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GRADUATE COLLEGE

THE ROLE OF INTERNATIONAL TRADE AND INDUSTRIALIZATION IN ECONOMIC GROWTH IN DEVELOPING COUNTRIES: THE CASE OF MALAYSIA

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

By

S. ALI AHMADI

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THE ROLE OF INTERNATIONAL TRADE AND INDUSTRIALIZATION IN ECONOMIC GROWTH IN DEVELOPING COUNTRIES: THE CASE OF MALAYSIA

A Dissertation APPROVED FOR THE DEPARTMENT OF ECONOMICS

BY

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DEDICATION

I dedicate this dissertation to my wife, Dora, and my children, Hassan, Amir, and Susan. Without their love, patience, and sacrifice, this dissertation would not have been completed.

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ABSTRACT

The purpose of this study was to investigate the role of exports and industrialization in the economic development of Malaysia. To achieve its purpose, this study used and tested several models of exports and economic growth.

Data for the empirical estimation of the models came from secondary sources in the statistical publications of World Bank and International Monetary Fund (IMF), or directly from these two institutions. The data covered the period from 1966 to 1994.

Several simple regression models tested the hypothesis that the growth of exports or growth of exports and industrialization makes significant contribution to the growth of GPD in Malaysia. These models were estimated with ordinary least squares. Additionally, a simultaneous-equations model of trade, industrialization and economic development was constructed. The model was tested with Full-Information Maximum Likelihood. Growth of income was modeled as a function of the growth of labor (L), capital (I), exports and industrialization (R). The variables investment, industrialization and exports were endogenized and modeled as functions of other endogenous and exogenous variables as follows: growth of I as a function of growth of Y, X and Foreign Capital Inflow (F), growth of R as a function of the growth of Y, X and lag variable for R, and growth of exports as a function of price of exports, world income and growth of Foreign Capital Inflow (F) and investment. The model was estimated by Full Information Maximum Likelihood.

This study found that: a strong, positive and highly significant relationship between exports growth and income growth is observed with high explanatory powers for the models; export growth in Malaysia makes a contribution to income growth over and above the contribution of primary factors of production (labor and capital); introducing export as a variable in the production function will increase the power of the model; the elasticity of income with respect to export was significantly higher than those of other developing countries previously investigated by other researchers.

The simultaneous-equation model results indicated that: growth of income primarily depended on growth of exports and growth of capital; growth of investment primarily depended on growth of income but was negatively affected by growth of exports; industrialization primarily depended on the export growth; export growth inversely related to the unit price of exports and positively related to the world income and foreign capital inflow; the primary determinant of export growth was the growth of foreign capital inflow.

Chapter I

INTRODUCTION

Since the era of the classical economists, the relationship between international trade, industrialization and economic growth has been a major issue of discussion. Adam Smith (1776) identified the process of exchange that leads to specialization in production through division of labor as an early feature of industrial society. According to Smith, individuals, in pursuing their self interest, make provision for savings which leads to the accumulation of capital goods that in turn increases output production over time. Smith also put a great deal of emphasis on the role of trade in the development process. He asserted that the division of labor was limited only by the extent of trade and, therefore, nations should open their economies to the international markets and specialize in the goods they produce best. Smith's model provided no justification as to why a country which produced every commodity at an absolute advantage should engage in trade with another country. David Ricardo's concept of *Comparative Advantage* resolved this dilemma. In his "Principle of Political Economy and Taxation," Ricardo (1817), demonstrated that countries should, and tend to, specialize in the production and export of goods in which they are *relatively* more efficient in return for goods in which they have *relatively* less advantage.

The classical theory of trade, in itself, was not able to explain economic development. This was because the theory was based on certain simplistic assumptions (e.g. a two-country, two-product model, zero transportation cost,

limited number of factors of production). These models later were extended by the theories of Heckschere-Ohlin, Stopler-Samuelson, Rybczynski and others. These will be covered in the chapter entitled Review of Literature.

In general, during the nineteenth century, international trade functioned as an *engine of growth*. According to Robertson (1946), trade stimulated economic growth in Great Britain and spread to the rest of the world.

The idea that trade served as an engine of growth in explaining nineteenth century economic growth was rejected by Kravis (1970). He argued that, while the external factors provided additional stimuli, it was the favorable internal factors that caused economic growth. Lewis (1980) stressed that trade fueled economic growth of the *center* during the nineteenth century but has slowed down during the twentieth century.

The earlier years of the Post World War II Period were characterized by a decline in the perceived role of exports in the development process. This trade pessimism dominated both the economic literature of development and the trade policies of developing countries; import substitution was instead supposed to be essential. Moreover, trade liberalization advocated by the General Agreement on Tariffs and Trade (GATT) was biased in favor of the industrial countries' exports. Developing countries generally believed that GATT was a "rich man's club." Upon formulation of the Prebish-Singer thesis in the 1940s, a whole body of literature developed which was critical of the asserted gains to the Less Developed Countries from international trade. The implication of this body of literature was to reject the idea that trade could serve as the engine of growth. Studies by Singer

(1960), Myrdal (1957) and Prebish (1959), among others, viewed the pattern of international trade as actually harmful to the prospects of developing nations. Policies such as Import-Substitution were advocated during the 1950s and 1960s.

In the following two decades, however, the bias appeared to be shifting, with an increasingly larger role granted to exports. These discussions during the 1970s gradually evolved into something of a new conventional wisdom, stressing the importance of export promotion and expansion upon the improvement of statistical data collection in the LDCs; a large number of individual country case studies were undertaken. These studies focused on the relationships between economic growth, industrialization, and economic policy. Many of these studies examined the hypothesis that export-oriented policies lead to better growth performance than policies favoring import-substitution and protection.

More recently, a larger number of development economists have investigated the effects of export expansion upon the economies of developing countries from various aspects. These include the impact of export growth on national income growth [Michaely (1977), Michalopoulos and Jay (1973)], production of non-export goods [Heller and Porter (1978)], capital efficiency and capability to manage external shocks [Balassa (1978, 1981)]. These studies also include the scale effects and externalities (Tyler, 1981), resource reallocations (Feder, 1983), total factor productivities (Kavoussi, 1984), and contribution of exports to the reduction of import shortages (Esfahani, 1991).

Some of these studies deal with the individual country cases and compare the implications of export promotion versus import substitution strategies on

economic growth. Others deal with inter-country growth differentials: Balassa (1985,1977), Ram (1985), Feder (1983). Tyler (1981), and Fusu (1990). These studies employ a production function framework that includes exports as an argument in the production function and make judgements based on the value of the estimated coefficient of the export performance variable. Most of these studies confirmed Nurske's (1959) view that international trade provides some significant benefits to developing countries but it cannot be relied upon as the main force for development, these include Harberler (1959), Cairntross (1962), Myint (1954-55) and Kravis (1970).

These models, however, are, for the most part, partial and static in nature as they all present a single-equation approach that often deals with only one aspect of the issue, such as the contribution of exports to reduction of import shortage, or exports' impact on factor productivity and so on. There is today no acceptable general model that captures long-run dynamic aspects of international trade and economic development. A very limited number of studies have attempted to overcome some of these shortcomings either by taking account of simultaneity (Lee and Cole, 1994), or by developing a simultaneous equations model (Salvatore, 1983) that would capture the most important quantitative aspects of the relationship between international trade and economic development, or by including additional related variables in the model (Salvatore and Hatcher, 1991).

This is done by including in the model factors through which export growth is assumed to make contributions to economic development; in other words, by including the positive externalities' effect of exports growth. These factors include

contribution to greater capacity utilization, technological improvement, industrialization, and import of capital goods.

Background of Study

The Association of South East Asian Nations (ASEAN) Countries (except Singapore, already a Newly Industrialized Country) represent the third rung of the ladder in the development process of Asia, after Japan and the Newly Industrializing Countries (NICs), and have been noted by the World Bank in the recently published East Asian Miracle Report (World Bank, 1993)- except the Philippines- for their unique performance since the 1960's. The success story of the East Asian NICs followed by the impressive economic performance of ASEAN countries, also referred to as Near-NICs or the Next-Tier NICs (Malaysia, Thailand, Indonesia), all of whom have consciously undertaken outward-looking strategies in expanding their exports and attracting foreign investments, especially since the early 1980's, have generated provocative discussions of whether their models of growth could be generalized or emulated.

While some economists (e.g. Cline, 1982) have warned against applying the economic law of fallacy of composition, others (e.g. Ranis, 1987) arguing that the fallacy of composition applies only if the world trade volume is fixed, have asserted that there are vital lessons for other developing countries to be learned from these countries' experiences. These countries, as Anne Krueger (1984) has pointed out: "have demonstrated that poor societies can substantially transform their economies and alter their prospects. They have also demonstrated that rapid

growth can be consistent with rapidly rising living standards for the poorest segment. As such their experience provides a basis for optimism about future prospects of developing areas where authorities are committed to rising living standards of the population" (page 405).

..*.*.*.*

Over the past three decades, the Malaysian economy has grown on average by 6-3/4 percent a year, with an annual per capita GDP growth of 4 percent. This performance places Malaysia squarely in the group of fast-growing southeast Asian economies and, therefore, among the top performing economies in the world (IMF staff country report, 1995).

The Malaysian economy has simultaneously undergone a structural transformation from one of high dependance on primary products to one in which manufacturing is the dominant sector. This has enabled Malaysia to diversify its exports. In 1975, primary goods constituted 64 percent of exports; its share has now fallen to 40 percent with manufactured goods accounting for the majority (World Bank Country Report 1994). The ratio of exports to GNP has risen from 37 percent in 1970 to 70 percent in 1983. According to an IMF report, as the economy has industrialized, the share of manufactured products in total exports has increased steadily from 12 percent in 1970 to 74 percent in 1993.

Although there have been various studies devoted to Malaysian economy in recent years, no study exists that has exclusively analyzed the role of trade and industrialization in the Malaysian economic growth.

This study focuses on the role of trade and industrialization in the

Malaysian economy by testing a neoclassical and a simultaneous-equation model of trade growth. It is hoped that this study will fill in an important gap in the literature.

Objectives of the study

The present study contributes to the empirical literature on trade and growth by combining the role of both exports and industrialization in economic development using both the neoclassical models of exports, industrialization and growth and a simultaneous-equations model. Thus the objectives of the study six fold.

