- | | |
| II | 0.5402[b] | -0.0718[d] | -- | -- | -- | 0.4364[b] | 50 | 1.38 |
| | (2.2534) | (-1.6743) | -- | -- | -- | (3.5740) | | |
| III | 0.3452[b] | -- | 0.6224[b] | 0.2691[c] | 0.8491[b] | -- | 63 | 1.48 |
| | (2.6230) | -- | (4.6486) | (2.0460) | (4.1669) | -- | | |
| Jamaica | | | | | | | | |
| I CSC | -0.0504 | 0.2073[d] | 0.5054 | 0.0261 | 0.2841 | -- | 50 | 1.72 |
| | (-0.2140) | (1.4750) | (1.3830) | (0.1100) | (0.5760) | -- | | |
| II CSC | -0.1165 | 0.2131 | -- | -- | -- | 0.1680 | 28 | 1.81 |
| | (-0.4330) | (1.3390) | -- | -- | -- | (0.8730) | | |
| III CSC | 0.2049 | -- | 0.7492[b] | 0.2192 | 0.4956 | -- | 42 | 1.57 |
| | (1.2290) | -- | (2.2260) | (1.0780) | (1.0160) | -- | | |
| Uruguay | | | | | | | | |
| I | -0.3892 | 0.0993 | 0.4567[b] | 0.4647[c] | 0.6908[b] | -- | 82 | 1.33 |
| | (-0.9497) | (1.2328) | (2.4619) | (2.0109) | (2.2538) | | | |
| II | -0.3355 | 0.1187[d] | -- | -- | -- | 0.3676[b] | 79 | 1.27 |
| | (-0.8523) | (1.6592) | -- | -- | -- | (2.2752) | | |
| III | 0.0714 | -- | 0.6046[b] | 0.7131[b] | 0.8744[b] | -- | 80 | 1.64 |
| | (0.4167) | -- | (4.2040 | (6.2014) | (3.2121) | -- | | |

TABLE XLI (Continued)

| Country and Cases | $0_0$ | $0_1$ $\partial I/\partial \bar{Y}$ | $0_2$ $\partial I/\partial \bar{F}$ | $0_3$ $\partial I/\partial \bar{E}$ | $0_4$ $\partial I/\partial \bar{\pi}$ | $0_5$ $\partial I/\partial \bar{M}$ | $R^2$ % | DW |
|---|---|---|---|---|---|---|---|---|
| Thailand | | | | | | | | |
| I | -8.4923[b] | 0.2052[b] | 1.1710[b] | 0.1824 | 1.3992[b] | -- | 99 | 1.33 |
| | (-3.1957) | (4.6395) | (5.6631 | (1.0086) | (5.2864) | -- | | |
| II | -6.2174[d] | 0.1589[b] | -- | -- | -- | 0.4781[b] | 98 | 1.24 |
| | (-1.7486) | (2.9875) | -- | -- | -- | (2.7427) | | |
| III | 0.0312 | -- | 1.4688[b] | 0.9804[b] | 1.8075[b] | -- | 98 | 1.38 |
| | (0.0108) | -- | (4.9456) | (11.6350) | (4.7927 | -- | | |
| Peru | | | | | | | | |
| I | 19.8637[b] | 0.0829[c] | 0.5090[b] | 0.2314 | 0.2380 | -- | 88 | 1.79 |
| | (3.1105) | (2.0491) | (3.1325) | (1.2078) | (0.8033) | -- | | |
| II | 17.1981[b] | 0.0094 | -- | -- | -- | 0.6264[b] | 78 | 1.16 |
| | (2.2039) | (0.2780) | -- | -- | -- | (3.7628) | | |
| III | 23.5145[b] | -- | 0.7961[b] | 0.5945[b] | 0.7770[b] | -- | 84 | 1.75 |
| | (3.5005) | -- | (8.8355) | (7.4385) | (5.2011) | -- | | |
| Dominican Rep. | | | | | | | | |
| I | -0.2521[b] | 0.2057[b] | 0.3618[b] | 0.2462[c] | 0.2389[c] | -- | 99 | 2.36 |
| | (-10.0406) | (5.2176) | (2.7403) | (1.9696) | (1.9723) | -- | | |
| II | -0.2677[b] | 0.2685[b] | -- | -- | -- | 0.1049 | 98 | 2.31 |
| | (-8.8409) | (6.8987) | -- | -- | -- | (0.8299) | | |
| III | -0.1587[b] | -- | 0.9367[b] | 0.8748[b] | 0.6770[b] | -- | 98 | 2.19 |
| | (-5.5473) | -- | (7.9247) | (17.6502) | (4.7738) | -- | | |

TABLE XLI (Continued)

| Country and Cases | $0_0$ | $0_1$ $\partial I/\partial \bar{Y}$ | $0_2$ $\partial I/\partial \bar{F}$ | $0_3$ $\partial I/\partial \bar{E}$ | $0_4$ $\partial I/\partial \bar{\pi}$ | $0_5$ $\partial I/\partial \bar{M}$ | $R^2$ % | DW |
|---|---|---|---|---|---|---|---|---|
| Guatemala | | | | | | | | |
| I | -0.0986[c] | 0.0752[d] | 0.9974 | 0.4263[b] | 1.1876[b] | -- | 99 | 2.01 |
| | (-2.1207) | (1.6845) | (11.3800) | (2.7334) | (11.3027) | -- | | |
| II | 0.0128 | -0.0462 | -- | -- | -- | 0.9150 | 99 | 1.86 |
| | (0.2705) | (-1.1821) | -- | -- | -- | (8.1359) | | |
| III | -0.0230[d] | -- | 1.0447[b] | 0.6843[b] | 1.2041[b] | -- | 99 | 1.88 |
| | (-1.7899) | -- | (11.9191) | (22.1006) | (10.9009) | -- | | |
| Panama | | | | | | | | |
| I | -0.1395[b] | 0.3292[c] | 0.8410[d] | -0.0750 | 1.0275[d] | -- | 95 | 2.01 |
| | (-2.9681) | (2.1842) | (1.8078) | (-0.2369) | (1.7517) | -- | | |
| II | -0.1401[b] | 0.3095[b] | -- | -- | -- | 0.0970 | 94 | 1.83 |
| | (-2.9104) | (2.7748) | -- | -- | -- | (0.4864) | | |
| III | -0.0694[c] | -- | 1.1896[b] | 0.5879[b] | 1.5286[b] | -- | 94 | 2.22 |
| | (-1.8182) | -- | (2.4489) | (5.8662) | (2.5471) | -- | | |
| Israel | | | | | | | | |
| I CSC | -0.2678 | 0.3589[b] | 0.2419[c] | -0.2728[d] | 0.4006 | -- | 90 | 1.14 |
| | (-1.0460) | (3.4700) | (2.0840) | (-1.7070) | (1.4670) | -- | | |
| II CSC | 0.0398 | 0.2109[c] | -- | -- | -- | 0.1110 | 77 | 1.01 |
| | (0.1350) | (1.9660) | -- | -- | -- | (0.9550) | | |
| III | 0.3251[b] | -- | 0.7658[b] | 0.0343 | 1.2187[b] | -- | 92 | 1.58 |
| | (2.5182) | -- | (5.8781) | (0.3841) | (3.2275) | -- | | |

TABLE XLI (Continued)

| Country and Cases | $\theta_0$ | $\theta_1$ $\partial I/\partial \bar{Y}$ | $\theta_2$ $\partial I/\partial \bar{F}$ | $\theta_3$ $\partial I/\partial \bar{E}$ | $\theta_4$ $\partial I/\partial \bar{\pi}$ | $\theta_5$ $\partial I/\partial \bar{M}$ | $R^2$ % | DW |
|---|---|---|---|---|---|---|---|---|
| Portugal | | | | | | | | |
| I | -8.9670 | 0.1690[d] | 0.1249 | 0.2864 | 0.2636 | -- | 92 | 1.76 |
| | (-0.7019) | (1.7421) | (0.4613) | (1.2010) | (0.9247) | -- | | |
| II | -14.6351[d] | 0.1848[c] | -- | -- | -- | 0.2451 | 91 | 1.49 |
| | (-1.5677) | (1.9826) | -- | -- | -- | (1.0878) | | |
| III | 7.5502 | -- | 0.5179[b] | 0.6438[b] | 0.7003[b] | -- | 90 | 1.66 |
| | (0.8239) | -- | (3.2286) | (4.9452) | (4.8149) | -- | | |
| Spain | | | | | | | | |
| I | 113.1324[c] | 0.0772[b] | 1.0323[b] | 0.1896[b] | 1.3564[b] | -- | 99 | 2.02 |
| | (2.0195) | (2.3916) | (8.1174) | (5.7996) | (9.9118) | -- | | |
| II CSC | 249.3072[b] | 0.0269 | -- | -- | -- | 1.0495[b] | 95 | 1.47 |
| | (3.0600) | (0.7230) | -- | -- | -- | (6.0840) | | |
| III | 234.4183[b] | -- | 1.2814[b] | 1.2564[b] | 1.5871[b] | -- | 99 | 1.93 |
| | (8.5909) | -- | (15.3180) | (31.7716) | (14.2662) | | | |

[a] t values are in parentheses

[b] significant at .01 level

[c] significant at .05 level

[d] significant at .10 level

Sri-Lanka and Sudan) conform to this case. The values for $\partial I/\partial \overline{Y}$ and $\partial I/\partial \overline{E}$ are positive and the coefficients are significant at one of the three levels of probability given at the bottom of the table. Also, the estimates for $\partial I/\partial \overline{F}$ and $\partial I/\partial \overline{\pi}$ are positive and less than one as expected.

For the two remaining countries (Burma and Pakistan), the results indicate that they are not constrained by saving for this time period. In the case of Pakistan, the estimated coefficient for $\partial I/\partial \overline{E}$ was negative which is not expected in this case, but not statistically different from zero at the 0.10 probability level. For Burma, the estimated values of $\partial I/\partial \overline{F}$ and $\partial I/\partial \overline{\pi}$ are not less than or equal to one as expected. A statistical test shows that they are statistically different from one and, in this case, greater than one.

Using the same procedure explained above, it was found that nine of the eleven MINODC's conform to this case. The two countries that showed this constraint not binding in their economy were Ghana and Israel. In the case of Israel, the coefficient of $\partial I/\partial \overline{E}$ was negative and significant at the .10 probability level. The coefficient of $\partial I/\partial \overline{Y}$ for Ghana was also negative. However, positive value were expected for both variables.

Case II

Case II represents trade and capacity constraints. For the LINODC's no country conformed to Case II. For a country to be binding in this case in its economic growth, the value for $\partial I/\partial \overline{Y}$ must be non-positive while the estimated coefficient for $\partial I/\partial \overline{M}$ must be greater than or equal to one. Only one country had the expected sign on the estimated coefficient of $\partial I/\partial \overline{Y}$. However, the expected sign on $\partial I/\partial \overline{M}$ did not conform. As a result, this case was rejected to be binding for any of the LINODC's.

For the MINODC's, only one country (Guatemala) conformed to this case. Ghana had the expected signs for the variables, however, the range for the $\partial I/\partial \overline{M}$ did not conform to the range given in Table XXXIX.

Case III

Case III represents saving and trade constraints. For this case to be binding, the estimated coefficients of $\partial I/\partial \overline{F}$, $\partial I/\partial \overline{E}$, and $\partial I/\partial \overline{\pi}$ must be positive (i.e. $\geq 0$). The results for most countries showed consistency with this case. However, as Weisskopf stated, this case is based on a weak assumption since the permissible range defined for this case is $\geq 0$. Yet, he explains the possible values of the parameters of this equation could easily assume substantial positive values. This suggests that for many countries the cut-off value might appropriately be much higher than zero, in which case the frequency of results consistent with Case III would be diminished [82].