(a) to examine the role of exports on economic growth in Malaysia by applying a simple regression model

(b) to examine the role of exports on economic growth in Malaysia by applying a neoclassical model of trade and growth (a Cobb-Douglas Production Function where output is a function of total investment employment and export)

(c) to examine the role of exports, investment and industrialization in economic growth by applying a neoclassical model (a modified version of Salvatore and Hatcher's (1991) model).

(d) to examine the role of exports, investment and industrialization in economic growth by applying a simultaneous-equations model (a modified version of Salvatore's (1983) simultaneous-equations model).

(e) to estimate the long-run elasticity of output with respect to exports and industrial production

(f) to extract policy implications on exports and industrialization

Significance of the Study

Malaysia is noteworthy in the study of dynamic trade and development performance because of its unusually rapid industrialization and its highly dynamic export growth, especially of manufactured goods. As early as mid-1980's, as noted by Bradford(1987), " Malaysia . . . . was of consequence in most studies as (an) example of (a) potential NIC." (page 300)

Ever since then, the economic growth of Malaysia has been even more impressive [Cho (1990), International Monetary Fund(1993), Wold Bank(1994)]. Indeed, its performance has gone beyond what is naturally expected of an economy following changes in factor endowments.

The NICs and near-NICs have been distinguished by relatively accelerated rates of structural change, both internally and in their export shares. It is important to identify causal variables that could explain the reasons for the unusual GDP growth and high export performance of Malaysia as compared with other transitional and non-transitional economies.

Relevance of the Study

The relevance of this study stems from the following facts:

- As compared with the NICS, there are fewer studies that deal with the determinants of growth in Malaysia

- Studies dealing exclusively with the role of exports and or industrialization in Malaysian economic growth are non-existent. Several studies have included Malaysia among other countries as part of cross-section analysis of export and growth; their models, however, are, for the most part, partial and static in the nature. The periods covered in these studies do not reflect Malaysia's recent impressive export-led growth.

- Except for Salvatore (1983), no study has developed a simultaneous-equations model that captures the most important quantitative aspects of the relationship between international trade, industrialization and economic development. Salvatore's study, however, mainly concerns comparisons of **groups** of countries (e.g., industry-oriented, primary-oriented, etc) with Malaysia included. The present study deals exclusively with the case of Malaysia and extends Salvatore's coverage of the data from ending in 1978 to ending in 1994.

Chapter II

REVIEW OF LITERATURE

International Trade and Economic Growth

Theoretical Framework

a) Early trade theories - mercantilism

The study of trade emerged in the mercantilist era (roughly the period from 1500 to 1750) as a crude set of arguments and writings that cannot be classified as a formal school of thought, but rather as a collection of similar attitudes toward the role of international trade. Writers and politicians believed the way for a nation to become rich and powerful was to export more than it imported. The resulting export surplus would then lead to an inflow of gold and silver. The more gold and silver a nation had, the richer and more powerful it was. Therefore, mercantilists' view implied a nation could gain in trade only at the expense of other nations.

b) Orthodox theory

The orthodox trade theory refers to the views put forward by the classical economists (Adam Smith, David Ricardo, John Stuart Mill), continued by recent formalization in the Heckscher-Ohlin-Samuelson model. These theories all advocated free trade, emphasizing the role of specialization, comparative advantage and productive efficiency.

Adam Smith's theory of absolute advantage. In his *Wealth of Nations* (1776), Adam Smith ridiculed the fear of trade by comparing nations to households. He argued that, just as in a household, a nation can benefit by producing only some of its needs and buying others with products it can sell:

> It is the maxim of every prudent master of a family, never to attempt to make at home what it will cost him more to make than to buy. The tailor does not attempt to make his own shoe, but buys them from the shoemaker . . . what is prudence in the conduct of every private family, can scarce by folly in that of a great kingdom. If a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it from them with some part of the product of our own industry, employed in a way in which we have some advantage (Book IV, Chap. II, p. 456).

Smith's theory was based on absolute advantage, and therefore did not see any benefit for trade between two countries if one produced every product at an absolutely lower cost (as measured by the labor input) than the other country.

David Ricardo's theory of comparative advantage. Ricardo's main contribution to the theory of trade was to show that countries gain from trade regardless of whether they have any absolute advantage. In his *Principles of Political Economy and Taxation* (1817), he demonstrated what has become known as:

> The Principle of Comparative Advantage: a nation, like a person, gains from trade by exporting goods or services in which it has its greatest comparative advantage in productivity and importing those in which it has the least comparative advantage (p. 133).

According to Ricardo, countries tend to specialize in and export the production of the goods in which they have a low relative cost and import products

in which they have a high relative cost. Ricardo, like Smith, believed labor cost dictated value and prices as long as the country held no international trade.

The classical theory of international trade was deficient in that it was based on some simplistic and unrealistic assumptions: zero transportation cost, mobility or factors of production domestically, but immobility of these factors between countries. Also, the law of comparative advantage was based on a two-country and two-product model with only one factor of production: labor. Later, theories put forward by Eli Heckscher (1919), Bertil Ohlin (1933), and Paul Samuelson (1948), known as the neoclassical models of trade, took account of some of these shortcomings.

Heckscher-Ohlin-Samuelson (H-O-S). The H-O-S theory states that a nation's comparative advantage is determined by the relative abundance of its factors of production, such as capital and labor. Given the assumptions of two-country, two-factor, two-products, factor immobility between two countries and perfect competition with zero transportation cost, the theory maintains a country will export (import) commodities that intensively use the country's relatively abundant (scarce) resources.

Structuralist

Structuralists claimed that trade between developed and underdeveloped countries will work in favor of the former and against the latter. The writings of Raul Prebisch (1950) and Singer (1960) simultaneously put forward the view that the commodity terms of trade of developing countries have the tendency to deteriorate over time. They attributed this deterioration to differences in the

process of adjustment to technical progress. They thought that, unlike the developed countries in which improvement in productivity leads to wage increase, in the underdeveloped countries, labor supply pressure keeps wages unchanged and, therefore, it leads to lower prices.

Prebisch (1950) claimed that "the great industrial centers not only kept for themselves the benefit of the use of new techniques in their own economy, but in a favorable position to obtain a share of that deriving from technical progress of the periphery" (page 14).

In a retrospective evaluation, Singer (1984) asserted that "treated as a projection, one can certainly claim that the secular deterioration of the terms of trade thesis has passed the test better than most other economic projections" (page 282). He cited the data for the post-1950 period to support this proposition. Prebisch and Singer proposed that the developing countries should adopt a strategy that involved industrialization and, in particular, a reduced role of primary exports. The combination of low income and price elasticities of demand for primary products, along with different structures of the product and factor markets in high-income and low-income countries were claimed to be the keys to a persistent and secular decline in the terms of trade for the developing world.

Also, Prebisch (1959) developed a two-country, two-commodity model in which the advance *center* produces and exports manufactured goods with income elasticity of demand greater than one, and the backward *periphery* produces and exports primary commodities with an income elasticity of demand less than unity. With a certain rate of growth of income for the *center*, he argued that there will be

a lower rate of growth of imports (of the primary products) from the *periphery*. In contrast, he showed that the same rate of income for the periphery will lead to a higher rate of imports (of industrial products) from the center. Therefore, even with a trade balance (import=exports) for both center and periphery, the former's income will grow at a higher rate than that of the latter. That is, with free trade, the pace of economic growth in the periphery will always lag behind that of the center.

Gunnar Myrdal (1957) also argued that income elasticity of import demand in developing countries is further increased by the "demonstration effect" on their pattern of consumption emanating from developed countries. The implications of this, as noted by Kondonassis (1991), is that "trade expansion tends to aggravate regional disparities in productivity and income and thus the poor get poorer and the rich get richer. This is because the more developed countries with their established industrial centers and their developed infrastructure and external economies, attract capital and experience increasing returns. Myrdal calls for a new theory of international trade based on the realities of the LDCs" (page 7). Singer, Prebisch and Myrdal and the rest of the structuralists called for limiting the exports in developing countries instead. They advocated import substitutions.

In the structuralist paradigm, therefore, rich countries differ from poor ones not merely because they are richer in physical and human capital per head, but also because the greater accumulation had been nurtured by strategic reforms and was causally interdependent with intersectoral resource shifts, notably from agriculture to industry. However, poor countries could narrow the gap by supplementing and

redirecting market forces through strategic interventions; that is, altering agrarian property rights, labor market reforms, national planning, fiscal monetary subsidies and penalties, and so on. For geopolitical and humanitarian reasons, the rich countries should assist in these efforts with technical and financial aid on concessional terms and unilateral terms.

Neoclassical Models

The basis for the neoclassical theory is trade and financial liberalization. Trade liberalization and getting "the prices right" are the neoclassical responses to the "big push" recommendations by both Nurske and the Rosenstein-Roden [in Kondonassis (1991), page 8]. The Neoclassical view maintains that poor countries are inefficient because they suffer from distortion or gaps between observed prices and optimal prices. "Getting the prices right" becomes the neoclassical slogan, with special emphasis on equating internal price ratios to those ruling in the markets of the world. Trade liberalization is, therefore, advocated.

In the context of the neoclassical model, a strong correlation should exist between export and GNP growth. A rapidly growing export sector would have beneficial effects on general economic growth, because it would result in increased specialization and competition as well as possibilities for exploiting economies of scale. In a dynamic setting, the net effect would be improved efficiency in resource utilization and faster growth in factor productivity. In a somewhat different context, increased exports, as argued by Leibenstein (1966), could increase factor productivity by increasing X-efficiency. The increased contact with the outside world might result in substantial improvement of production methods

with attendant beneficial results in productivity. The argument could, therefore, be made that productivity growth would be higher in countries which are better placed in international trade, in the sense that their exports are rising rapidly and that such countries would experience more rapid growth in output. As a result, the link between export growth and output growth is productivity growth generated from increased specialization, competition, and other factors attendant to the opening of the economy to international trade.

Review of Empirical Studies

A large number of studies in the last three decades have focused on exports and their contribution to economic growth.

The hypothesis to be tested was that a rapid growth of exports accelerated the economy's growth. One simpler way was to test this hypothesis in isolation, that is, without specifying a full model of exports and growth. The stipulated hypothesis about the relationship between exports and growth was to be tested by examining the correlation between the variables which represent these two magnitudes of economic performance. Among those who undertook this approach were Emery (1967), Maizels (1968) and Kravis (1970), all of whom found the two variables to be significantly and positively related. Michaely (1977) argued that all of the preceding studies "shared a common fault: they correlate growth, measured by change in the national product (whether total or per capita) with the change in exports. Since exports are themselves part of the national product, an autocorrelation is present; and a positive correlation of the two variables is almost

inevitable, whatever their true relationship to each other . . . obviously this has no indication of causal relationship and no explanatory value for the purpose at hand" (Page 49-50). To remedy this, while admitting that specifying a full model of the sources of growth was much beyond the scope of his paper, he tested the hypothesis of, (and found a significant and positive) correlation between the annual change of the ratio of exports to GNP and annual change of per capita GNP in 41 developing countries from 1960 to 1973. He concluded that the more rapid the change in exports, the more rapid the economy's growth.

Michalopoulos and Jay (1973) were the first to test the relation of exports and economic growth in the context of the neoclassical model. To add explanatory power, they analyzed the role of exports from the production side. Arguing that, "while a strong correlation between GNP and export growth may in fact be present, both export and GNP growth might be explained by other factors which are themselves basically responsible for economic development" (page 3). Thus, they asserted output was a function of investment, employment and exports. That is, they introduced variable exports in the standard production function in addition to the traditional inputs, labor and capital.

The model they tested was based on two hypotheses: (a) whether the effect of export growth on GNP was, in fact, additional to the effect of changes on primary factors of production and (b) whether export growth could be related to estimates of productivity growth across countries. They first constructed a simple Cobb-Douglas Production-Function Model:

$$Y = A\, K_d^a\, K_f^b\, L^c \qquad (1)$$

Where:
- Y = Income (GDP)
- K_d = Domestic Capital
- K_f = Foreign Capital
- L = Labor Force
- A = Constant

After differentiating with respect to time and additional manipulation, a linear model resulted. They first fit this model for 39 LDCs for the decade of 1960-69, obtaining the following results:

$$\begin{array}{lll} Y = 0.25K_d + & 0.20K_f + & 0.66L \\ \quad (7.81) & (3.35) & (2.44) \end{array}$$

$$\bar{R}^2 = 0.53 \qquad n = 39$$

Then, before including exports (X) in the model, as a preliminary test, they related export growth (X) to the residual from equation (2). The result was:

$$\begin{array}{llll} \text{Aires} = & -0.07 + & 2.04\ X & R^2 = 0.38 \\ & (-2.73) & (4.83) & n = 38 \end{array} \qquad (3)$$

Where: Y_{res} = The difference between the actual values of 4 and the values estimate from (2)

In light of the positive and statistically significant relationship between Y_{res} and export growth, Michalapoulos and Jay reestimated equation (2) to include export growth as a separate variable and obtained the following results:

$$\begin{array}{llll} Y = 0.24K_d + & 2.12K_f + & 0.60L + & 2.04\ x \\ \quad (9.62) & (2.33) & (2.81) & (4.82) \end{array}$$

$$R^2 = 0.71 \qquad n = 39$$

Before proceeding to discuss this equation, the authors decided to explore further the possibility that the export-GNP relationship results simply from the fact that they both depended on growth of primary inputs, as argued by Irwin Kravis (1970). For this purpose, they regressed export growth on the other primary inputs. The following equation resulted:

$$\begin{array}{lccc} X = & 0.18K_d & + \quad 1.98K_f & + \quad 1.42L \\ & (0.37) & (2.21) & (0.35) \end{array}$$

$$R^2 = 0.07 \qquad n = 35$$

The authors argued that these results strongly indicated export growth was not dependent on the growth of primary inputs. They found a weak positive relationship with the net foreign capital inflow. However, they argued, this relationship suggested that, if anything, the pattern of distribution of aid and private capital flows tended to favor countries with strong export performance. On the other hand, growth in domestic inputs is apparently not correlated with export growth. In conclusion, Michalopoulos and Jay wrote: "In light of these findings, we are inclined to reject the hypothesis that export growth is a handmaiden to GNP growth in which both are dependent on growth of primary inputs. Export growth does contribute substantially to explaining GNP growth over and above the contribution of primary inputs" (page 9).

The study of Michalopoulos and Jay spurred considerable work by researchers during the 1970's and 1980's. However, these studies used mainly cross section rather than time-series data. Some of the most prominent of these researches include studies by Balassa (1978 and 1985), Tyler (1981), and Kavoussi

(1984). Balassa (1978) applied the method of Michalopoulos and Jay to the pooled data of ten countries for the period 1960-66 and 1966-73. The results in two equations (one, a production function excluding exports; the other, including exports) indicated that the export variable in the regression equation raises the coefficient of determination (R^2 from 0.58 to 0.77). At the same time, all regression coefficients were significant at the 5-percent level in both equations:

For the period 1960-73:

$$\begin{array}{llllll} Y = & 0.15K_d & + & 0.23K_f & + & 0.97L + \quad 2.04\ X \\ & (3.33) & & (2.40) & & 1.99 \qquad 3.57 \\ & n = 10 & & & & R^2 = 0.77 \end{array}$$

$$\begin{array}{llllll} Y = & 0.18K_d & + & 0.30K_f & + & 1.09L \\ & & & & & 1.74 \\ & n = 10 & & & & R^2 = 0.58 \end{array}$$

Balassa (1985) extended his previous studies (1981, 1984) to combine the use of trade orientation variable and the indicator of policy responses to external shocks, together with the variables from the production function in the same estimating equation. This new formulation was able to separate the effects of countries' initial policy stances from those policy responses to external shocks, avoiding the problem of simultaneity bias, as well as adjusting for the effects of changes in capital and labor on output growth. The model tested was:

$$DY = a_o + a_1(s_d/Y) + a_2(s_f/Y) + a_3(L/L) + a_4TO + a_5(EP/ES) + a_6(IS/ES) + a_7(ANEF/ES) + a_8(ES/Y) + a_o(Y/P) + a_{10}(X_m/X)$$

Where:

DY =	changes in GNP between 1973 and 1979 as a percentage of 1973 GNP;
s_d/Y =	sum of gross domestic investments less current account balances from 1973 to 1978 as a percentage of 1973 GNP;
s_f/Y =	sum of current account balances from 1973 to 1978 as a percentage of 1973 GNP;
L/L =	change in labor force between 1973 and 1978 as a percentage of the 1973 value;
ES =	balance of payment effects of external shocks, averages for 1974 to 1978;
TO =	trade orientation;
EP =	balance of payment effects of export promotion, averages for 1974 to 1978;
IS =	balance of payment effects of import substitution, averages for 1974 to 1978;
ANEF =	balance of payment effects of additional net external financing, averages for 1974 to 1978.

(All value data were in constant dollar terms.)

The result was that trade orientation had a significant influence on the rate of economic growth in the 43 countries during the 1973-79 period. An interesting result was that the rate of GNP growth was higher, the greater the extent of reliance on export promotion in response to external shocks of the period, indicating the importance of external trade, even in the face of uncertainties.

The same study (Balassa, 1985) also examined the approach used by Michalapoulos and Jay (1973) and also Balassa (1978), and found the following results (41 non-OPEC, low- and middle-income countries for the period 1973-79):

$$Y = \underset{(-1.1)}{-14.0} + \underset{(3.6)}{0.18K_d} + \underset{(1.0)}{0.07K_f} + \underset{(1.8)}{1.16L}$$

$$n = 41 \qquad R^2 = 0.31$$

$$Y = \underset{(-5.2)}{-6.8} + \underset{2.2}{0.12K_d} + \underset{(0.5)}{0.04K_f} + \underset{1.5}{0.98L} + \underset{2.0}{0.15\ x}$$

These results also agreed with those found in Michalopoulos and Jay (1973) and Balassa (1978), namely that the introduction of an export variable in the production function-type framework raises the explanatory power of the model.

Tyler's (1981) study analyzed the empirical relationship between economic growth and export expansion in developing countries as observed through an inter-country cross-section. Employing data from 55 middle-income developing countries for the period 1960-1977, bivariate tests (simple Pearson and Spearman rank correlation) revealed significant positive association between growth and various other economic variables total exports and manufacturing exports. Admitting that the bivariate association alone does not incorporate the effects of other variables, he then, following Balassa and other researchers, used a Cobb-Douglas Production Function:

$$X_i = A\, K_i^{\alpha}\, L_i^{\beta}\, E_i^{\gamma}$$

Where:
- X_i = Country i's GNP
- A = A technological constant
- K_i = Country i's stock services
- L_i = Country i's labor force inputs
- E_i = Country i's exports

By adding a time dimension, differentiating the resultant equation with respect to time and dividing through by the original equation, Tyler obtained a linearly estimable equation:

$$\dot{X}/X_i = \dot{A}/A + \alpha(\dot{K}/K_i) + \beta(\dot{L}/L) + \gamma(\dot{E}/E) \qquad (I)$$

Using the notations in Michalopoulos and Jay, we get:

$$Y = a + \alpha I + \beta L + \gamma X \qquad \text{(II)}$$

He then tested various forms of this latter equation.

The results based on the version of this equation that corresponds to that of Michalopoulos and Jay (1973) and Balassa (1978) (II) produced the following equation:

$$Y = 2.0 + 0.29I + 1.02L \qquad R^2 = 0.68$$

$$n = 39$$

$$(7.0) \quad (2.6)$$

$$Y = 2.0 + 0.26I + 0.95L + 0.05x \qquad R^2 = 0.71$$

$$n = 37$$

$$(5.9) \quad (2.6) \quad (1.6)$$

Tyler's study also indicated that while primary exports seemed to raise total factor productivity of low-income levels, their effectiveness on the productivity front tended to diminish as countries became more advanced among middle-income countries; gains from export expansion are significant only in those economies that shift to exports of manufactured products.