In view of the weakness of this case, the countries were classified as Case III only if the regression results were consistent with this case and inconsistent with both Case I and Case II. Only Burma in the LINODC's and Israel and Ghana in the MINODC's are classified in this case. Countries for which none of these cases were satisfied were considered inconclusive. The problem of having two or more cases to be binding for a country over a particular time period can be a result of the length of the period. As Weisskopf suggested, this problem could be solved by reducing the length of the time period considered. This kind of experimentation, he said, may lead to the discovery of a period during which the country can be unambigously classified under one case or

another. To test for such results, the following summary covers the time periods of 1960-79, 1960-69, 1970-79, and 1973-79.

Comparison of Constraints for Different Time Periods

Based on the criteria given in Tables XXXVIII and XXXIX, the regression results of each country for the time periods identified above were examined. The results are presented in Tables XLII and XLIII for the LINODC's and MINODC's, respectively. Glancing through Table XLII only one country, Sri Lanka, had a consistent savings constraint for all four time periods. Of the remaining four countries, two (Sudan and Pakistan) showed a saving constraint for three time periods, while Malawi had a saving constraint for the first two time periods and a trade constraint for the last two time periods. One country, Burma, had saving and trade constraint to be binding for three time periods.

The results of the binding constraint for the four time periods for the MINODC's are presented in Table XLIII. Of the 11 countries in this group, five had savings constraint for the four time periods, while four countries had this constraint binding for three time periods. One of the remaining two countries showed a trade constraint to be binding for three time periods, while the other had saving and trade constraint also for three time periods.

Based on the above findings, it can be concluded that for the LINODC's four countries (Sri Lanka, Pakistan, Sudan and Malawi) were faced with a saving constraint in their economic growth. The remaining country, Burma, had a binding saving and trade constraint. For the MINODC's, the binding constraint in the economic growth of Guatemala was

TABLE XLII

SUMMARY OF THE BINDING CONSTRAINTS FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES FOR FOUR DIFFERENT TIME PERIODS

| Country | First Period 1960-79 | Second Period 1960-69 | Third Period 1970-79 | Fourth Period 1973-79 |
|---|---|---|---|---|
| Malawi | Saving | Saving | Trade | Trade |
| Sri Lanka | Saving | Saving | Saving | Saving |
| Burma | Saving & Trade | Saving & Trade | Trade | Saving & Trade |
| Pakistan | Trade | Saving | Saving | Saving |
| Sudan | Saving | Saving | Saving & Trade | Saving |

TABLE XLIII

SUMMARY OF THE BINDING CONSTRAINTS FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES FOR FOUR DIFFERENT TIME PERIODS

| Country | First Period 1960-79 | Second Period 1960-69 | Third Period 1970-79 | Fourth Period 1973-79 |
|---|---|---|---|---|
| Ghana | Saving & Trade | Saving | Saving | Saving & Trade |
| Jamaica | Saving | Saving & Trade | Saving | Saving |
| Uruguay | Saving | Saving | Saving | Saving |
| Thailand | Saving | Saving | Trade | Saving |
| Peru | Saving | Saving | Saving | Saving |
| Dominican Rep. | Saving | Saving | Saving | Saving |
| Guatemala | Trade | Saving & Trade | Trade | Trade |
| Panama | Saving | Saving | Saving | Saving |
| Israel | Saving & Trade | Inconclusive | Saving & Trade | Saving & Trade |
| Portugal | Saving | Inconclusive | Saving | Saving |
| Spain | Saving | Saving | Trade | Saving |

found to be trade, while for Israel it was saving and trade. The dominant constraint to growth for the remaining nine countries was the saving constraint.

## Investment Elasticities

Investment elasticities were calculated to determine the effect of the terms of trade as well as the other variables on investment. The estimated investment elasticities with respect to the variable in question are presented in Tables XLIV and XLV for LINODC's and MINODC's, respectively. The estimated elasticities of investment with respect to output ($\overline{Y}$) for the LINODC's were all greater than one with the exception of Malawi. In contrast, the investment elasticities with respect to this variable for the MINODC's was less than one with the exception of Dominican Republic and Panama. This suggests that a one percent change in output or income will have a larger effect on investment in the LINODC's than in the MINODC's, ceteris paribus.

For the remaining variables, except $\overline{M}$ in Guatemala, the estimated elasticities of investment were all less than one. That is, a one percent change in these variables leads to less than one percent change in investment. For the LINODC's, the estimated elasticities of investment with respect to the terms of trade ($\overline{\pi}$) varies between -0.0011 percent and 0.3562 percent. The same elasticity varies between -0.0133 percent and 0.2567 percent for the MINODC's. The importance of the terms of trade in affecting investment varies from country to country. For example, in Panama a one percent change in this variable will have a large effect on investment, second only to that of output, while its effect on investment ranks fourth in Pakistan.

TABLE XLIV

ESTIMATED ELASTICITIES OF INVESTMENT FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79

| Country | Estimated Elasticities W.R.T.[a] $\overline{Y}$ | $\overline{F}$ | $\overline{E}$ | $\overline{\Pi}$ |
|---|---|---|---|---|
| Malawi | 0.0014 | 0.4153 | 0.3943 | -0.0187 |
| Sri Lanka | 1.1365 | -0.2328 | 0.1212 | 0.3562 |
| Burma | 1.1068 | -0.0461 | 0.3968 | 0.1699 |
| Pakistan | 1.1595 | 0.1090 | -0.1309 | 0.0164 |
| Sudan | 1.0146 | 0.0374 | 0.0081 | -0.0011 |

[a]with respect to

TABLE XLV

ESTIMATED ELASTICITIES OF INVESTMENT FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES, 1960-79

| Country | Estimated Elasticities W.R.T.[a] | | | | |
|---|---|---|---|---|---|
| | $\overline{Y}$ | $\overline{F}$ | $\overline{E}$ | $\overline{\Pi}$ | $\overline{M}$ |
| Ghana | -- | 0.1395 | 0.3920 | -0.0630 | -- |
| Jamaica | 0.8738 | 0.2570 | 0.0405 | -0.0778 | -- |
| Uruguay | 0.7449 | -0.1356 | 0.5221 | 0.2443 | -- |
| Thailand | 0.8509 | 0.1705 | 0.1494 | -0.0133 | -- |
| Peru | 0.4858 | -0.0391 | 0.2546 | 0.0256 | -- |
| Dominican Rep. | 1.0817 | 0.3638 | 0.2616 | -0.1937 | -- |
| Guatemala | -0.3008 | -- | -- | -- | 1.2720 |
| Panama | 1.2856 | -0.0590 | -0.1130 | 0.2567 | -- |
| Israel | -- | 0.4951 | 0.0399 | 0.2533 | -- |
| Portugal | 0.7985 | 0.0580 | 0.3050 | 0.0240 | -- |
| Spain | 0.3245 | 0.0770 | 0.0975 | 0.0471 | -- |

[a] with respect to

## Estimated Savings Function

The results of the test designed to identify the binding constraint among alternative constraints suggest that savings has more often been binding than trade for the NODC's as a whole for the time period under study. Therefore, it is now possible to identify a behavioral savings function for these countries for the study period. To achieve this objective, equation (6.4) was estimated for the countries with a saving constraint with the results presented in Tables XLVI and XLVII. Since by definition $S = Y-C$ and $S \leq S^*$ in the model, the value for S was used to represent the data for the ex ante saving, $S^*$.

The estimated coefficients represent the marginal response of ex ante domestic savings to a unit change in the level of gross domestic product, capital inflow, exports and terms of trade effect. Not surprisingly, the results show a uniformly negative response (with few exceptions) of savings to net foreign capital inflow and terms of trade effect. This is expected since one of the requirements of consistency with Case I was that the coefficients of $\partial I/\partial \bar{F}$ and $\partial I/\partial \bar{\pi}$ in the corresponding investment function (6.12), which is equal to $1 + c$ and $1 + e$, respectively, be less than or equal to one. The significance of the coefficients on net capital inflow and terms of trade effect show that the impact of these variables on savings is highly significant.[4] What this implies from the earlier discussion is that capital inflow and proceeds from the terms of trade are used to finance consumption expenditure and as a result savings decrease.

For exports, the results differ for the LINODC's and MINODC's. For the MINODC's, the export sector shows a significant impact on the propensity to save.

TABLE XLVI

ESTIMATED SAVINGS FUNCTION FOR THE LOW-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| Country | Intercept a | Gross Domestic Product b | Capital Inflow c | Exports d | Terms of Trade Effect e | $R^2$ % | DW |
|---|---|---|---|---|---|---|---|
| Malawi | -0.0360 (-1.2397) | 0.8505[b] (5.4637) | -2.6010[b] (-5.4236) | -1.6265[b] (-2.7748) | -2.4457[c] (-2.0624) | 74 | 1.63 |
| Sri Lanka | -1.3377 (-1.0770) | 0.1921[d] (1.6200) | -0.4648[b] (-4.2900) | 0.0744 (0.2740) | -0.4531[b] (-2.9180) | 80 | 1.10 |
| Pakistan | -2.2385 (-1.3361) | 0.1810[b] (4.7354) | -0.6286[b] (-4.3822) | -0.2387 (-1.5564) | -0.6036 (-1.0037) | 89 | 1.36 |
| Sudan | 0.0608 (0.8608) | 0.0956 (1.2338) | -0.4459 (-1.5172) | 0.0457 (0.1229) | 0.0290 (0.0467) | 39 | 2.20 |

[a] t values are in parentheses

[b] significant at .01 level

[c] significant at .05 level

[d] significant at .10 level

TABLE XLVII

ESTIMATED SAVINGS FUNCTION FOR THE MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| Country | Intercept a | Gross Domestic Product b | Capital Inflow c | Exports d | Terms of Trade Effect e | $R^2$ % | DW |
|---|---|---|---|---|---|---|---|
| Ghana | 0.5230[b] | -0.0464 | -0.4174[b] | 0.3256[b] | -0.1905 | 67 | 1.32 |
| | (2.6056) | (-1.1212) | (-3.2581) | (2.5251) | (-1.0131) | | |
| Jamaica | 0.0657 | -0.1793 | 0.1736 | 0.6428 | -0.8245 | 30 | 1.88 |
| | (0.1722) | (-0.7164) | (0.2056) | (1.2904) | (-0.6894) | | |
| Uruguay | 0.4449 | -0.0304 | -0.0881 | 0.5830[b] | 0.1817 | 62 | 1.48 |
| | (1.1602) | (-0.4034) | (-0.5076) | (2.6965) | (0.6335) | | |
| Thailand | -11.7626[b] | 0.1658[b] | -0.3175[d] | 0.6077[b] | -0.0256 | 99 | 2.46 |
| | (-5.1420) | (4.1540) | (-1.6140) | (3.7000) | (-0.1030) | | |
| Peru | 19.9115[b] | 0.0822[c] | -0.4894[b] | 0.2344 | -0.7583[b] | 91 | 1.80 |
| | (3.1376) | (2.0443) | (-3.0309) | (1.2310) | (-2.5754) | | |
| Dominican Rep. | -0.2545[b] | 0.2173[b] | -0.8400[b] | 0.3307[b] | -0.8547[b] | 99 | 2.41 |
| | (-8.5474) | (4.6470) | (-5.3635) | (2.2400) | (-5.9485) | | |
| Panama | -0.0064 | -0.2147 | -1.2178 | 1.1026 | -0.6941 | 29 | 1.39 |
| | (-0.0326) | (-0.3413) | (-0.6273) | (0.8345) | (-0.2835) | | |
| Portugal | -8.5608 | 0.1680[d] | -0.8708[b] | 0.2834 | -0.7301[b] | 78 | 1.76 |
| | (-0.6697) | (1.7306) | (-3.2136) | (1.1880) | (-2.5595) | | |
| Spain | 873.0606 | -0.2166 | 0.3224 | 1.9828 | 0.3829 | 80 | 2.72 |
| | (3.2850) | (-1.3540) | (0.4950) | (2.5990) | (0.5320) | | |

[a] t values are in parentheses

[b] significant at .01 level

[c] significant at .05 level

[d] significant at .10 level

This is indicated by the generally significant positive relationship of savings with exports. Various authors [84] support the result of a positive relationship in primary commodity exporting countries between exports and savings. To the extent that this is true, an increase in exports contributes to a reduction in the trade constraint which will indirectly contribute to a reduction of the savings constraint.