Kavoussi (1984) examined the relationship between export expansion and economic growth in a sample of 73 developing countries, using data for the period 1960-1978. Kavoussi noted that Balassa's sample was comprised of only 11 developing countries, and Tyler's sample, although much larger, was also limited to one group of developing countries. Tyler omitted low-income developing countries from his sample on the grounds that some basic level of development is necessary for a country to receive the most benefit from export-oriented growth

(Tyler, 1981, p. 124). Kavoussi wondered whether the positive correlation between exports and growth would hold for a large sample which includes both low- and middle-income countries in general, and for the less advanced developing economies in particular. Furthermore, unlike previous studies, he wanted to examine how the commodity composition of exports affected the relationship between exports and economic growth. He started with a simple production function of the type:

$$Y(t) = f(K(t), L(t), t), \qquad \text{(I)}$$

Where:
Y = GNP
K = Capital Stock
L = Labor Force
t = Time

With the assumption that elasticities of output with respect to capital and labor were constant, and that technical change was Hicks-neutral and its rate remained constant, he reformulated the initial equation as follows to show the growth rate of GNP:

$$RY = a + bRK + cRL \qquad \text{(II)}$$

Where:
RY = growth rate of GNP
Rk = growth rate of capital stock
RL = growth rate of labor force

Instead of assuming that the rate of technical change was constant, to test the impact of export growth the growth of total factor productivity, he hypothesized that rate of total factor productivity growth was a function of the growth rate of exports (RX). Thus, he wrote:

$$RY = a + Brk + CRL + dRX \qquad \text{(III)}$$

Further, to demonstrate the impact of a commodity composition of export, he hypothesized that the impact of manufactured exports on factor productivity is greater than that of primary products. To test this hypothesis, he wrote the coefficient of RX as a linear function of the commodity composition of exports at the end of the period under consideration. Thus he reformulated equation (III) as follows:

$$RY = a + bRX + CRL + DRX + d_2 MR X$$

Where: MX = The share of manufactured goods in total merchandise exports
MRX= (MX) (RX)

The results of the study indicated that for the entire sample, the addition of RX in the regression equation increased the coefficient of determination from 0.49 to 0.57 and that the coefficient of RX was positive and highly significant, indicating that export expansion enhanced growth of total factor productivity. Also, Kavoussi found that in the more advanced developing economies, the effect of export expansion on the growth of total factor productivity was more sensitive to the share of manufactured goods in total exports. Thus, if a country depends completely on exports of primary commodities as it reaches higher income levels, the positive impact of export expansion on factor productivity practically disappears. On the other hand, if it is able to shift to exports of manufactured products, the favorable effects of exports on productivity will be enhanced considerably.

Kavoussi and Tyler, differing from the studies by Michalopoulos & Jay and Balassa, did not differentiate between domestic capital and foreign capital; instead they preferred to use total capital. The results, however, did not differ.

In the 1970's several countries in South Asia, South America, and Africa adopted export-promotion strategy and liberalized their trade regimes. Therefore, the role of exports for developing countries seemed to be more important in the 1970s than in the 1960s.

Ram (1985), based on a production function of the type $Y = f(L, K, X)$, estimated the following model for 73 LDCs:

$$Y = B_o + B_1 L + B_2 I/Y + B_3 X$$

Where Y, L, K, X represented aggregate real output, labor input, capital input and exports; B_1, B_2, B_3 were the elasticities of output with respect to L, K. and X; I represented the investment-income ratio (Rk/Y).

He used the data for the two periods of 1960-1970 and 1970-1977 separately to judge whether the importance of export for economic growth increased over the 1970s. Ram further took a closer look at the differentials in the low-income and the middle-income LDCs for both periods. He also conducted a test to see whether the assumption of homoscedasticity was reasonable, and therefore whether the simple-equation model was adequate. Additionally, the importance of the exports seemed to have increased in the 1970's. Finally, using White's specification test, he noted the absence of heteroscedasticity and other specialization errors, indicating the appropriateness of the single-equation model used. Once again, export performance proved important for economic growth.

All the previous studies used cross-section data to investigate the role of exports growth in economic growth. Estimates obtained from cross-section data

are useful in many ways, especially when we are dealing with small numbers of observations for individual countries. However, as argued by Ram (1987), "There is evidence of tremendous parametric variations across countries in regards to estimates of the growth equations typically used in such contexts. It seems important, therefore, to make a beginning toward an assessment of the export-growth nexus for individual countries on the basis of time series data" (page 52).

In a follow-up study to the first one, therefore, Ram (1987) used two models to capture the basic relationship between GDP growth and exports growth. Using the time-series data obtained from the World Bank's world tables for the time period from 1960-1982, he estimated the parameters of the following equation:

$$Y = B_o + B_2L + a_k (I/Y) + B_x + U$$

where a dot over the variable indicated its rate of growth and I/Y was the investment-output ratio. Like most other researchers, Ram used the rate of population growth in place of the rate of growth of labor force. This method is normally used on the grounds that, for most LDCs, usable time-series data on labor force for some time periods is scarce.

Ram concluded that in the entire sample of 88 countries, despite parametric variations across countries, the predominant export-growth connection was positive, and nearly one-half of these positive coefficients were statistically significant at least at the 10% level.

Ram (1987) did include Malaysia in his time series based analysis. The present study, however, differs with that of Ram's in that it: (a) covers a time

period longer than that of Ram's (1960-1992 instead of 1960-1982 in Ram's study); (b) includes the role of industrialization as well as exports in the production function; (c) examines the role of trade and industrialization, using a model different from, but similar to, that of Ram's, plus some other models, including a simultaneous model of growth that was not used in the study by Ram.

Anne Krueger (1978), using cross-section and time-series data for 10 Asian countries for the time period 1954-71, assessed the effect of exports on GNP. A fairly simple log-linear regression specification was estimated for each country from time series data. The estimates indicated that "an increase in the role of growth of exports of one percent, would increase the rate of growth of GNP by just 0.1 percent." She noted that trade liberalization attempts which cover foreign exchange rates and interest rates as well as liberalized export sector would increase the responsiveness of the economy of developing countries to export performance.

A few studies have attempted to incorporate the role of industrialization in the relationship of trade and growth. Salvatore (1983) was the first and the only one to attempt to capture the most important quantitative aspects of the relationship between international trade and economic development by developing a simultaneous-equations model. Arguing that the large number of studies in the previous two decades had not helped resolve the theoretical controversy of whether trade is an "engine" or a "handmaiden" of growth, primarily due to the static and the partial nature of the single-equation model, he constructed the following simultaneous-equation model and empirically tested the model using cross-section and time-series data for S_2 countries over the period of 1961-1978:

$$DY = A_o + a_1 I_t + A_2 R, + 6_3 DX_t \quad (1)$$
$$I_t = b_o + b_1 y_1 + B_2 D Y, + b_3 X_t + b_4 F_L \quad (2)$$
$$R_t = C_o + C_1 D Y, + c_2 X_L + c_3 R_{t-1} \quad (3)$$
$$X_t = d_o + d_1 P_t + d_2 W_1 + d_3 R_t \quad (4)$$

Where:

DY = growth of real *per capital* income;
I = gross fixed capital formation as a percentage of gross domestic product (GDP);
R = industrial output (manufacturing plus construction) as a percentage of GDP;
DX = growth in the percentage of exports to GDP;
Y = real *per capital* income in U.S. dollars;
X = exports as a percentage of GDP;
F = capital inflow (net imports of goods and services) as a percentage of GDP;
P = ratio of the consumer price index in the nation relative to the consumer price index of all market economies;
W = index of real GDP of all markets economies.

The model was estimated by Full Information Maximum Likelihood, validated by dynamic simulation, and utilized to conduct dynamic policy and other counterfactual simulations. By subdividing the entire time period into four subperiods (with the use of dummy variables), Salvatore's model permitted testing for shifting over time of the structural relationships. Salvatore's study found strong empirical support for trade's importance for development, but to be more in the nature of a handmaiden than of an engine of growth.

The present study's third model borrows from Salvatore's (1983) study. Based on differences in theoretical justifications and the differences in the composition and the availability of the data, the present study makes several modifications to the model proposed by Salvatore. These differences are discussed in chapter three of this study under the Design of the Study.

Greenway and Chong (1988) examined the rationale behind and the characteristics of alternative development strategies. They further classified the orientation of a country's trade strategies into four groups: strongly outward-oriented, moderately outward-oriented, moderately inward-oriented and strongly inward-oriented. Since one of the objectives of industrialization is to diversify a country's export base away from primary products, Greenway and Chong propose that the annual average growth rates of manufacture exports be used as an obvious indicator of industrial performance. The study argued that the manufacturing value-added seemed to have grown more quickly in outward-oriented economies with a higher average share of manufacturing value added and labor force and a faster growth of manufacturing exports. Therefore, industrialization was found to progress further in the outward-looking than-inward looking economies. The present study seeks to examine the role of exports in growth, using only the manufacturing exports of Malaysia for the period 1960-1992.

Salvatore and Hatcher (1991) make use of the same classification as in Greenway and Chong to examine the effect of trade on economic development for countries within each group and also to analyze the efficiency of investment and of the entire industrialization process under different trade strategies. In order to do this, Salvatore and Hatcher formulated a single equation model from the general production function which introduced both export (X) and industrialization (R) as additional inputs, in addition to capital (K) and labor (L).

Similar to the variable R used in Salvatore's (1983), the industrialization variable R adopted in this study was used as a proxy for the rate of investments and the introduction of new technologies in the previous years.

Salvatore and Hatcher estimated the following model separately for each group for the time periods 1963-73 and 1973-85:

$$DY = a' + c' I + g' DX + h' DR$$

Where:

DY = the growth of real per capital income;
I = gross fixed capital formation as a percentage of GDP;
DX = the growth in the value of real exports;
DR = the growth of real industrial productions.

Salvatore and Hatcher further decomposed the influence of pooling time series and cross section data, and the influence of the actual sample of countries in the estimation, and later reestimated the above model for the individual countries for the entire period. The empirical findings partially supported the hypothesis that international trade benefits most developing countries and that outward-orientation leads to a more efficient use of resources. Investment was found to be significant only in outward and moderately inward-oriented countries, while industrialization seemed to greatly benefit all except the strongly inward-oriented countries where it can lead to serious inefficiencies. On the average, Salvatore and Hatcher concluded, international trade will benefit all the countries in all time periods.

In the present study, the second model examined borrows from Salvatore and Hatcher with some modifications. This study uses the data for the manufacture exports instead of Salvatore and Hatcher's total exports. This study, unlike the one of Salvatore and Hatcher, includes labor in the estimating model;

this study also extends the time period to 1992 instead of Salvatore and Hatcher's 1963-1985 time period.

The next major and seminal study in this area was undertaken by Feder (1983), in which the researcher made the following major postulates: (a) there are two sectors in the economy, one of which is the export sector and the other is the non-exports sector; (b) the output of the export sector generates an "externality" effect on production of non-export output; (c) labor and capital serve as the conventional inputs in both sectors; and (d) production functions for export sector and non-export sectors are different, and relative marginal products of the input differ across the two sectors. The results of the study showed that if social marginal productivities are higher in the export-sector, economies which shift resources into exports will gain more than inward-oriented economies. The empirical findings suggested that even when entrepreneurs optimize resource allocation given the prices they face, substantial gains are to be made due to externalities' effects.

Numerous studies followed Feder's lead in investigating the "externalities' effect of export expansion. Among those are Ram (1987), Esfahani (1991), Hutchison and Jingh (1992), McIntyre (1995) and Felipe (1995).

Several studies have focused on the direction of causality between exports and economic growth in developing countries. For example, Jung and Marshal (1985) tested the direction of causality by using the Granger method for 37 developing countries for the period of 1950-1980. Bahmani-Oskooee, et al. (1991) used a different causality test, as did Chow (1987) and Felipe (1995). The results

showed that for some countries the causality went from export to income growth and for some other countries the opposite applied.

Chapter III

AN OVERVIEW OF THE MALAYSIAN ECONOMY

The purpose of this chapter is to provide an overview of the economy of, as well as present a brief history and description of the industrialization process in, Malaysia. The emphasis, however, will be on those aspects of the Malaysian economy that pertain to the present study. The objective is to provide justifications for the models and hypotheses this study investigates.

Malaya, or what it is now called Peninsular Malaysia, achieved independence in 1957.[1] In 1963, the Federation of Malaysia was formed between Malaya, North Borneo (later renamed Sarah), Sarawak and Singapore. However, Singapore left the federation in 1965. The Malaysian economy at the time of independence was heavily resource-dependent. Agriculture and mining accounted for 44 percent of GDP with only 10 percent of the GDP coming from manufacturing. Malaysian exports were for the most part primary-oriented; rubber and tin accounted for more than 70 percent of exports. Agriculture was composed of two distinct sectors; one was the foreign-owned plantation farming which was export-oriented. The other sector was the low-productivity subsistence farming owned mainly by the ethnic Malay population.

In 1958, the Malaysian government adopted and supported an Import-Substitution Policy, which granted tax exemptions for a period of up to eight years to firms in approved industries. A legislation known as the Pioneer Industries

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[1]A more detailed description of Malaysia's recent economic history is found in Cho (1990), and Mohd (1995), from which the present student has borrowed.

Ordinance fostered the development and expansion of food, rubber products, textiles, and car assembly industries, and contributed to an increase in manufacturing's share in GDP to 14 percent by 1970.

Reflecting the bias toward import-substitution policies during the 1960s, agriculture's role in the economy declined, and the share of imports in GDP declined from about 45 percent in early 1960s to 37 percent by 1969.

In 1970, Malaysia embarked on a second stage in its development strategy with the introduction of the 20-year New Economic Policy (NEP). The main objectives of NEP were poverty eradication and wealth redistribution. Economic growth through industrialization was viewed as essential to success of the plan, since only rapid growth could ensure that the plan would leave no group worse off. The policy, however, was implemented through heavy involvement of the government in the industrial sector and through its participation in industrial projects and the regulation of private sector activity. During the 1970s, the number of public enterprises increased by 50 percent, financed by a large buildup in government-guaranteed foreign debt.

Export Promotion Strategy

As the limitations of import-substitution (e.g., limited domestic market, etc.) became more pronounced in the mid-1960s, the government was persuaded to switch to a labor-intensive export-oriented strategy to inject fresh dynamism and to fight growing unemployment.

Under this second phase of Malaysia, manufacturing became increasingly export-oriented. This reflected, in part, the degree to which the size of the

domestic market constrained manufacturing production under import-substitution. Under the Investment Incentives Act introduced in 1968, the Malaysian government offered tax relief to firms that exported more than 20 percent of their production. In addition, Malaysia established Free Trade Zones (FTZs), which permitted firms to import their components free of duty and export their products exclusive of sales and excise taxes. During this period, 15 percent of new manufacturing jobs were created in FTZs and, by 1980, 70 percent of manufactured exports were produced in these zones. However, tariff concessions granted to firms in the FTZs tended to increase the import content of the goods produced. In some industries the propensity to import intermediate and capital goods exceeded 90 percent.

Reflecting the goal of export-led industrialization, the share of manufacturing in GDP increased from 14 percent in 1970 to 20 percent in 1980, and export grew from 46 percent of GDP to 58 percent over the same period. As a result, the share of agriculture declined from 32 percent of GDP to 23 percent of GDP during the 1970s (IMF, 1994).

The world recession of the early 1980s set back the objective of rapid growth through export-driven industrialization. This recession severely damaged the Malaysian economy. Manufacturing, which concentrated heavily into two export-oriented industries (electronics and textiles) suffered from the decline in the external demand. Relative to exports, debt service obligations increased significantly. This was especially exacerbated by a sharp deterioration in terms of trade in 1985-86 and led to a contraction of GDP one percent in 1985. This was

the only year since the independence in which GDP declined, after rising by 6-3/4 percent per year during 1980-84. In order to restore economic growth, the government reoriented its policies and introduced a set of measures designed to promote private sector activity. The package, introduced between 1983 and 1986 "included: (a) improvement in the investment climate by liberalizing equity and employment requirements and introducing more generous corporate tax relief, particularly for export-oriented firms, and (b) a reduction in the public sector's role in industry through a cut in the share of development expenditures equivalent to 10 percent of GNP between 1983 and 1990 and the initiation of Privatization Program" (IMF Staff Country Report, No. 94/4, Page 3).

The new orientation, along with improvement in the external conditions, led the economy to a remarkable private-investment recovery in 1987. Over the next few years, foreign direct investment inflow sharply increased. The value of approved projects more than doubled between 1987 and 1988 and reached a record high in 1991. Investment was particularly strong from Japan and the Asian newly industrialized economies (NIEs), which reflected in part the reallocation of their production base to lower cost countries. In light of these changes, manufacturing grew at a rate of 15 percent per year over the period of 1986-90, and GDP grew at a rate of about 8.3 percent in the same period.

The impressive performance of the economy under the new liberal policies of the second half of the 1980s led the government to introduce a ten-year National Development Policy (NDP) in 1991. The NDP emphasized growth through promoting private sector activity and human resource development.

Labor Force and Unemployment

The pattern of unemployment and underemployment in Malaysia indicates differentials based on geographic factors (between different regions of the country), demographic factors (age and sex) and skill and quality of the labor force.

Toward the latter half of the 1960s, unemployment rose, especially among unskilled workers (about 8 percent). However, regional imbalances in the supply and demand for labor were quite apparent.

According to Cho (1990): "By the end of the 1970s, it was recognized that the lack of trained manpower was a principal constraint in accelerating socio-economic development. Between 1971 and 1975 the 15-29 age group registered a faster rate of growth, as compared with the overall labor force growth (4.8 percent compared with 3.2 percent respectively). However, there was a reduction in the unemployment rate from 7.4 percent in 1970 to 7.0 percent in 1975. During this period employment grew at the rate of about 3.3 per annum and the impact was greater in urban than in the rural areas. In the 1980s Malaysia embarked on a second phase of industrialization, through import substitution strategy. Much of the industrialization in Malaysia, however, were capital-intensive, providing fewer employment opportunities. The rate of unemployment between 1980 and 1985 increased in Malaysia from 5.7 percent to 7.6 percent" (pages 26-27.)

Rapid growth since 1987, which was concentrated largely in the export-oriented manufacturing sector, contributed to a sharp decline in the unemployment rate, from 8.2 percent in 1987 to 3.7 percent in 1992. As a result, shortages of both skilled and unskilled labor emerged. Increasingly tight labor market

conditions contributed to rising labor costs, which threatened to erode Malaysia's external competitiveness and to reduce the flow of foreign investment (IMF Country Report, No. 44).

Direct Foreign Investment

In Malaysia, Direct Foreign Investment (DFI) has for a long time constituted a significant portion of international capital inflows. According to IMF staff country report (No. 95, December 1995), "Classified as long-term capital, DFI represents the largest component of net corporate investment in Malaysia. In terms of their relative contribution, net private inflows of long-term capital have comprised nearly three quarters of the total net capital inflows" (page 16). Although throughout the 1970s and 1980s the government policy encouraged Direct Foreign Investment, only after the recession of 1985-86 did the large fiscal and trade deficit and declining investment bring an all-out push for DFI, especially for export. This new policy, which included greater tax incentives for potential investors, had a dramatic impact on foreign investment.

According to the World Bank's "East Asian Miracle" (1993), DFI approvals in Malaysia, which averaged US $300 million a year in 1983-85, jumped to US $2 billion by 1988. Unlike the previous decade, when Singapore was the greatest source of DFI, in 1988, a quarter of DFI originated by Japan, followed by Taiwan, China, and the United States. The new investments, by 1988, were directed toward electrical and electronic products, chemical products, rubber products, basic metal products, and petroleum. More than before, nations dedicated their

investments to exports. The DFI brought substantial benefit to the Malaysian economy, particularly in generating foreign exchange (page 302-303).

Major Investors in Malaysia

According to the World Bank's "East Asian Miracle," thanks to DFI, Malaysia is now the world's third-largest producer of semi-conductors, garnering almost $3 billion US in net exports in 1986 alone. In the late 1980s, Siemens built in Malaysia its fourth plant worldwide to manufacture megachips. National Semi-conductor recently built Malaysia's first wafer fabrication plant to supply its local semi-conductor plant; Motorola and Hitachi have followed suit. Seagate has expanded production of disk drives from Singapore to Malaysia. Nixdof Computer AG, which recently established a US $3 million software center to create applications for unix-based workstations, was attracted to Malaysia by the fact that its software engineers cost one-fifth of Germany's. Intel called its Malaysian exports to help set up a chip assembly line in Arizona.