In the case of LINODC's the propensity to save is more closely related to the gross domestic product than it is to exports. In fact, some countries showed a negative response of savings to exports. This indicates that during the two decades under study, there was either a decline or no change in growth of exports of these countries which resulted in an increase in the marginal propensity to save from gross domestic product. However, since an increase in exports will indirectly reduce the savings constraint, failure of these countries to increase exports might have contributed to the savings constraint being dominant in their economic growth. Development policy of these countries should, therefore, be geared towards increasing exports so that a desired growth rate can be achieved. Policies such as export diversification, increase in production of export commodities are examples.

Some MINODC's showed a positive relationship between savings and gross domestic product, while some had a negative relationship. The negative relationship implies that these countries perhaps experienced an increase in their balance of payments deficit during the period by borrowing from abroad.[5] This result conforms to the argument in Chapter II that the MINODC's were heavier borrowers in the 1970's than the LINODC's in the adjustment process to an increase in oil prices.

For the NODC's in general the savings constraint was the binding constraint in their economic growth with one exception, Guatemala. The result for Guatemala shows that the major constraint on investment is the availability or lack of foreign exchange. Foreign exchange constrains the level of imports and is thereby an important determinant of capital formation. To measure the behavior of this constraint, equation (6.5) was estimated and the following results:

$$M^* = -0.0859 + 0.1099Y + 0.8695I$$
$$(-2.0893)^b \quad (3.7414)^a \quad (8.1359)^a$$
$$R^2 = 99, \ DW = 1.30$$

In this regression, both of the explanatory variables are significant at the one percent level. Investment has an estimated coefficient close to one indicating that an increase in this variable is associated with an approximately equal increase in imports. Or interpreting it differently, imports are converted more rapidly to investment than to output. Although the estimated coefficient of output is significant, its value is small indicating a change in output has little effect on the change in imports.

The estimated elasticity of imports with respect to investment also substantiates the strong relationship between investment and imports. A one percent change in investment is associated with a 1.27 percent change in imports. By contrast, a one percent change in output will have a -0.30 percent change on imports, other things equal.

The results confirm that a lack of foreign exchange has a significant effect on investment, while it is quite ineffective in stimulating output. It follows that there may be considerable potential for

stimulating economic growth of Guatemala through policies that will increase the foreign exchange receipts. Policies directed at increasing exports, and capital inflow (public or private) are examples.

## Summary

A standard macroeconomic "two-gap" model similar to that of Weisskopf, but which incorporates the terms of trade effect, was developed to identify the constraints to growth in the NODC's.

The chapter includes empirical results intended to validate this model. The model and empirical results are summarized below.

### Theoretical Framework

The basic concept of the model was that there are two factors limiting the economic growth of developing countries. The first is the availability of domestic savings needed for investment. The second is the availability of foreign exchange needed for importing capital goods required for current investment.

The model is defined by three national income accounting identities; an ex ante (potential) saving function; and an ex ante (required) import function. The model also includes three inequalities: actual saving must be equal to or less than potential or desired saving; actual imports must be equal to or greater than required imports for current consumption and investment; and actual output must be equal to or less than capacity output. The model was then reduced to three constraints: savings, trade and capacity.

Since the model has one more equation or inequality than endogenous variables, it was shown that no more than two of the above three

constraints can hold as equalities at a given time. Based on these constraints, three possible cases to the model were identified. Case I, where the saving and capacity constraints are binding; Case II, where trade and capacity constraints are binding; and Case III, where both saving and trade constraints are binding and the economy is operating at less than full capacity.

The three alternative cases above have different implications for the role of the terms of trade effect and its impact on gross investment. To explore this implication, the corresponding equalities in each case were used to eliminate the endogenous variable Y. As a result, the investment functions for each of the three cases were obtained for estimation purpose. Utilizing a priori restriction on the possible values of the original structural parameters, a corresponding range of values or restrictions on these parameters was derived depending on whether an economy falls in Case I, Case II or Case III. The decision on which case was applicable for a given time period was made depending on the degree of consistency of the estimated parameters with the restrictions corresponding to that case.

## Empirical Results

Three separate regressions were estimated representing Cases I, II, and III for the LINODC's and MINODC's. The empirical analysis covered four different time periods to determine the constraint to growth at different time periods.

The results for the first time period, 1960-79, showed that out of five LINODC's, three conformed to Case I and the remaining two to Case II. For the MINODC's, nine of the eleven countries conformed to Case I,

while two showed Case III to be the binding constraint and only one country conformed to Case II. The empirical results for the second and third time periods, 1960-69 and 1970-79, respectively, showed the savings constraint to be binding for the majority of the NODC's. For the final time period, 1973-79, which was examined to identify the dominant constraint during the time of rapid oil price increases, the results of both groups of countries conformed to Case I.

Based on the empirical results presented above, it was concluded that the saving constraint was more often binding for the NODC's in general. As a result, ex ante saving functions were estimated. The results for both groups of countries (with few exceptions) showed a uniformly negative response of saving to the terms of trade effect and net capital inflow.

To determine the contribution of the terms of trade effect, as well as the other exogenous variables in the model, investment elasticities were calculated. The estimated elasticities of investment were all less than one in absolute value with the exception of the output variable for the LINODC's. The investment elasticities with respect to the terms of trade effect varied from -0.130 to 0.397 for the LINODC's and -0.194 to 0.257 for the MINODC's.

## FOOTNOTES

[1]The terms of trade effect is defined as: $\Pi = (P_x/P_m - 1) E$ where $P_x$ and $P_m$ are the price of exports and imports, respectively and E is the total real value of exports. The terms of trade effect is defined in such a way so as to capture the effects of changes in the price of exports relative to the price of imports.

[2]Net capital inflow (F) is usually defined as the trade deficit, M-E, because of the unavailability of more precise data. F defined in this way includes a component of compensatory short-run capital flows that arise specially in response to short-run fluctuations in imports and exports. However, this study has attempted to measure this fluctuation separately by incorporating the terms of trade effect in the model.

[3]For a mathematical deviation of the model, see Appendix C.

[4]For insignificant, though negative, coefficients of some countries could be caused by an over valued domestic currency. For an elaboration of this argument, see the appendix in Weisskopf [82].

[5]For a closer examination of the balance of payments of these countries, see Appendix B, Table LVI.

# CHAPTER VII

# THE EFFECT OF THE TERMS OF TRADE ON THE ECONOMIC GROWTH OF NON-OIL DEVELOPING COUNTRIES

## Introduction

Recent growth performance of the world as measured by GDP, especially during the decade of the 1970's, can only be explained as one of sharp decline (Chapter I). Recession and inflation in the developed countries, together with the rise in oil prices, have been the main forces behind this decline. The growth rate of DC's as a whole fell from 6 percent in the 1960's to 5.2 percent in the 1970's. For the NODC's as a group, the growth rate for the 1970's was about the same as the rate achieved in the 1960's. However the overall performance of the NODC's was due to a comparatively high growth rate in 10 more diversified economies.[1]

The majority of the NODC's in the study sample experienced a decline in the average growth rate of real total GDP in the 1970's (Tables XLVIII and XLIX). Their record is even more depressing from the point of view of growth in real per capita GDP. The average annual compound rates of growth of GDP per capita from 1974 to 1979 were between -4.4 percent and 2.4 percent for the LINODC's and between -4.9 percent and two percent for the MINODC's.[2] Growth of population was at an average annual rate of about 2.5 percent.

## TABLE XLVIII

## ANNUAL AVERAGE GROWTH RATES OF TOTAL AND PER CAPITA REAL GROSS DOMESTIC PRODUCT AT MARKET PRICES FOR THE SAMPLE OF LOW-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| | Total GDP | | | | | | | Per Capita GDP | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | 1960-1970 | 1970-1979 | 1974-1975 | 1975-1976 | 1976-1977 | 1977-1978 | 1978-1979 | 1960-1970 | 1970-1979 | 1974-1975 | 1975-1976 | 1976-1977 | 1977-1978 | 1978-1979 |
| Malawi | 4.8 | 6.9 | 6.0 | 4.1 | 5.9 | 7.2 | 5.6 | 1.9 | 3.6 | 2.7 | 0.9 | 2.6 | 3.8 | 2.2 |
| Sri Lanka | 5.0 | 4.6 | 3.2 | 4.5 | 1.7 | 7.8 | 6.0 | 2.5 | 2.8 | 1.5 | 2.7 | 0.0 | 5.9 | 4.1 |
| Benin | 4.0 | 3.2 | -6.0 | 3.4 | 2.1 | 5.5 | 4.1 | 1.3 | 0.3 | -8.7 | 0.5 | -0.9 | 2.4 | 1.0 |
| Burma | 2.4 | 3.4 | 2.7 | 4.2 | 6.1 | 6.0 | 5.6 | 0.2 | 0.7 | -0.4 | 1.7 | 3.5 | 3.4 | 3.0 |
| Cen. Afr. Rep. | 1.3 | 1.7 | 1.3 | 3.3 | 7.4 | 0.5 | -0.5 | -0.5 | -1.7 | -0.8 | 1.1 | 5.1 | -1.7 | -2.7 |
| Mozambique | 3.7 | -2.8 | -13.1 | -4.8 | 0.8 | 0.8 | 2.5 | 1.4 | -5.2 | -15.2 | -7.2 | -1.7 | -1.8 | -0.2 |
| Mauritania | 8.1 | 1.7 | 5.1 | 5.1 | -2.0 | -1.4 | 3.0 | 5.5 | -1.0 | 2.3 | 2.3 | -4.7 | -4.1 | 0.1 |
| Pakistan | 6.1 | 4.9 | 4.8 | 3.6 | 7.0 | 5.9 | 6.0 | 3.3 | 1.7 | 1.6 | 0.4 | 3.7 | 2.6 | 2.6 |
| Senegal | 0.8 | 2.3 | 7.9 | 7.3 | 0.7 | -0.1 | 11.0 | -2.5 | -0.6 | 4.8 | 4.4 | -1.9 | -11.4 | 8.2 |
| Chad | 0.1 | 2.7 | 9.3 | 5.7 | 2.4 | -3.7 | -3.0 | -1.7 | 0.5 | 6.9 | 3.4 | 0.0 | -5.9 | -5.3 |
| Niger | 5.3 | 4.7 | -2.5 | 17.7 | 6.5 | 10.0 | 4.7 | 1.8 | 1.8 | -5.2 | 14.4 | 3.5 | 6.8 | 1.7 |
| Sudan | 2.5 | 3.2 | 4.3 | 4.9 | 4.8 | 4.0 | 3.0 | 0.2 | 0.5 | 1.6 | 2.1 | 2.0 | 1.2 | 0.2 |
| Upper Volta | 4.9 | 1.4 | 1.4 | -0.3 | -3.4 | 3.0 | 6.1 | 2.7 | -1.0 | -1.1 | -2.7 | -5.8 | 0.4 | 3.4 |
| Uganda | 5.3 | -0.3 | -2.0 | 0.7 | 1.6 | -4.0 | -- | 1.5 | 3.2 | 4.8 | -2.2 | -1.4 | -6.9 | -- |
| Bangladesh | 3.8 | 5.6 | 12.2 | 1.4 | 7.6 | 5.0 | 7.0 | 0.8 | 2.8 | 5.4 | -1.3 | 4.5 | 1.9 | 3.8 |

[a] Growth rates of real product are based on gross domestic product at constant prices without any adjustment made for changes in the terms of trade.

Source: Handbook of International Trade and Development Statistics, UNCOTAD, Supplement 1980, UN, New York, 1980.

TABLE XLIX

ANNUAL AVERAGE GROWTH RATES OF TOTAL AND PER CAPITA REAL GROSS DOMESTIC PRODUCT AT MARKET PRICES FOR THE SAMPLE OF MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| | Total GDP | | | | | | | Per Capita GDP | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | 1960-1970 | 1970-1979 | 1974-1975 | 1975-1976 | 1976-1977 | 1977-1978 | 1978-1979 | 1960-1970 | 1970-1979 | 1974-1975 | 1975-1976 | 1976-1977 | 1977-1978 | 1978-1979 |
| Ghana | 2.3 | 0.0 | -12.4 | -5.7 | 1.2 | 1.0 | 1.5 | 0.0 | -2.9 | -15.1 | -8.6 | -1.9 | -2.1 | -1.6 |
| Jamaica | 5.5 | -0.7 | -1.0 | -6.7 | 4.0 | 0.0 | -1.7 | 4.1 | -2.3 | -2.7 | -8.1 | -5.3 | -1.4 | -3.0 |
| Ivory Coast | 7.7 | 7.8 | 8.0 | 12.0 | 8.6 | 10.3 | 4.2 | 2.6 | 3.4 | 3.6 | 7.8 | 4.8 | 6.6 | 0.9 |
| Uruguay | 1.2 | 2.4 | 6.1 | 2.5 | 3.8 | 3.7 | 8.5 | 0.0 | 2.2 | 3.9 | 2.1 | 3.3 | 3.1 | 7.7 |
| Lebanon | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| South Africa | 6.2 | 3.3 | 2.9 | 1.3 | 0.0 | 2.3 | 3.7 | 3.5 | 0.6 | 0.2 | -1.4 | -2.7 | -0.5 | 0.9 |
| Thailand | 8.3 | 7.2 | 7.4 | 9.8 | 5.8 | 8.4 | 6.6 | 5.1 | 4.1 | 4.3 | 6.7 | 2.8 | 5.4 | 3.6 |
| Peru | 4.8 | 3.2 | 6.8 | 2.0 | 0.0 | -0.7 | 3.5 | 1.9 | 0.4 | 3.9 | -0.8 | -2.8 | -3.4 | 0.7 |
| Dominican Rep. | 4.6 | 7.0 | 5.2 | 6.7 | 5.5 | 2.3 | 3.6 | 1.2 | 4.0 | 2.3 | 3.9 | 2.8 | -0.2 | 1.0 |
| Guatemala | 5.6 | 6.0 | 1.9 | 7.4 | 7.8 | 5.5 | 5.0 | 2.5 | 2.8 | -1.1 | 4.2 | 4.6 | 2.4 | 1.9 |
| Panama | 7.8 | 3.3 | 0.6 | -0.3 | 3.4 | 2.7 | 4.9 | 4.7 | 0.6 | -2.0 | -2.8 | 0.8 | 0.2 | 2.4 |
| Israel | 8.2 | 4.6 | 3.0 | 0.0 | -0.3 | 6.3 | 5.2 | 4.5 | 1.6 | 0.0 | -2.7 | -3.0 | 3.5 | 2.5 |
| Portugal | 6.3 | 4.1 | -4.3 | 6.2 | 5.3 | 3.2 | 4.1 | 6.3 | 2.9 | -8.1 | 2.8 | 6.8 | 2.3 | 3.2 |
| Zambia | 8.3 | 1.9 | -3.7 | 8.3 | -4.4 | 0.5 | -- | 5.3 | -1.1 | -6.6 | 5.0 | -7.4 | -2.7 | -- |
| Spain | 7.2 | 4.1 | 1.1 | 3.0 | 2.6 | 2.5 | 1.0 | 6.0 | 3.0 | -1.1 | 2.0 | 1.6 | 1.5 | 0.0 |

[a] See the footnote in Table XLVIII for explanation.

Source: Handbook of International Trade and Development Statistics, UNCOTAD, Supplement 1980, UN, New York, 1980.

The performance in the second half of the 1970's can be attributed in part to the 1974 oil price increases and to drought (Uganda, Sudan, Mozambique, Dominican Republic, and Zambia). These events reduced not only agricultural production, but also the quantity of electricity available to industry and commerce. In addition, due to the continuing recession and inflation in the industrialized nations which comprise the developing countries most important markets, the demand for primary commodities decreased substantially. This decrease caused a shortage of foreign exchange needed to sustain the rising costs of oil and other imports.

A lack of foreign exchange, as alluded to in Chapter VI, may inhibit investment and, hence, the growth of the economy. However, a country's performance in its economic growth not only is constrained by trade but also by domestic savings. As demonstrated in the previous chapter, the majority of the NODC's showed growth to be limited by a scarcity or lack of domestic savings. The relationship of savings to the terms of trade effect was found to be negative indicating that proceeds from the terms of trade effect may have been used to finance consumption rather than investment expenditures.

In this chapter, an attempt is made to determine the impact of the terms of trade effect on the overall growth of the LINODC's and MINODC's. This impact is measured by the elasticities of GDP with respect to the terms of trade effect. This elasticity will show the percentage change in GDP resulting from a one percent change in the terms of trade. To achieve this objective an income determination model is used.

## An Income Determination Model

In formulating the dynamic income determination model, a capacity equation was constructed with the assumption that capacity is determined by investment in previous periods. This equation then was combined with the investment equation obtained in the two-gap analysis presented in Chapter VI.

If it is assumed that capital stock (K) is in place at the beginning of the period, and current capital stock is not affected by investment in the current period, $K_t$ can be written as follows:

$$K_t = f\ (K_{t-2},\ I_{t-1}) \tag{7.1}$$

Following Oyejide [85], the capital labor ratio is assumed to be constant for the study period. This assumption is necessary since time series employment data for most of the countries under study were not available. Given this assumption, the production function can be written as follows:

$$\bar{Y}_t = f\ (K_t) \tag{7.2}$$

where

$\bar{Y}_t$ represents the exogenously determined GDP at time t.

Substituting equation (7.1) into equation (7.2) results in:

$$\bar{Y}_t = f\ (K_{t-2},\ I_{t-1}) \tag{7.3}$$

Assuming that f is monotonic,[3] $K_{t-2}$ can be rewritten as:

$$K_{t-2} = f^{-1}\ (\bar{Y}_{t-2}) \tag{7.4}$$

Substituting (7.4) into equation (7.3) results in:

$$\bar{Y}_t = f\ [f^{-1}\ (\bar{Y}_{t-2}),\ I_{t-1}] \tag{7.5}$$

The assumption is made that f in equation (7.5) is a linear function. Then the equation is rewritten as:

$$\bar{Y}_t = \bar{Y}_{t-2} + f\ (I_{t-1}) \tag{7.6}$$

Equation (7.6) is the capacity determination equation. Combining this equation with the investment equation of either (6.16) or (6.17), depending on whether a country has a saving or trade constraint in its economy, yields the following dynamic income determination equation, respectively:

$$\bar{Y}_t = \bar{Y}_{t-2} + f\ (\bar{Y}_{t-1},\ \bar{F}_{t-1},\ \bar{E}_{t-1},\ \bar{\Pi}_{t-1}) \tag{7.7}$$

$$\bar{Y}_t = \bar{Y}_{t-2} + f\ (\bar{Y}_{t-1},\ \bar{M}_{t-1}) \tag{7.8}$$

Equation (7.7) indicates that income or GDP in time t depends on the level of output, net capital inflow, exports, and the terms of trade effect in time t-1 and on output in t-2. In equation (7.8), current income is a function of output for two previous years and the amount of imports in the previous year. This specification is based on the assumption made earlier that capacity is determined by past investment rather than current investment. Since the lagged endogenous variables are determined in a previous period of time, they are considered exogenous as far as the current GDP in the equation is concerned.

## Estimation Procedure

Assuming linear functions, equation (7.7) and (7.8) are rewritten for estimation purposes as follows:

$$\bar{Y}_t = \theta_0 + \theta_1 \bar{Y}_{t-1} + \theta_2 \bar{Y}_{t-2} + \theta_3 \bar{F}_{t-1} + \theta_4 \bar{E}_{t-1} + \theta_5 \bar{\Pi}_{t-1} + U_t \tag{7.9}$$

$$\bar{Y}_t = \theta_0 + \theta_1 \bar{Y}_{t-1} + \theta_2 \bar{Y}_{t-2} + \theta_3 \bar{M}_{t-1} + U_t \tag{7.10}$$

where U is an error term, t is time period, and the other variables are defined as in the previous chapter but lagged one period of time. Since the income determination model above is a dynamic model, ordinary least squares (OLS)[4] is suitable for the estimation of the parameters of the equations.

The presence of lagged dependent variables as explanatory variables could result in biased parameter estimates because of correlation between the lagged dependent variables and the disturbances. However, this problem of biasness is expected to become insignificant as the sample size increases. Although the estimates remain biased, they gain consistency. The situation is worse if the disturbances are also serially correlated because the estimates then become inconsistent as well as biased [88].

The use of lagged dependent variables as regressors rules out the Durbin-Watson statistic as a suitable test for autocorrelation [89]. Nerlove and Wallis [90] show that the inclusion of lagged dependent variables results in a Durbin-Watson test statistic asymptotically biased toward two. Two is the expected value when there is no autocorrelation in the residuals. Examination of the residuals for the equations in this chapter showed no evidence of autocorrelation.

## Empirical Results

Equation (7.9) was estimated for all LINODC's and MINODC's except Guatemala. For that country, which was identified to have a trade constraint in its economic growth, equation (7.10) was estimated.

On the basis of the restrictions identified in Chapter VI, coefficients on the export and output variables are expected to be positive. This indicates a positive relationship between the growth of GDP and the growth of export proceeds and output. Coefficients on the net capital inflow and the terms of trade effect may be either positive or negative. To the extent that net capital inflow and proceeds from the terms of trade effect are used for increasing private

or public consumption, a negative relationship is expected. However, if these resources are used for savings which increase investment, a positive relationship is expected.

Low-Income Non-Oil Developing Countries

The estimated GDP equations of the LINODC's are presented in Table L. For some of the LINODC's the output variable of the previous year was found to be highly correlated with the other explanatory variables causing a high degree of multicollinearity.[5] In order to reduce the problem of multicollinearity, it was decided to transform the $\bar{Y}_{t-1}$ data to first differences. The countries where this corrective measure is utilized are identified in Table L.

The results show that all of the coefficients on the two-period lagged output variable carry the expected sign but are statistically insignificant in two of the four countries. The insignificance of this variable indicates that it has little explanatory effect on growth. With only one exception, the coefficients on output in the previous year also carry the expected sign and are statistically significant at the one percent probability level. Hence, it can be concluded that in general output is significantly important in explaining growth of the LINODC's.

With respect to the net capital inflow, all of the coefficients have a positive sign indicating a direct relationship with GDP. This relationship, however, is only significant for Pakistan and Sudan. Given the assumption of a constant capital-labor ratio, the result for these countries implies that growth was partly attained by a rise in domestic savings made possible through a net capital inflow for the time period under study. The nonsignificant positive relationship of

TABLE L

ESTIMATED GROSS DOMESTIC PRODUCT EQUATIONS FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| Country | Intercept | Estimated Coefficients $\bar{Y}_{t-1}$ | $\bar{Y}_{t-2}$ | $\bar{F}_{t-1}$ | $\bar{E}_{t-1}$ | $\bar{\Pi}_{t-1}$ | $R^2$ % |
|---|---|---|---|---|---|---|---|
| Malawi[e] | 0.13688[b] | 0.8623[b] | 0.2409 | 0.8237 | 1.7590[c] | 2.1288[c] | 96 |
| | (2.9364) | (2.8028) | (0.7687) | (1.3489) | (2.0442) | (1.9749) | |
| Sri Lanka | 3.6833 | - | 0.5342[d] | 0.5338 | 1.5866[c] | 0.0435 | 96 |
| | (0.9882) | - | (1.5574) | (0.7409) | (2.1088) | (0.0469) | |
| Pakistan[e] | 15.7655[b] | 0.7712[b] | 0.6898[b] | 1.2737[b] | 1.0897[b] | 5.2355[b] | 99 |
| | (3.0647) | (3.5295) | (5.7291) | (3.4305) | (2.5936) | (2.8711) | |
| Sudan | 2.3401[b] | -0.7269[d] | 0.0344 | 1.4557[d] | 2.5012 | 12.8226[b] | 83 |
| | (5.4599) | (-1.6656) | (0.0936) | (1.5340) | (1.0896) | (4.8869) | |

[a] t-values are in parentheses.