Malaysian plants produce a range of products, from TVs, radio cassette players, and toasters to computer peripherals. Many companies that started small in Malaysia have stayed and expanded. Sharp has participated in several joint ventures in Malaysia, where it assembles color televisions and computer monitors. In the late 1980s, Sony began to manufacture in-house some of the components for its new color TV plant in Malaysia. Matsushita's Malaysia operations, which grew in the mid-1980s as expenses rose in Japan, have come to supply 10-15 percent of the world market for room air conditioners (Lim & Fang 1991).

The Industrialization Process

The industrialization process in Malaysia really begins after Independence, since, due to British policies regarding colonial division of labor, there was not much manufacturing activity before 1957. In other words, Malaysia's experience of manufacturing during the colonial period, except for some raw material processing of mainly tin and rubber, was poor. Even after Independence, when the government encouraged import-substituting industrialization during the subsequent decade, it was the foreign firms (mainly British) who benefitted the most from these policies. These firms continued to dominate the Malaysian market behind the new protective tariff walls erected as part of the import-substitution policy. Many of the industries developed by the government during this period, due to the capital intensity of the production processes, were poorly linked to the rest of the Malaysian economy and generated very little employment. In this regard, Malaysia was different from other Southeast Asian countries such as South Korea and Taiwan, who experienced far greater industrialization under Japanese colonialism since the beginning of the century.

Development Planning

After Independence, during the period up to the first Malaysia Plan (1966-70), the development plans and strategies by the Malaysian government were neither ambitious nor ideology-oriented. The plans reflected the basis of the various sectors of the economy, with no intention of altering the socioeconomic status quo. Although some attention was given to the equitable distribution of the benefits of growth, and to the allocation of resources, the plans were dominated by

the concerns about the rural development and improving the infrastructure of the economy. After Independence, the government's priorities made important changes. The emphases of the post-independence plans were a high rate of economic growth and the reduction of economic instability, which heavy dependence on a few primary industries caused. Macroeconomic objectives included providing equal share for the citizens from the development process and providing jobs for everyone. In practice, however, these concerns for equity were overshadowed by a concern for enlarging the economic pie. As Cho (1990) explains: "It may be concluded that plans had adopted a satisficing rather than a maximizing objective function. The completion of each project represented only a step forward and an attempt at a local rather than global solution to the problem" (page 67).

New Economic Policy

As previously noted, up to (and during) the first Malaysia Plan, 1966-70, economic policy focused on reaching a faster rate of economic growth and less reliance on the export of primary products, a higher level of employment, and a more equitable distribution of income and wealth. The riot of May 13, 1968, was a reflection that some of these policy goals had not been achieved (Lim, 1973, page 298).

The New Economic Policy (NEP) covered a period (1971-90) during which greater concern was accorded to two interrelated policy themes:

> "to reduce and eventually eradicate poverty, by raising income levels and increasing employment opportunities for all Malaysians,

irrespective of race; [and] ... accelerating the process of restructuring Malaysian society to correct economic imbalance, so as to reduce and eventually eliminate the identification of race with economic function" (Malaysia 1971, page 1).

In order to have an overall picture of the industrialization process, in what follows, a brief review of the Malaysian development plans since Independence is presented. A more elaborate discussion of these plans is included in Cho (1990) and Amin Mohd (1994), from which the following was borrowed.

First Malaya Plan (1956-1960)

During this period, import substitution was an essential part of growth. The growth strategy in this period was mainly based on import substitution policy. The policy was perceived as a way of reducing dependence on a few primary commodities and of achieving diversification of the economy. Such a strategy basically involves the introduction of various incentives, including health protection. Hence, the Pioneer Industries Ordinance was introduced in 1958, which provided generous tax relief and tariff protection to selected enterprises that qualified as "pioneer" industries. This was the first measure taken to accelerate industrial development, particularly to encourage the development of local industries, such as food processing, to cater for the domestic market. An interesting feature of this strategy was that unlike the experience of other developing countries, import substitution in Malaysia did not lead to excessively high trade barriers.

Second Malaya Plan 1960-1965

Domestic financing was one of the major constraints inhibiting the industrialization process. In 1960, in order to provide an environment conducive to industrialization, the government established the Malayan Stock Exchange and other agencies such as the Malaysian Industrial Development Fund (MIDF) to mobilize private capital for industrial development. The Tariff Advisory Committee Board (TAB), which later became the Special Advisory Committee on Tariff (SACT), also formed to formalize the system of tariff protection.

First Malaysia Plan 1966-70

By the late 1960s, despite the impressive growth of the manufacturing sector, the viability of the import-substitution strategy of industrialization was in question. This came in view of the limited size of the domestic market and the inability of this strategy to generate sufficient employment opportunities. The number of workers employed per million Ringgit of final demand was only one third of its counterpart in the agricultural sector. Furthermore, although the previous policies did make a significant impact in accelerating industrialization over the period, they did not completely succeed in encouraging industries to make a fuller use of domestic raw materials.

Since the main objective was to substitute final consumer goods, rather than to promote secondary processing of domestic raw materials, the increasing industrialization in Malaysia also resulted in the changing composition of trade in manufactured goods with imports of manufactured goods rising substantially in comparison to exports of manufactured goods--a classic shortcoming of

industrialization through import-substitution. In view of the above-mentioned shortcomings, in 1968, the focus of policy shifted to export-led growth, marking the beginning of a new phase of export-oriented industrialization. The Investment Incentive Act of 1968 was introduced to broaden the scope of incentives for industrial development and attract further industrial investment. The Federal Industrial Development Authority [later renamed as the Malaysian Industrial Development Authority (MIDA)] was established to expedite processing investment proposals. Between 1960 and 1970, the average annual growth rate of manufacturing exports from Peninsular Malaysia was 14.2 percent. Exports of manufacturing products grew more than two times the rate of total exports.

Second Malaysia Plan 1971-75

The New Economic Policy adopted in 1971 added a new dimension and direction to industrialization in Malaysia. The restructuring program of the Second Malaysia Plan during the 1971-75 period set out two quantitative targets: first employment by sector should reflect the ethnic composition of the population; second, by 1990, Malaysian groups (as opposed to the Chinese and other immigrants) should own and manage at least 30 percent of the corporate sector, an increase from its 2.4 percent share in 1972. This increase in the Malaysian groups' (Malaya and Bumiputera) share would be through their active participation in an expanding national take rather than through the redistribution of the existing wealth.

Among the policies to be promoted in this period were:

1. Export-processing zones (EPZs) or Free Trade Zones (FTZs) set up under the FTZ Act of 1971, whereby companies enjoy tax holidays, exemptions from import and export duties, and, unrestricted and tax-free remittance of profits and dividends within these enclaves. As a result, highly organized multinational subsidiaries dominated FTZs, assembling mainly electrical machinery, appliances and parts;

2. An amendment to the Investment Incentive Act, 1968, to increase incentives available to labor-intensive industries, and to allow firms outside the FTZs to enjoy similar benefits to those in FTZs;

3. An amendment to the Customs Act of 1967, also in 1971, to allow the establishment of licensed manufacturing warehouses outside FTZs;

4. Establishment of the Capital Issues Committee and Foreign Investment Committee in 1968 and 1974 respectively, to coordinate local and foreign investments;

5. Introduction of Industrial Coordination Act (ICA) in 1975 to provide some coordinated direction on the type of industries which would be promoted. Licenses were issued to those wishing to engage in manufacturing activities, subject to compliance with equity ownership and employment structure deadlines. However, the business community reacted strongly and negatively. Still, despite the uncertainties brought about by various acts, the period between 1971 and 1975 witnessed growth of around 11 percent per year in value-added from manufacturing, at a rate of 6.6 percent in 1972 to 14.4 percent in 1975. Employment grew in manufacturing at a rate of 6.6 percent per year and its export

performance grew by 29 percent per year, in excess of the growth target of 15 percent per year.

From a spatial perspective, the Second Malaysia Plan recognized that development should be integrated in space and time. For example, according to Cho (1990), "the Mid-Term Review of Second Malaysia Plan noted the correlation between ethnic and regional disparities in income. A correction was thus necessary 'so as to reduce and eventually eliminate the identification of race with economic function and geographical location'" (Malaysia 1973, page 7). But the biggest problem facing the government from an equity viewpoint (and putting to one side ethnicity consideration), "was that its attempt to improve regional distribution of income and to reduce regional disparities in economic development may be perverse in terms of racial distribution of income" (page 73).

Third Malaysia Plan 1976-80

The mid-term review of the Second Malaysia Plan set the tone for the Third Malaysia Plan 1976-80. NEP still provided the foundations of the national doctrine for the Third Malaysia Plan, but the programs proposed were less preoccupied with the targets posted in the Second Malaysia Plan. While NEP exclusively addressed the problem of Malaya poverty, in the context of the Third Malaysia Plan, rural poverty took on an expanded meaning. It now also referred to poor living in new villages and state worker's new villages that were created during the emergency (1948-60) and are inhabited mostly by Chinese. Estate workers are mainly Indians who live and work on the rubber and oil palm estates (Malaysia, 1976, page 159-77).

Development expenditures for the Third Malaysia Plan were almost twice that of previous plans. The private sector was expected to fund a greater proportion of this expenditure than the public sector, in contrast to previous plans. Careful reading of the plan will reveal that it was much more sympathetic to private investment and private savings. Such a switch reflected a realization that the public sector on its own would find development expenditures increasingly burdensome. To conclude, the Third Malaysia Plan, as MacAndrew (1977) explains: "provided a fascinating case study of the massive intervention and use of government policy and machinery to meet, contain, and shape political developments in the country since, the very scope and breath of the plan is based, for all its economic strength, on political factors" (page 308).

Fourth Malaysia Plan 1981-1985

In the early 1980s, Malaysia further embarked on heavy industry projects, launched under the leadership of the Heavy Industries Corporation of Malaysia (HICOM), in an effort to broaden and deepen the industrial base. A number of projects were initiated, such as iron and steel, cement, and the national car and small engine plants. These industries were heavily financed by foreign borrowing. Unfortunately, this was a period of global recession, and the government was confronted with the "twin-deficit problem" in the fiscal and external balances in 1982. The manufacturing sector was adversely affected in 1985 with real output in the sector declining by 3.8 percent, while manufacturing exports recorded a negligible growth of 0.23 percent.