[b] Significant at .01 level.

[c] Significant at .05 level.

[d] Significant at .10 level.

[e] First difference of $\bar{Y}_{t-1}$ was used.

capital inflow with GDP for the rest of the LINODC's indicates a less certain effect this resource had on growth. This could support the view that so long as net capital inflow is used to increase private or public consumption, its contribution to growth may be insignificant or even negative [91, 92, 93].

All of the coefficients on the export variable have the expected sign and are statistically significant at the five percent probability level except for Sudan. The positive relationship, together with the fact that these coefficients are highly significant, indicates that growth in these countries resulted overwhelmingly from the growth of exports as suggested by the engine of growth theory.[6] With regard to the terms of trade effect, all of the coefficients have a positive sign and are statistically significant at the five percent probability level except for Sri Lanka. This result indicates that the proceeds from the terms of trade effect have a significant impact on the growth of LINODC's.

The percent of the total variation in GDP explained by the variables for the LINODC's is exceptionally high. Except for Sudan, all of the equations have $R^2$ in excess of 96 percent.

Middle-Income Non-Oil Developing Countries

The analysis of growth in the MINODC's closely follows the analysis of growth for the LINODC's as explained above. Due to insignificance and high correlations with other explanatory variables, the output variables for some of the MINODC's were dropped. Examination of the coefficient values of these countries in Table LI indicates that the dynamic relationship between output in the previous year and GDP have

the expected sign. With some exceptions, all of the coefficients are significant at the one percent probability level. The coefficients on the output variable of two-period lag have also the expected sign. Although these coefficients have the expected sign, only two are significant at the one percent probability level. The estimated coefficient values of output in the previous year are close to unity. This implies that an increase in this variable is associated with an approximately equal increase in current GDP.

With regard to net capital inflow, 66 percent of the coefficients have a positive sign while the rest of the coefficients have a negative sign. This could indicate that foreign capital inflow in the majority of the MINODC's was used for investment rather than consumption purposes. As a result, a direct positive relationship exists between GDP and capital inflow. This result supports the hypothesis that foreign capital inflow has a positive effect on growth for most developing countries.

The results show that all of the coefficients of the export variable carry the expected positive sign. Furthermore, with only one exception, the coefficients are all significant at the 10 percent or lower probability level. This indicates that for the MINODC's lagged exports are important in explaining current growth. The relationship between the terms of trade effect and GDP for the MINODC's is also presented in Table LI. Fifty-six percent of the coefficients have a positive sign and 67 percent of the coefficients are statistically different from zero at the 10 percent or better probability level. The negative coefficients indicate that proceeds from the terms of trade are used for consumption rather than for investment purposes, hence causing growth to decline.

TABLE LI

ESTIMATED GROSS DOMESTIC PRODUCT EQUAITONS FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| Country | Intercept | Estimated Coefficients $\bar{Y}_{t-1}$ | $\bar{Y}_{t-2}$ | $\bar{F}_{t-1}$ | $\bar{E}_{t-1}$ | $\bar{\Pi}_{t-1}$ | $R^2$ % |
|---|---|---|---|---|---|---|---|
| Ghana[e] | 1.7028[b] | 0.7736[b] | 0.5914[b] | -1.0186[b] | 0.4342 | -1.3232[b] | 92 |
| | (3.5588) | (2.8537) | (4.3339) | (-3.1607) | (0.8068) | (-2.6927) | |
| Jamaica | 0.2419 | -- | 0.6739[b] | -0.2600 | 0.6014[d] | -0.9128 | 89 |
| | (0.8750) | -- | (5.4020) | (-0.4939) | (1.7676) | (-1.2209) | |
| Uruguay[e] | -2.7792[d] | 0.5888[b] | 0.6630 | -0.5118[d] | 0.8410[c] | -0.7934[d] | 93 |
| | (-1.7244) | (3.0506) | (3.6160 | (-1.3686) | (1.8318) | (-1.6523) | |
| Thailand | 8.6826[d] | 0.8425[b] | 0.0778 | 0.2342 | 0.6200[d] | -0.1780 | 99 |
| | (1.7923) | (2.6916) | (0.2560) | (1.5405) | (1.7835) | (-1.0816) | |
| Peru | -7.6195 | 1.6947 | 0.1639 | 2.9653[b] | 5.0607[b] | 5.1041[b] | 82 |
| | (-0.0682) | (1.2245) | (0.0912) | (3.5385) | (4.2260) | (3.5619) | |
| Dominican Rep. | 0.4292[b] | -- | -- | 2.8548[b] | 3.2417[b] | 1.9556[b] | 94 |
| | (2.2759) | -- | -- | (4.4184) | (11.8873) | (2.4155) | |
| Panama | 0.2627[b] | -- | -- | 0.1923 | 2.1607[b] | 0.6821 | 96 |
| | (3.5293) | -- | -- | (0.1961) | (11.0309) | (0.5710) | |
| Portugal | 145.6231[b] | -- | -- | 1.6598[b] | 1.9146[b] | 2.4909[b] | 85 |
| | (3.9636) | -- | -- | (2.5807) | (3.6681) | (4.2718) | |
| Spain | 1,820.0050[b] | -- | -- | 2.9844[b] | 4.6618[b] | 3.1474[b] | 95 |
| | (8.4544) | -- | -- | (4.5200) | (14.9432) | (3.5860) | |

[a] t-values are in parentheses.

[b] Significant at .01 level.

[c] Significant at .05 level.

[d] Significant at .10 level.

[e] First difference of $\bar{Y}_{t-1}$ was used.

The percent of total variation in GDP accounted by the variables in the model ranges between 82 percent and 99 percent. With the exception of the equations for Peru, Portugal, and Jamaica, all of the other equations have $R^2$ in excess of 92 percent.

Among the MINODC's, the only country showing a trade constraint in its economic growth was Guatemala. Equation (7.10) was estimated and the results of the estimated coefficients with t-values in parentheses are presented below.

$$\bar{Y}_t = \underset{}{1.1166} + \underset{(3.2329)}{5.7068}\ \bar{Y}_{t-1} + \underset{(2.5780)}{6.5129}\ \bar{Y}_{t-2} + \underset{(3.6217)}{0.8689}\ \bar{M}_{t-1} \quad \underset{(0.4357)}{}$$

$$R^2 = 75$$

Equation (7.10) is a simplified version of equation (6.13) in Chapter VI. In that equation, the coefficients of net capital inflow, exports, and the terms of trade effect were found to be the same. These variables have been combined in the above estimated equation and are represented by the lagged import variable. The coefficients of the three explanatory variables show a positive relationship with growth. However, only the output variables are statistically significant at the one percent probability level. The coefficient of the lagged import variable has a value close to one. This implies that an increase in imports is associated with an approximately equal increase in current GDP. The percent of total variation in GDP during the period under consideration is explained by the included variables in the equation. This is indicated by the $R^2$ (75 percent).

## Estimated Short and Long-Run Elasticities

The computed short and long-run GDP elasticities for the LINODC's and MINODC's are given in Tables LII and LIII, respectively. Such

TABLE LII

SHORT AND LONG RUN ELASTICITIES OF GROSS DOMESTIC PRODUCT FOR THE LOW-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| Country | Elasticities of GDP W.R.T.[b] Net Capital Inflow | Exports | Terms of Trade Effect | |
|---|---|---|---|---|
| Malawi | 0.1075 | 0.3880 | -0.0066 | S |
| | 0.7807 | 2.8177 | -0.0479 | L |
| Sir Lanka | -0.0459 | 0.4010 | 0.0049 | S |
| | -- | -- | -- | L |
| Pakistan | 0.0500 | 0.0887 | 0.0402 | S |
| | 0.2185 | 0.3877 | 0.1757 | L |
| Sudan | 0.1075 | 0.0012 | 0.5062 | S |
| | 0.0623 | 0.0007 | 0.2931 | L |

[a]S stands for short-run and L for long-run.

[b]With respect to.

TABLE LIII

SHORT AND LONG RUN ELASTICITIES OF GROSS DOMESTIC PRODUCT FOR THE MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES[a]

| Country | Elasticities of GDP W.R.T.[b] Net Capital Inflow | Exports | Terms of Trade Effect | |
|---|---|---|---|---|
| Ghana | -0.0364 | 0.0873 | 0.0199 | S |
| | -0.1608 | 0.3856 | 0.0879 | L |
| Jamaica | -0.0326 | 0.2168 | 0.0675 | S |
| | -- | -- | -- | L |
| Uruguay | 0.0219 | 0.1226 | -0.0001 | S |
| | 0.0533 | 0.2982 | -0.0002 | L |
| Thailand | 0.0016 | 0.1148 | -0.0008 | S |
| | 0.0114 | 0.7289 | -0.0051 | L |
| Peru | -0.0198 | 0.8926 | 0.1007 | S |
| | 0.0285 | -1.2849 | -0.1450 | L |
| Dominican Rep. | 0.5037 | 0.6310 | -0.2777 | S |
| | -- | -- | -- | L |
| Panama | -0.0056 | 0.8060 | 0.0482 | S |
| | -- | -- | -- | L |
| Portugal | 0.1631 | 0.4091 | -0.0479 | S |
| | -- | -- | -- | L |
| Spain | 0.0530 | 0.5473 | 0.0260 | S |
| | -- | -- | -- | L |

[a] S stands for short-run and L for long-run.

[b] With respect to.

measurements allow an evaluation of the impact of the explanatory factors, including the terms of trade effect on the growth of the NODC's under study.

The values of the short-run elasticities of GDP at the mean were calculated using the following formula:

$$B_i \cdot \frac{\bar{X}_i}{\bar{Y}}$$

where $B_i$ is the estimated coefficient of the variable $X_i$, $\bar{X}_i$ is the mean value of the $i^{th}$ variable, and $\bar{Y}$ is the mean value of the dependent variable which is GDP in this case.

The long-run elasticities of GDP at the mean values of the variables for each country was derived by dividing the short-run elasticities by one minus the coefficient on the one year lagged dependent variable. That is,

$$\frac{B_i \ (\bar{X}_i/\bar{Y})}{1 - \text{coef. on } \bar{Y}_{t-1}}$$

The results in Tables LII and LIII show that the short-run elasticities of GDP with respect to net capital inflow for all LINODC's and LINODC's are less than one. This means that a one percent change in net capital inflow will result in less than a one percent change in GDP ceteris paribus. Negative signs for the estimated GDP elasticities are consistent with the expectation that as long as capital inflow is used to increase consumption, its effect on growth will be negative.

The short-run elasticities of GDP with respect to exports for both the LINODC's and MINODC's is also less than one. However, the magnitude of exports on GDP is greater than the other two variables, except for Sudan. The results indicate that a one percent change in exports would result in a larger change in GDP than a one percent change in either net

capital inflow or the terms of trade effect. This, together with the fact that these coefficients are highly significant, indicates that growth in these countries depends heavily on exports. It is thus clear why the economies of NODC's are sensitive to what happens to the price of their exports.

With regard to the terms of trade effect on GDP, the results show that a one percent change in terms of trade is associated with less than a one percent change in GDP for the sample of NODC's. With a few exceptions, the terms of trade effect on growth in the NODC's is relatively small. Negative signs of the elasticities indicate that their terms of trade have contributed to a decline in growth of the countries under study.

While all the long-run elasticities of GDP are consistently larger than the short-run elasticities, most are less than one. This result suggests that even when sufficient time for adjustment is allowed, growth in the NODC's remains inelastic.

The previous section emphasized the effect of a one percent change in the terms of trade on GDP for the sample of NODC's. However, it is necessary to estimate the total impact of changes in the terms of trade on growth of these countries for the decades of the 1960's and the 1970's since the particular interest of this study is to examine the effect of higher oil prices on the terms of trade and economic growth.

To achieve this objective the ratio of the world crude petroleum price index to the total world commodity price index was first constructed. The percentage change in real crude petroleum prices was then calculated for the 1960's (-10 percent) and the 1970's (331 percent). An application of this percentage change to representative

elasticities of the terms of trade with respect to the world crude petroleum price index (see Chapter V) for the LINODC's and MINODC's resulted in the expected percentage change in the terms of trade. The expected percentage change in the terms of trade for LINODC's is found to be 1.4 percent and -46.3 percent for the 1960's and the 1970's, respectively, while it was 1.6 percent and -53.0 percent for the MINODC's.

The total impact of changes in the terms of trade on the overall growth is given by the product of the estimated short-run GDP elasticities for a typical LINODC (.14 percent) and MINODC (.10 percent) and the expected percentage change in the terms of trade. Our estimate shows that changes in the terms of trade in the 1960's have increased growth in both the LINODC's and MINODC's by 0.20 percent and 0.16 percent, respectively. In contrast to the 1960's, changes in the terms of trade in the 1970's have reduced growth in these countries. The estimated decline in growth solely as a result of changes in the terms of trade due to higher oil prices is found to be -6.5 percent in the LINODC's and -5.3 percent in the MINODC's.

Although great structural changes have taken place over time in most of the NODC's which have diminished the relative importance of the terms of trade, it is clear that economic growth in these countries is sensitive to what happens to their terms of trade. This is especially important in light of the recent trends in the terms of trade due to higher oil prices. Economic growth has a number of implications in the development process of NODC's. A high growth rate, for example, provides the resources to tackle poverty, to expand education and to have better health programs. This enables more people to raise their incomes, live longer lives, and fulfill their potential.

## Summary

The main objective of this chapter was to estimate the impact of changes in the terms of trade on the overall growth of NODC's. To achieve this objective an income determination model was developed. In formulating this model, a capacity determination equation was first constructed. In constructing the capacity equation, a number of assumptions were made. First, it was assumed that capital stock (K) is in place at the beginning of the period, and current capital stock ($K_t$) is not affected by investment in the current period. Given this assumption, $K_t$ was identified to be a function of capital stock at the beginning of the period and investment in the previous year. Second, it was assumed that the capital-labor ratio was constant for the study period. This assumption was necessary since time series data for labor for most of the sample of NODC's was not available. A production function was then written for output ($\bar{Y}_t$) as a function of $K_t$, where $\bar{Y}_t$ represented the exogenously determined GDP at time t. The capacity determination equation was combined with the investment equation of Chapter VII, to yield a dynamic income determination equation.

Based on the above model, empirical results were obtained for the sample of NODC's. The results show that all of the signs on the variables are what was expected, with most being significant at the .01 percent probability level. In addition, all of the relationships appear to fit well over the study period for the sample countries.

To measure the impact of the terms of trade on growth of these countries, short and long-run elasticities of GDP were computed. The short-run elasticity estimates were all less than one. This implies that a one percent change in the terms of trade resulted in a less than

one percent change in GDP for the sample of NODC's during the study period. While all the long-run GDP elasticities were consistently higher than the short-run elasticities, most were also less than one.

The total impact of changes in the terms of trade on the overall growth of the sample of NODC's was calculated for the 1960's and 1970's. The computation was done by applying the estimated short-run GDP elasticities, for typical LINODC's and MINODC's, to the expected percentage change in the terms of trade. The estimate shows that changes in the terms of trade in the 1960's resulted in a slight improvement in growth of both groups of countries. The result for the 1970's indicated that changes in the terms of trade caused growth in these countries to decline substantially.

## FOOTNOTES

[1]See footnote 8 in Chapter I for the names and rates of growth of these countries.

[2]The average annual compound rates of growth of per capita GDP for one country in the LINODC's (Niger) and three in the MINODC's were above three percent and were excluded in deriving these ranges.

[3]If $X_2 > X_1$ a monotonic transformation of it is given by $f(X_2) > f(X_1)$, i.e., the ordering is preserved. For a further definition and examples of a monotonic transformation of a function, see Silberberg [86].

[4]For an explanation of the use of OLS in a dynamic model, see Labys [87].

[5]A high degree of multicollinearity arises whenever one explanatory variable is highly correlated with another explanatory variable or with a linear combination of other explanatory variables.

[6]For a thorough explanation of this theory, see Nurkse [5].

# CHAPTER VIII

## SUMMARY AND CONCLUSIONS

The purpose of this chapter is to summarize the particular findings of the previous chapters and to suggest general conclusions regarding the terms of trade movements and its subsequent effect on growth in the non-oil developing countries (NODC's) due to higher oil prices in the 1970's. The procedure is to: (1) restate the reasons for the study and the objectives; (2) briefly describe the procedures used in achieving the objectives; (3) report the principle findings; (4) identify the limitations of the study; and (5) inquire whether the general relations uncovered between high oil prices, the terms of trade and economic growth can be of service in directing future research and in formulating development policies.

### Reasons for Study and Objectives

Studies on the role of international trade as an important source of economic growth and development in the developing countries (DC's) date back to the late 1940's, when problems associated with economic development of these countries received a good deal of attention in a substantial number of publications. The process of economic development through trade, however, was jeopardized in a number of DC's, particularly in the non-oil developing countries (NODC's), due to a series of global economic shocks during the decade of the 1970's. In

these countries the average annual per capita growth dropped to 2.7 percent from 3.1 percent in the 1960's and for the lowest income countries per capita growth dropped from 1.6 to 0.9 percent.

Among the factors responsible for this poor performance were a slow-down in the growth of developed countries coupled with high rates of inflation, and a dramatic rise in the price of crude oil. The impact of higher oil prices in the NODC's was evident in a variety of ways. Since the process of economic development is characterized by increased use of energy to accomodate expanding industries, mechanization of agriculture, and increased consumer demand such as for transportation and lighting, the oil price increases will have a significant impact upon growth and consumer welfare in these countries. Imports of oil constitute from about one-fifth to one-third of the total import bill of the NODC's and as high as one-half in some countries. The total import bill of oil for these countries rose to $57.8 billion in 1980 from $22.1 billion in 1975 and $10 billion in 1974.

The consequence of rising international oil prices was to require these countries to devote a larger proportion of their foreign exchange earnings to paying for oil. This resulted in limiting their ability to import and, hence, restrained their economic growth. In addition, the high rate of inflation in the industrialized countries led to a continuous increase in world prices of manufactured goods (the imports of most DC's), while prices of primary commodities declined (the exports of most DC's). Added to these adverse features was the oil-induced slow growth in the developed countries which limited the exports of DC's, hence, their foreign exchange earnings.

The net effect of the increase in the price of oil together with a widespread inflation and recession in the developed countries was a substantial change in the terms of trade for NODC's. A deterioration in the terms of trade was a serious constraint to economic growth of NODC's. Thus, it is very important to identify the extent of the deterioration in the terms of trade due to higher prices of oil and its subsequent effect on economic growth so as to provide increased knowledge for public policy decisions. The main objective of this study was to analyze the effects of higher oil prices on the terms of trade and subsequent growth of randomly selected low-income non-oil developing countries (LINODC's) and middle-income non-oil developing countries (MINODC's) for the years of 1960 to 1979. The specific objectives were to:

1. Determine the changes in both the export and import price indexes and their effect on the net barter terms of trade (NBTT) of the sample of NODC's.
2. Determine the change in the purchasing power of exports and its effect on the NODC's ability to import.
3. Analyze the contribution of higher oil prices to the movements in terms of trade of the sample of NODC's.
4. Determine the contribution of the terms of trade to the constraints on economic growth of NODC's.
5. Analyze the overall implications of higher oil prices on the economic growth and development of the sample of NODC's.

## Procedures

The net barter terms of trade (NBTT) is defined as the export price index divided by the import price index. A favorable movement

in the terms of trade is associated with a rise in NBTT, while a deterioration in the terms of trade is associated with a decline in the NBTT. The NBTT allows for changes in the price of exports but does not allow for changes in the volume of exports (VOE). A deterioration in NBTT due to a decline in the price of exports can be offset (worsened) by an increase (decrease) in the VOE. To correct for this problem and to determine the ability of the NODC's to import, the purchasing power of exports (PPOE) was calculated. The PPOE was obtained by multiplying the NBTT by the quantity or VOE index. An increase in the PPOE indicates an increase in a country's ability to import based on exports.

Export and import price index equations were estimated to determine the contribution of higher oil prices to the movement in the NBTT. Since export and import price indexes are a reflection of weighted world prices (assuming the countries are price takers), the weights for a particular country were determined by the quantities of exports and imports for that country. The factors that were hypothesized to contribute to a quantitative explanation of the export price index were the world price indexes of agricultural products (WAGPI), minerals (WMIPI) and non-ferrous metals (WNFMPI). On the import side, the quantitative explanation was hypothesized to come from world price indexes of cereals (WCERSPI), crude petroleum (WCRPETPI), and manufactured goods (WMANGOPI). An analysis of the composition of exports and imports for individual countries determined the specific explanatory functions. Based on the estimated results the corresponding elasticities were calculated to evaluate the most important price changes in determining the trend in the terms of trade for each country for the years under study.

A deterioration in the terms of trade contributes to limiting economic growth. Economic growth in NODC's has been hypothesized to be limited by at least two factors: the availability of domestic savings needed for investment, and the scarcity of foreign exchange for importing capital goods required for the current level of production and investment. To determine the dominant constraint and the contribution of the terms of trade to this constraint in each country under study, a standard macroeconomic "two-gap" model similar to the one tested by Weisskopf [82] was used. From the model three separate reduced equations were obtained for estimation purposes. Designating them as the savings constraint, trade constraint, and savings and trade constraint and utilizing apriori restrictions on the possible values of the original structural parameters, corresponding ranges or restrictions on the parameters of the reduced equations were assigned. Using a linear regression procedure, the three separate equations were estimated. The results were checked for consistency with the corresponding constraints and each country was then classified into one of the three constraints.

To analyze the implication of the terms of trade on the overall economic growth of these countries, an income determination equation was estimated. In formulating this model a capacity determination equation was first constructed with the assumption that capacity is determined by investment in previous years. This equation was then combined with the investment equation, depending on whether a country's economy was constrained by savings, trade or savings and trade, to yield a dynamic income determination equation. Assuming linear relationships and using time series data on the relevant variables the equations were estimated using ordinary least squares procedure.

# Findings and Conclusions

## Findings

The empirical results of NBTT for the 1960's show a general fluctuation for the low-income non-oil developing countries (LINODC's), while it either declined or fluctuated for about half of the middle-income non-oil developing countries (MINODC's). For the other half of the MINODC's the NBTT showed an improvement for this time period. Differential movements in the NBTT among this group of countries reflects the different commodity composition of their exports and imports and the differential price movements of these commodities in the 1960's.

For this period 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. The downward trend in the export price indexes were due to low price levels for many important food and agricultural raw materials resulting from a contraction in world demand for these commodities. The steady increase in the import price indexes can be attributed to an increase in the manufactured good prices. For most of the LINODC's, however, export price indexes were slightly higher than the import price indexes throughout the 1960's. With respect to the MINODC's, both their export and import price indexes rose proportionately for the 1960's. As in the LINODC's, their export price indexes were slightly higher than their import price indexes, resulting for some countries an improved NBTT.

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. However, the NBTT in the LINODC's showed an upward trend in the early part of the 1970's due to an increase in the prices of some primary commodities (sugar, coffee, and cocoa). Greater deterioration in NBTT for both groups of the countries occurred from 1974 to 1979. The NBTT indexes were lowest in 1974-76 and again in 1978-79.