The basic structural weaknesses of the economy also surfaced during that time. They included over-regulation and its impact on private investment, a huge debt overhead, an over-valued exchange rate, and the existence of a skills and technology gap.

Fifth Malaysia Plan 1986-1990

The Fifth Malaysia Plan represents the last segment of the twenty-year outline plan for attaining national unity. This plan views the last five-year period as the most crucial and challenging in light of the NEP and the state of the economy. The government will continue to provide an investment climate to stimulate certain domestic activities: road construction, low-cost housing, and rising standards of living in rural areas. The private sectors, however, are expected to provide the dynamism in the economy with the progressive withdrawal of the government from the economic sector. In this, the government expects that the private sectors will switch from their preoccupation with finance, property developments and real estate to manufacturing for exports. Malaysia Incorporated, a term adopted to refer to the integration of the roles and function of the government, the private sector, employers and employees, and producers and consumers, has as the theme to help develop a united, just, stable and progressive society.

The Fifth Malaysia Plan projected much growth to come from the private sector. However, according to World Bank's "East Asian Miracle" (1993), the privatization process has been proceeding very slowly; the performance of the private sector, although improving, has been dismal. The "East Asian Miracle"

(1993) further contends that although the "privatization . . . continues to this day, the Malaysian public sector remains formidable" (page 311).

Sixth Malaysia Plan 1991-1995

The performance of the manufacturing sector in 1990 surpassed the target share of the first outline perspective (OPP 1) within NEP. For the next twenty years, it is targeted by the OPP 2 to take up a higher share, 37.2 percent, of the GDP.

The formulation of the OPP 2 and the Sixth Malaysia Plan took into account the impact of past policies and strategies, seeing a continuation of policies and strategies aimed at a more broad-based, efficient and export-oriented manufacturing sector. In essence, Malaysia is embarking on a renewed economic development path, whereby the industrialization process will depend more on the economic framework of growth (Malaysia, 1991, pp. 45-50). Efforts are being made to enhance further the development of new sources of growth with a view of providing greater dynamism in an increasingly integrated manufacturing sector. Emphasis is also placed on product improvement in terms of quality and technology, through efforts towards the establishment of a strong scientific and technical infrastructure. In this respect, the recommendations of the Action Plan for Industrial Technology Development (APITD), which provide comprehensive guidelines for the development of short, medium and long-term strategies are being implemented. Among the strategies of APITD are the intensification of industrial research and development of indigenous technological capacities, as well as the development of adequate industrial manpower for R & D. The roles of existing R

& D centers are being enhanced to be more industrial-oriented and market-driven in their activities. The key areas designated for industrial technology development are automated manufacturing, advanced materials, electronic technology, biotechnology, and information technology. R & D also emphasizes the development of energy-saving technology and energy-efficient industries.

As part of the efforts to enhance and improve international competitiveness of industries, greater emphasis is being given toward the production of sophisticated high-quality and high value-added products that can compute and integrate with the markets of developed countries. Efforts are also directed toward ensuring the capacity of exports to compete internationally.

As local industries upgrade their technology and modernize their operations to remain competitive, there is an increasing need for trained manpower that could take advantage of information-based manufacturing technologies as well as current managerial and organizational techniques adopted by industries worldwide. In recognition of these developments, training for technical and supervisory staff, particularly technicians, as well as skilled workers at the production level, is given attention so that shortages of human skills do not pose a major bottleneck to the growth and modernization of industry (Malaysia, 1991, page 141-6).

Technology Transfer and Manpower Training

Foreign investment, from the point of view of developing countries, is expected to be accompanied by technology transfers from the industrial countries. This, expectedly, will happen through the flow of information, the use of patents and trademarks, and the use of production processes and engineering designs that

are separate from the employment of the foreign personnel and the import of machinery and plant equipment. Some of the methods through which these transfers take place are: technical cooperation programs, direct employment of foreign experts, contractual purchases of a given technology through licenses or agreements, or internalized technology transfer from parent companies to the subsidiaries. Generally, no reliable data exists pertaining to modes of technology transfer to Malaysia, nor to any developing countries. The available information, provided by the Malaysian government, indicates that much of such technology transfers for Malaysia have taken place through internalized modes for which no data is available, and through formal contractual agreements and joint ventures. These contractual agreements, of course, entail royalty payments by the Malaysians to the foreign investors or partners. The scarce or conflicting data available indicate a state of relative ignorance concerning the cost of technology transfer for Malaysia. As concerns the present study, this could imply a high cost of technology transfer to Malaysia, indicating the possibility of inefficient choice of industrialization.

Manpower training at the beginning stages of industrialization should be viewed as an integral part of the process of transferring technology. Most of the Malaysian subsidiaries of the multi-national corporations or the Malaysian companies who purchase technologies through licensing agreements, according to Anuwar Ali (1993), "are still largely at the stage of learning to absorb transferred process technology, rather than at a stage of improvement and innovation" (page 200). This implies that the role of the MNCs in improving production of labor has

not been significant, and the government has not incorporated a manpower training provision as criterion for evaluating and approving direct foreign investment. Many MNCs have set up branch plants in Malaysia in search of cheap, unskilled labor and good returns on investment. Mehmet (1983) argues that "the use of unskilled labor has resulted in the development of a secondary labor market dominated by low-wage female workers and rural immigrants" (page 131). Many of the firms in the FTZs are branch plant operations of MNCs producing for the world markets. Most employ unskilled, low-paid female workers in conjunction with highly automated techniques of production. This is the case, for example, in the electronics assembly industry, which is, at the same time, responsible for much of the growth in the manufacturing output. Cho (1992) contends that these branch plant industries tend to move about the areas where factor costs such as labor and land are cheapest. Apart from low wages (due to lack of skills), the lack of career prospects results in a high rate of turnover. Cho argues that such industries have not resulted in the transfer of skills or achieved high output per worker because of the high capital investment per unit of labor. Cho cautions that the growth of the secondary labor market may be counter-productive on both social and economic grounds (page 216).

Manufacturing Sector

The manufacturing sector in Malaysia is now the single most important sector of economy, according to indicators such as the manufacturing share of GDP, contribution to exports, earnings and to job creation. In the last three

decades, the rapid growth of the manufacturing sector has transformed Malaysia from an agriculture-based economy into a second-tier NIC (Limqueco et al., 1989).

Malaysia's manufacturing sector encompasses most industries and types of products, from low-technology goods such as certain types of foodstuffs, through medium-technology production of some chemical products, to some high-technology elements in the electronic and rubber industries. Manufacturing in Malaysia also includes the light industries producing textiles and garments, as well as government-sponsored "heavy" industry, including the manufacture of the Malaysian car, cement plants, steel mills and the like. Also, manufacturing in Malaysia as seen by O'Brien (1993), comprises three elements: first, the longest-established import-substituting section, which produces goods such as food and drinks, some simple metal productions, some electrical products, and the like; second, companies manufacturing resource-based, mainly export oriented products such as latex rubber and timber products; and third, companies involved in the production of non-resource-based products, such as electrical goods and electronic components, for sale on the world market.

The manufacturing sector today is of great absolute and relative significance. The question, however, is whether this key sector of the Malaysian economy is capable of self-sustained reproduction, or whether it is dependent upon the outside world for inputs and for markets of its outputs. A survey by O'Brien (1993) concluded that 59 percent of output of the manufacturing sector comprises investment goods and 41 percent comprises consumption goods. In this survey, manufacturing industries were classified as being essentially investment or

consumer goods producers, consideration was given that at least 75 percent of their production output was directed to one or the other of these sectors.

This high percentage of output consisting of investment goods leads to some degree of self-sufficiency for the manufacturing sector in any developing country. This, however, will be the case if the investment goods produced in Malaysia are used in Malaysian manufacturing and, equally important, if the unfinished products and components made by the Malaysian manufacturers constitute inputs for other domestic manufactured goods. This is not always the case according to the results of the aforementioned survey. The issue at stake here is one of interindustry linkage, introduced by Hirschman (1958).

Manufacturing Sector Linkage

In his theory of unbalanced growth, Hirschman (1958) introduced the two concepts of "forward linkage" and "backward linkage." Backward linkage occurs when an industry makes use of another domestic industry's output in creating its product. Backward linkages stimulate demand at earlier stage in production process, inducing positive investment decisions in industries that supply inputs to the industry in question. Forward linkage occurs when an industry produces a good that becomes an input for another manufactured product. Forward linkages induce investment decisions by increasing the availability of a certain output for use at later stages of production; that is, by decreasing the cost of productive activities in "downstream" industries.

All the manufacturing industries are one way or the other connected to the national economy, through their use of infrastructure such as sewage, roads, railways, harbors, airports, water, electricity, postal services and so on, and also through their employment of labor. In the case of Malaysia, as noted by O'Brien (1993), however, "marked differences exist beyond this point. These variations are, in part, due to the uneven global distribution of natural resources, but are also a consequence of the policies and practices of the companies which comprise the manufacturing sector" (page 151).

According to available data, an insignificant proportion of value added in Malaysian manufacturing comes from machinery production (in 1988, for example, only 2 percent). This domestic output of machinery and equipment is insufficient to meet local demands. Therefore, as the data on imports reveals, Malaysian manufacturers are highly dependent on both finished and unfinished inputs from abroad. In 1986, for example, 23 percent of all imports were consumption goods; 29 percent were investment goods and 48 percent intermediate goods. It is important to know whether these imported machines and investment goods are being used to manufacture Malaysian-made capital equipment which will reduce the country's dependency on imports some time in the future.

Although, in terms of size and pattern of ownership, the manufacturing sector in Malaysia is diverse in terms of output and value, the sector is narrowly based. For example, according to O'Brien (1993), in 1988, nearly half of value-added in the sector came from just three industries--food and beverages, chemicals, and electrical and electronic products. The production of food and other

consumption goods does have a positive impact on economy industrialization since they are produced and consumed in Malaysia. However, they do not have the same developmental potential as the production of investment goods because the final product is consumed and is not a component of something else that could be made in Malaysia. Manufacturing chemicals mainly consists of a great deal of mixing of compounds imported from abroad, using machinery imported from abroad. However, this is one industry that could generate some backward linkage (between traders and manufacturers) and forward linkage between manufacturers of intermediate goods such as industrial chemical products and those industries that use these goods.