The cause for the deterioration in these years was the increase in import prices that resulted from a quadruple increase in oil prices. As during the 1960's, both the export and import price indexes in the MINODC's were rising in the 1970's. The index of import prices, however, rose more sharply in these countries producing a deterioration in their NBTT. In the LINODC's both the export and import price indexes were also rising, but at a faster rate. With few exceptions, however, the latter rose more sharply, while the former rose at a slower rate after 1974. This caused the NBTT of these countries to decline more in the second half of the 1970's than in the first half.

The findings of the PPOE indexes for the 1960's show, with few exceptions, an increase for both the LINODC's and MINODC's. In spite of these increases, the PPOE of the majority of both groups of countries remained below the base year, 1975 = 100. The increase in the PPOE for this time period in general reflects the upward movement of the VOE since the change in NBTT for the same time period was slight.

The PPOE in the 1970's was substantially different than that of the 1960's. This index either declined or fluctuated in the LINODC's, while it fluctuated erratically for most of the MINODC's. The years 1973-74 and 1978-79 were periods of the most significant deterioration for the LINODC's. Most of the variation in the MINODC's occurred between

1974 and 1979. The PPOE of this group of countries for 1977, for example, showed an improvement over 1976, but dropped significantly in 1978 and 1979.

The result in the 1970's was attributable to the occurrence of a general decline in the VOE and relatively stagnant export earnings in conjunction with rapidly increasing import prices. The most notable import price increase for the decade in these countries was that of oil. Between 1972 and 1980 oil prices (measured in current prices) increased by 900 percent, from $3 per barrel in 1972 to about $30 per barrel in 1980. For the LINODC's and MINODC's as a whole, this meant a cost of $57.8 billion for imported oil in 1980. Based on the results above it can be concluded that in the 1970's both the NBTT and the PPOE of the NODC's declined due to a rapid increase in their import prices. These results do not indicate which factors in the world market were most responsible.

The results of the static export and import price index equations used to identify empirically the major factors that have contributed to the movement in the terms of trade, showed that different world commodity prices were responsible for the movement in the NBTT of the NODC's for the 1960's and 1970's. The evaluation of the empirical results was based on how well the equations satisfy our expectations and the statistical fit. For both groups of countries all of the relationships in the export and import equations fit well over the historical period. Signs of the coefficients were what was expected and most of the variables were significant in the regressions, with the only exceptions of the variable WCERSPI which was generally not significantly different from zero.

The corresponding elasticities of the NBTT calculated from the estimated export and import price index equations 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 percentage changes of the world commodity prices revealed different results, particularly for the 1970's.

The results of the estimated net changes in NBTT associated with WMANGOPI in the 1960's generally supported the basic results of the elasticity that this variable contributed the largest share in the changes of the terms of trade of the countries under study. For the 1970's the estimated net changes in NBTT for all LINODC's and MINODC's showed to be mostly influenced by the variable WCRPETPI. This finding combined with the earlier finding, i.e., the deterioration in NBTT in the 1970's, supported the basic hypothesis that higher oil prices in the 1970's contributed significantly to the deterioration in the terms of trade of NODC's.

The empirical results of the investment equations used to identify the constraints to growth indicate that, for the time period of 1960 to 1979, the savings constraint was binding for the sample of NODC's. The empirical result for the time period 1960-69 and 1970-79, which was examined to identify the dominant constraint during the two development decades, also showed the savings constraint to be binding. Similarly, the result for the period 1973-79 showed the majority of these countries to conform to the same constraint.

The estimated investment elasticities with respect to the terms of trade show that the contribution of the terms of trade to be less than

one. That is, a one percent change in the terms of trade caused less than a one percent change in investment during the study period. Since the results of the test designed to identify the binding constraint among alternative constraints suggest that savings was more often binding, the ex ante savings function of the model was estimated for the sample NODC's. The estimated results show a uniformly negative response of savings to the terms of trade. This suggests that the proceeds from the terms of trade were used to finance consumption expenditure and as a result savings decreases. A decline in savings will cause investment to decrease which will in turn cause growth to decline.

The total impact of changes in the terms of trade on the overall growth was estimated using an income determination equation. The estimate shows that changes in the terms of trade in the 1960's have increased growth by 0.20 percent and 0.16 percent in both the LINODC's and MINODC's, respectively. In contrast, however, changes in the terms of trade showed to decrease growth in these countries in the 1970's. The estimated decline in growth solely as a result of changes in the terms of trade, due to higher oil prices, is found to be -6.5 percent in the LINODC's and -5.3 percent in the MINODC's. This result supports our central hypothesis that the rapid escalations of oil prices in the 1970's have had major adverse impacts on the terms of trade of NODC's and their subsequent economic growth and development.

## Conclusions

Although there was no uniformity of experience within each group of the sample of NODC's, the results presented in this study suggest that these countries have, as a whole, experienced a deterioration in their

terms of trade for the decade of the 1970's. The major factor contributing to the deterioration of the terms of trade was found to be the large price increases in oil. 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. It thus seems essential that these countires, 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.

Most of the NODC's make extensive use of noncommercial or nonconventional energy sources such as firewood, charcoal, and animal residue. It is estimated that these forms of energy supply represent about half of all energy production for DC's [14]. However, the supply of energy from these sources is declining. Furthermore, as countries develop, these nonconventional sources will not provide sufficient energy to power greater development. Many of these nonconventional sources, therefore, must be replaced by commercial energy.

Assuming the same rate of growth in population (2.5 percent per year) and per capita energy consumption (5 percent annually), it is estimated that total energy demand for each country in the NODC's in the 1990's to be about 3.24 times its value for 1974 (Appendix D). The NODC's without adequate energy resources of their own will be competing in the future with developed countries for dwindling supplies of oil. In many cases, they will be at a disadvantage in this competition because of their inability to increase the export of agriculture and other raw materials in sufficient quantities to pay for the high cost of imported oil.

Therefore, the possibilities of developing alternative energy sources, especially renewable sources need to be evaluated for individual countries to reduce dependency on oil imports. Energy sources such as hydroelectric power, wind, solar, coal, geothermal, and alcohol are examples. Developing alternative sources of energy is expensive and the technology is often limited in these countries. However, an effort by developed countries and international organizations should consider providing these countries with the technical and financial assistance necessary to develop alternative sources of energy.

The findings of this study also indicate that a decline in the price and volume of primary commodities, together with increased price of manufactured goods, were partly responsible for the deterioration in the terms of trade. Therefore, policies such as: (1) international price stabilization schemes; (2) increases in the bargaining power of primary producers through legislation; (3) import substitutions; (4) diversification of exports; and (5) tariff protection (assuming no retaliation by other countries) should be considered in limiting the adverse effects of reduced terms of trade and, hence, growth of the NODC's.

With respect to the constraints on growth, it is concluded that during the period 1960 to 1979 the NODC's under study experienced a binding domestic savings constraint in their economic growth. Thus there is a need to mobilize domestic savings at all levels (private and public) in these countries. Possible ways for this to occur include: (1) increased voluntary savings; (2) increased involuntary savings; (3) increased capital inflow from abroad; (4) a more efficient utilization of underemployed manpower; (5) more incentives to save through higher interest rates; (6) increased number of financial intermediaries for stimulating

more saving and to be transformed into capital formation; and (7) increased awareness of the public through education on the importance of savings to economic growth.

Voluntary savings can be increased by self imposed reduction in consumption. This will not be easy in the NODC's where there is a high degree of inequality in income distribution with most of the population at low income levels. Voluntary savings might be supplemented through compulsory savings by means of taxation aiming specially at "conspicuous consumption". However, most involuntary savings programs through taxation are handicapped by nonmodernized taxation systems, thus the tax potential is far greater than the actual tax collected.

Another possibility to increase domestic savings is through an inflow of capital (public or private), as long as it is used for investment rather than for consumption purposes. Policies to efficiently utilize under-employed manpower will lead to higher incomes and thus help to increase domestic savings. Given the present stage of economic development of the NODC's, agriculture still has to play the role of providing an important source of employment because the industrial sector has not expanded enough to absorb the unemployed manpower. Therefore, policies in the NODC's should be directed toward expanding the agricultural sector to provide efficient use of under-employed manpower as well as to increase agricultural productivity.

## Limitations of the Study and Suggestions for Future Research

A major shortcoming of the study could be traced to the terms of trade measurements. For example, the terms of trade does not allow for

changes in quality of imports and exports and thus may introduce a bias. Furthermore, the terms of trade measure does not account for unilateral transactions and trade in invisibles but reflects almost exclusively trade in commodities. In addition, the weighting procedures used in the terms of trade may also introduce bias. No single set of weights is entirely valid, therefore, the results may be sensitive to the arbitrary choice of base period. Thus, future research efforts should be devoted to developing measurements of the terms of trade that are free from these limitations. Future research should also be directed beyond questions of measurement errors. Factors such as the difference in the world's income elasticity of demand for manufacturing as compared to agricultural products and the market organization for the manufacturing and agricultural sectors are examples to be incorporated in studying the terms of trade.

With respect to the "two-gap" model, this study used test restrictions on individual parameters separately rather than simultaneously, in classifying countries in one of the three cases. This procedure might have caused some wrong results. Therefore, future research should look into classifying of countries on the basis of the degree to which the estimated parameters simultaneously satisfy the restrictions for a given specification. A further shortcoming in the "two-gap" model may arise from the fact that the equality restriction in Case II, i.e. $\partial I/\partial F = \partial I/\partial E = \partial I/\bar{\pi}$; and Case III,i.e., $\partial I/\partial \bar{Y} = 0$, are not utilized in the classification procedure. Future work on analysis of a binding constraint on growth should attempt to utilize these equality restrictions in the classification procedure.

A hypothesis that the oil price shocks of the 1970's have played a dominant role in bringing about a reduction in export growth of NODC's through a slowing down of economic growth in the developed countries was proposed, but the hypothesis was not tested empirically. Therefore, future research which tests this hypothesis empirically is suggested. The results of such a study could show the exact nature of the decline in exports due to the oil induced slow growth in developed countries.

This study relied exclusively on secondary data. Future research based on primary data could reveal the exact nature of the effect of terms of trade on economic growth in NODC's. Therefore, greater efforts should be made in future research to analyze in depth the nature of changes in terms of trade on growth of specific countries.

Finally, while this study has outlined a number of policy recommendations that should be pursued if an improvement in the terms of trade is to be made and the objective of economic growth is to be achieved, it is readily apparent that additional policy problems remain to be faced.

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# APPENDICES

# APPENDIX A

## CURRENT ACCOUNT DEFICITS

TABLE LIV

CURRENT ACCOUNT DEFICITS OF OIL-IMPORTING DEVELOPING COUNTRIES, 1970-90 AND PROJECTED 1985-1990

| Country Group | CURRENT ACCOUNT DEFICIT[a] 1970 | 1973 | 1975 | 1978 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|---|---|
| | | | BILLIONS OF DOLLARS, CURRENT PRICES | | | | |
| Low-Income | 1.2 | 2.3 | 5.4 | 5.7 | 10.0 | 18.6 | 32.0 |
| Middle-Income | 7.1 | 4.4 | 34.2 | 21.4 | 51.0 | 72.2 | 72.2 |
| TOTAL | 8.3 | 6.7 | 39.6 | 27.1 | 61.0 | 78.4 | 104.2 |
| | | | BILLIONS OF DOLLARS, 1977 PRICES | | | | |
| Low-Income | 2.2 | 3.2 | 6.1 | 5.0 | 7.1 | 9.2 | 11.8 |
| Middle-Income | 31.2 | 6.0 | 38.3 | 18.5 | 36.1 | 29.5 | 26.7 |
| TOTAL | 15.4 | 9.2 | 44.4 | 23.5 | 43.2 | 38.7 | 38.5 |
| | | | AS PERCENTAGE OF GNP | | | | |
| Low-Income | 1.6 | 2.2 | 3.8 | 2.7 | 3.6 | 3.8 | 3.9 |
| Middle-Income | 2.5 | 0.9 | 5.3 | 2.2 | 4.0 | 2.6 | 1.8 |
| TOTAL | 2.3 | 1.1 | 5.1 | 2.3 | 3.9 | 2.8 | 2.1 |

[a]Excludes official transfers.

Source: World Development Report, The World Bank, 1980.

# APPENDIX B

# BALANCE OF PAYMENTS FOR GOODS AND SERVICES

TABLE LV

BALANCE OF PAYMENTS FOR GOODS AND SERVICES FOR SELECTED LOW-INCOME NODC'S, 1971-1980[a]

| Country | (Millions of U.S. Dollars) 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|---|
| Malawi | - 41.3 | - 57.8 | - 39.1 | - 43.4 | - 88.4 | - 69.4 | - 62.8 | -170.1 | -237.3 |
| Sri Lanka | - 50.7 | - 44.9 | - 38.3 | -177.8 | -188.8 | - 70.8 | + 67.2 | -144.6 | -420.6 |
| Benin | - 23.4 | - 45.0 | - 37.2 | - 72.0 | -120.5 | -100.4 | -126.2 | -- | -- |
| Burma | - 61.4 | - 64.0 | - 77.1 | - 21.7 | - 96.2 | - 50.1 | -112.0 | -181.8 | -- |
| Central African Republic | - 17.9 | - 22.5 | - 24.4 | - 46.3 | - 73.1 | - 32.9 | - 47.2 | - 62.8 | - 85.7 |
| Mozambique | N.A. | -- | -- | -- | -- | -- | -- | -- | -- |
| Mauritania | -- | -- | - 16.6 | - 9.4 | -121.5 | -209.6 | -220.2 | -206.7 | -- |
| Pakistan | -- | -414.0 | -258.0 | -1158.0 | -1454.0 | -1326.0 | -1725.0 | -2241.0 | -2936.0 |
| Senegal | - 73.9 | - 53.8 | -158.5 | -129.3 | -169.5 | -199.2 | -174.3 | -- | -- |
| Chad | - 26.8 | - 28.7 | - 52.0 | - 53.9 | -125.5 | - 86.5 | -117.1 | -- | -- |
| Niger | - 7.8 | - 24.3 | -43.7 | -116.5 | - 72.5 | -112.2 | -- | -- | -- |
| Sudan | - 39.8 | - 58.9 | + 23.6 | -294.0 | -471.9 | -185.4 | - 93.9 | -108.7 | -248.9 |
| Upper Volta | - 55.8 | - 67.4 | - 96.5 | -123.2 | -184.7 | -154.1 | -224.0 | -- | -- |
| Uganda | - 80.9 | + 22.3 | - 44.4 | - 22.9 | - 68.7 | + 41.1 | + 70.8 | -127.8 | + 14.4 |
| Bangladesh | -- | -- | -509.6 | -742.2 | -981.9 | -486.4 | -720.5 | -979.4 | -- |

[a]Excludes Transfers

N.A. - Data not Available

Source: IFS, 1980 Yearbook, IMF.

TABLE LVI

BALANCE OF PAYMENTS FOR GOODS AND SERVICES FOR SELECTED MIDDLE-INCOME NODC'S, 1971-1980[a]

| Country | (Millions of U.S. Dollars) 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|---|
| Ghana | -146.1 | + 95.0 | +114.2 | -195.6 | - 26.9 | -100.7 | -138.0 | -104.2 | -183.3 |
| Ivory Coast | - 78.6 | - 68.4 | -147.2 | - 28.4 | -242.6 | - 9.9 | +159.2 | -369.3 | -- |
| Uruguay | - 71.8 | + 47.4 | + 18.2 | -135.1 | -196.4 | - 81.4 | -166.7 | -133.8 | -- |
| Lebanon | N.A. | -- | -- | -- | -- | -- | -- | -- | -- |
| South Africa | -1535.0 | -184.0 | -107.0 | -1579.0 | -2633.0 | -1982.0 | +491.0 | +1414.0 | +3480.0 |
| Thailand | -219.0 | -111.0 | -190.0 | -328.0 | -685.0 | -460.0 | -1143.0 | -1196.0 | -2139.0 |
| Peru | - 74.0 | - 71.0 | -304.0 | -773.0 | -1591.0 | -1252.0 | -976.0 | -249.0 | +496.0 |
| Dominican Republic | -146.9 | - 77.5 | -126. 9 | -275.6 | -111.7 | -288.6 | -312.5 | -429.4 | -483.2 |
| Guatemala | - 74.5 | - 41.5 | - 34.7 | -158.5 | -143.5 | -282.3 | -159.0 | -381.0 | -334.1 |
| Panama | - 77.8 | -103.1 | -106.9 | -220.8 | -163.8 | -172.2 | -155.0 | -208.6 | -332.2 |
| Israel | -1161.0 | -1046.0 | -2530.0 | -3243.0 | -4046.0 | -3192.0 | -2566.0 | -3349.0 | -3755.0 |
| Portugal | -- | -527.0 | -756.0 | -1940.0 | -1822.0 | -2244.0 | -2091.0 | -2096.0 | -2323.0 |
| Zambia | - 97.0 | - 74.0 | +268.0 | +143.0 | -593.0 | - 19.0 | -135.0 | -150.0 | -- |
| Spain | +115.0 | -254.0 | -766.0 | -4289.0 | -4662.0 | -5435.0 | -3602.0 | +123.0 | -- |
| Jamaica | -193.8 | -225.5 | -275.0 | - 86.8 | -310.5 | -308.6 | - 88.2 | -159.0 | -- |

[a]Excluded Transfers.

N.A. - Data not Available

Source: IFS, 1980 Yearbook, IMF

# APPENDIX C

# MATHEMATICAL DERIVATION OF THE CONSTRAINTS TO GROWTH

1. $Y + M = C + I + E$

2. $S = Y - C$

3. $F = M - E - \Pi$

4. $S^* = a + bY + cF + dE + \Pi$

5. $M^* = \alpha + \beta Y + \gamma I$

6. $E = \overline{E}$

7. $F = \overline{F}$

8. $\Pi = \overline{\Pi}$

9. $S \leq S^*$

10. $M \geq M^*$

11. $Y \leq \overline{Y}$

12. $I \geq 0$

13. $Y \geq 0$

taking $S \leq S^*$

from (2) we have $Y - C \leq a + bY + cF + dE + e\Pi$

by (1) $Y - (Y + M - I - E) \leq a + bY + cF + dE + e\Pi$

cancelling Y out we get:

$- M + I + E \leq a + bY + cF + dE + e\Pi$

by (3) we have: $(- F - E - \Pi) + I + E \leq a + bY + cF + dE + e\Pi$

rearranging terms we get:

(9') $I - bY \leq a + (1 + c)F + dE + (1 + e)\Pi$

taking $M \geq M^*$

by (3) $F + E + \Pi \geq \alpha + \beta Y + \gamma I$

rearranging terms we get:

$\gamma I + \beta Y \leq - \alpha + F + E + \Pi$

dividing by $\gamma$ we get:

$$(10') \qquad I + \beta/\gamma\ Y \leq -\alpha/\gamma + 1/\gamma\ F + 1/\gamma\ E + 1/\gamma\ \Pi$$

and we have

$$(11) \qquad Y \leq \overline{Y}$$

Solving for I by substituting Y out we get the following three cases.

Case I (when (9') and (11) are binding)

$$I = a + b\overline{Y} + (1 + c)\overline{F} + d\overline{E} + (1 + e)\overline{\Pi}$$

Case II (When (10') and (11) are binding)

$$I = -\alpha/\gamma - \beta/\gamma\ \overline{Y} + 1/\gamma\ \overline{F} + 1/\gamma\ \overline{E} + 1/\gamma\ \overline{\Pi}$$

substituting the above into equation (3) we get

$$I = -\alpha/\gamma - \beta/\gamma\ \overline{Y} + 1/\gamma\ \overline{M}$$

Case III (When (9') and (10') are binding)

first we divide (9') by b we get:

$$1/b\ I - Y = a/b + \frac{1 + c}{b}\overline{F} + d/b\ \overline{E} + \frac{1 + e}{b}\Pi$$

second we multiply (10') by $\gamma/\beta$ (which amounts to dividing it by $\beta/\gamma$), and we get:

$$\gamma/\beta\ I + Y = -\alpha/\beta + 1/\beta\ F + 1/\beta\ \overline{E} + 1/\beta\ \Pi$$

adding the above two we get

$$(1/b + \gamma/\beta)I = (a/b - \gamma/\beta) + (\frac{1 + c}{b} + 1/\beta)F + (d/b + 1/\beta)\overline{E}$$

$$+ (\frac{1 + e}{b} + 1/\beta)\overline{\Pi}$$

taking a common denomenator and adding them we get:

$$(\frac{\beta + b\gamma}{b\beta})I = (\frac{aB - \alpha b}{b\beta}) + (\frac{(1 + c)\ \beta + b}{b\beta})\overline{F} + (\frac{dB + b}{b\beta})\overline{E}$$

$$+ (\frac{(1 + c)\ \beta + b}{b\beta})\overline{\Pi}$$

multiplying the above by the inverse of coefficient with I we get:

$$I = (\frac{a\beta - \alpha b}{\beta + b}) + (\frac{(1 + c)\ \beta + b}{\beta + b\gamma})\overline{F} + (\frac{d\beta + b}{\beta + b\gamma})\overline{E} + (\frac{(1 + c)\ P + B}{\beta + b\gamma})\overline{\Pi}$$

# APPENDIX D

## ESTIMATED TOTAL ENERGY DEMAND

TABLE LVII

ESTIMATED TOTAL ENERGY DEMAND FOR LOW-INCOME NON-OIL DEVELOPING COUNTRIES

| Country | Total Energy Consumption 1974 | Estimated Energy Demand 1990 |
|---|---|---|
| Malawi | 8.1 | 26.2 |
| Sri Lanka | 55.4 | 180.0 |
| Benin | 3.8 | 12.3 |
| Burma | 49.0 | 159.0 |
| Central Afr. Rep. | 2.9 | 9.4 |
| Mozambique | 37.0 | 120.0 |
| Mauritania | 4.4 | 14.3 |
| Pakistan | 372.0 | 1,205.0 |
| Senegal | 21.2 | 68.0 |
| Chad | 2.0 | 6.5 |
| Niger | 4.1 | 13.3 |
| Sudan | 62.9 | 203.0 |
| Upper Volta | 2.3 | 7.5 |
| Uganda | 16.5 | 53.5 |
| Bangladesh | 66.4 | 215.0 |

Source: Siddiqi, A.T. and F.G. Hein. "Energy Resources of the Developing Countries and Some Priority Markets for the Use of Solar Energy." The Journal of Energy and Development, 3(1977): 164-189.

TABLE LVIII

ESTIMATED TOTAL ENERGY DEMAND FOR MIDDLE-INCOME NON-OIL DEVELOPING COUNTRIES

| Country | Total Energy Consumption 1974 | Estimated Energy Demand 1990 |
|---|---|---|
| Ghana | 51.0 | 165.0 |
| Jamaica | 83.5 | 271.0 |
| Ivory Coast | 51.3 | 166.0 |
| Uruguay | 78.9 | 256.0 |
| Lebanon | 86.7 | 281.0 |
| South Africa | | |
| Thailand | 358.0 | 1,160.0 |
| Peru | 290.0 | 940.0 |
| Dominican Rep. | 57.4 | 186.0 |
| Guatemala | 41.5 | 134.5 |
| Panama | 39.7 | 129.0 |
| Israel | | |
| Portugal | | |
| Zambia | 76.9 | 249.0 |
| Spain | | |

Source: Siddiqi, A.T. and F.G. Hein. "Energy Resources of the Developing Countries and Some Priority Markets for the Use of Solar Energy." The Journal of Energy and Development, 3(1977): 164-189.

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