As was mentioned earlier, manufactured products constitute almost half of the country's total exports. The electrical and electronic industries contribute well more than half the country's exports. Significantly, local input into the electrical industry comes from low technology components of these products. Many of the sophisticated components are either not available locally or are imported from abroad by preference. The backward linkage in the electrical industry, therefore, exists between the manufacturers and local producers and the importers are the ports from abroad. The forward linkage is, however, weak because most of these products are sold abroad.

In the electronics industry, much of the inputs (like all Silicon logs used to make semi-conductors) are developed in the USA and Japan. They are then air-freighted to Malaysia for slicing and polishing, and then reexported to the USA and Japan for chemical etching with circuit designs. Once this is done, the wafers

are then re-imported to Malaysia for dicing and attachment to fairly simple metal lead-frames. Much of the output is then sold on the world market. At the input end, therefore, links exist between the electronic companies and the local markets, at least in so far as the supply of low-technology components is concerned. Most often, transactions take place at the subsidiary-to-subsidiary level, that is, within the companies. At the output end, the data presented by O'Brien (1993) suggests that foreign-owned electronics companies forge few links within the local economy" (page 153). Most of the foreign capital invested in these industries is headquartered in Singapore, Japan, the USA or Australia.

Concluding Remarks

A review of the Malaysian economy indicates that with respect to some of the criteria for industrialization, Malaysia has made significant advances on its road to industrialization. These criteria include annual average growth in manufacturing output, the share of manufacturing employment, and the growth rate of manufacturing exports.

A closer look at the economy, however, reveals some structural problems concerning the industrialization process in Malaysia. First, at the time of converting from import-substitution strategy to an outward-oriented economy which took place due to the saturation of the domestic market, the Malaysian industrial base was narrow. This would make it difficult to compete with neighboring developing countries in Asia, who simultaneously chose export expansion strategy in penetrating protected overseas markets.

Second, the governments' preoccupation with ethnic equity and eradication of poverty, that would entail heavy governmental involvement in the economy, was naturally associated with difficulties in achieving efficiency. Third, the vigorous pursuance of export-promotion strategy entailed heavy reliance and over-dependence on foreign investment. The new plants were established by overseas investors and thereby under foreign control and the use of capital-intensive methods and scale of production was transplanted from Europe and North America. Such industries were not labor-intensive and as mentioned earlier, they did not contribute to employment growth by creating new backward linkage. Furthermore, while the modern sector of industry grew rapidly, the traditional sector remained small and did not benefit from spill-over from modern industry. Therefore, small-scale industry played an insignificant role in the Malaysian economy, especially in manufacturing. Moreover, as previously addressed, inter-industry linkage has also been extremely weak and has done little to reinforce the industrial base of the economy.

These factors indicate that the impressive growth of the economy, as reflected by GDP growth, may not have resulted in, and has not been associated with, a proportional growth of Total Factor Productivity (TAP). A sustained growth and long-run economic development is only guaranteed by the growth in productivity of primary factors of production. The simultaneous-equations model in the present study will investigate the role of exports growth in the growth of capital formation and the role of the growth of labor and investment in GDP growth.

Chapter IV

DESIGN OF THE STUDY

The simplest approach to investigate the bivariate relationship between exports and growth is to calculate and examine the simple (Pearson and Spearman) correlation coefficient between the rate of growth of exports and the GDP growth. An obvious problem with this approach, however, is that the correlation coefficient technique does not incorporate the effects of other relevant variables.

Another simple test of the role of exports on economic growth can be performed by using simple regression.

Model 1 - Simple Regression

The present study postulates income as a function of exports, in a logarithmically linear function. That is:

$$\text{Log } Y = a + b \text{ Log } X$$

Where Y and X are GDP and total exports, both in local prices.

The hypothesis to be tested here is that export growth makes a positive contribution to income growth. This study will also calculate the elasticity of income with respect to exports in Malaysia and compare it with its counterpart for other developing countries. Several variations of the simple regression will be tested. By adding a dummy variable, this study will also investigate the impact of the government policy of encouraging aggressive export-push strategy via DFI.

Model 2 - A Neoclassical Model of Trade and Growth

It is possible that while a strong correlation between income growth and export growth is present, both export and GNP growth can be explained by other factors which are themselves basically responsible for economic development. Michalopoulos and Jay (1973) [hereafter also called M & Jay (1973)], using a neoclassical model, attempted to remedy this problem by including domestic and foreign investment and labor, as well as exports, as explanatory variables in a production-function type relationship. The basic tenet of the neoclassical thesis is that export growth is beneficial to income growth by enabling a developing country to sustain increase in productivity through increased competition, specialization and improved resource allocation. Several studies followed their lead in utilizing this approach which has come to be known as the neoclassical model of exports and GDP growth. This study, as a preliminary step, following Michalopoulos and Jay, constructs and tests a simple production-function model. However, unlike in Michalopoulos and Jay(1973), this study uses total capital. Assuming a Cobb-Douglas production function postulating total output as a function of capital, labor and exports, we can write:

$$Y = A K^{\alpha} L^{\beta} X^{\gamma} \qquad (1)$$

Where
Y = Real Gross Domestic Products
K = Capital input in Physical Units
L = Labor input in physical units
X = Real value of exports
A = Constant

We can add a time dimension to this function by expressing all these variables as a function of time. Differentiating with respect to time gives:

$$\frac{dY}{dt} = A\alpha L^{\beta}X^{\gamma}K^{\alpha-1}\left(\frac{dk}{dt}\right) + A\beta K^{\alpha}X^{\gamma}L^{\beta-1}\left(\frac{dL}{dt}\right) + A\gamma K^{\alpha}L^{\beta}X^{\gamma-1}\left(\frac{dX}{dt}\right) \qquad (2)$$

Dividing through by equation (1) results in:

$$\frac{\frac{dY}{dt}}{AK^{\alpha}L^{\beta}X^{\gamma}} = \frac{A\alpha L^{\beta}X^{\gamma}K^{\alpha-1}\left(\frac{dK}{dT}\right)}{AK^{\alpha}L^{\beta}X^{\gamma}} + \frac{A\beta k^{\alpha}X^{\gamma}L^{\beta-1}\left(\frac{dL}{dt}\right)}{AK^{\alpha}L^{\beta}X^{\gamma}} + \frac{A\gamma K^{\alpha}L^{\beta}X^{\gamma-}}{Ak^{\alpha}L^{\beta}} \qquad (3)$$

or:

$$\frac{\frac{dY}{dt}}{Y} = \alpha\frac{\frac{dK}{dt}}{K} + \beta\frac{\frac{dL}{dt}}{L} + \gamma\frac{\frac{dX}{dt}}{X} \qquad (4)$$

Noting that:

$$\mathbf{dY/dt = Y_{t+1} - Y_t}$$

$$\mathbf{dK/dt = K_{t+1} - K_t = I}$$

$$\mathbf{Dl/dt = L_{t+1} - L_t}$$

Substituting into (4) we get:

$$\frac{Y_{t+1} - Y_t}{Y_t} = a\frac{I_t}{Y_t} + b\frac{L_{t+1}-L_t}{L_t} + c\frac{X_{t+1}-X_t}{X_t} \qquad (5)$$

Or alternatively we can write:

$$\dot{Y} = a\dot{I} + b\dot{L} + c\dot{X} \qquad (6)$$

(Growth of a variable will be shown with a dot over that variable, or as a superscript or the word "dot," hereafter,)

and $a = \alpha/K$, and $b = \beta/L$, $c = \gamma/X$

α and β are marginal physical product of Capital and labor,

a and **b** and **c** are elasticities of output with respect to **K** and L and X

Growth of capital is determined by the investment. It is true that investment in any year is some multiple of that year's GDP. That is, **K = Ky**, where k is the marginal propensity to invest.

Following Michalopoulos and Jay, this study first tests a production function of the Cobb-Douglas type including $\dot{I}$ and $\dot{L}$ (X not included) and then, to test the hypothesis that inclusion of export will raise the explanatory power of the equation and that the coefficient of exports is significant and positive, the following two models will be tested:

$$\dot{Y} = a\dot{I} + b\dot{L} + \varepsilon \qquad (7)$$

$$\dot{Y} = a\dot{I} + b\dot{L} + c\dot{X} + \varepsilon \qquad (8)$$

The linkage between export growth and output growth is well grounded in theory. The inclusion of export in the Cobb-Douglas model by Michalopoulos and Jay, of course, does not imply that exports are treated as an input in the production

function. It only suggests that export contributes to economic growth due to gains in productivity. Classical and neoclassical economists for a long time have cited export and free trade as a factor contributing to growth and development. In the case of developing countries, export has been noted to contribute to growth in the following ways:

1. Exports can provide a country with the foreign exchange needed to import capital and thereby enhance productivity. Capital is a crucial input in both the aggregate production function and the manufacturing sector. This is the argument used within the framework of two-gap models of development.

2. Countries tend to export the goods in which they have comparative advantage and, therefore, are relatively more efficient. Exports growth implies concentrating investment in the more efficient sectors of economy. Additionally, as argued by Tybout (1992), the necessity to remain competitive in the international market creates pressure to keep cost low and for more efficient use of factors of production (The "x-efficiency" argument by Leibenstein, 1966).

3. Exports tend to stimulate further investment, both domestic and foreign. This is true both in the same industry and those to which industry is linked.

4. Exports lead to lower production cost by generating economies of scale. The international trade provides additional markets for domestic production.

5. Lucas (1993) emphasizes the spillover of technology by linking trade to "learning by doing." According to Lucas, "large volume of trade is essential to

a learning based growth episode" (page 268). The idea of technology spillover goes back to John Stuart Mill as discussed by Meier (1995).

Model 3 - The effect of exports and industrialization in economic growth

In this model, following Salvatore and Hatcher (1991) we add industrialization as an additional input to the general-case model of exports and growth (neoclassical model). Instead of the Cobb-Douglas model, we can use a general model. Thus we write:

$$\mathbf{Y = (F, L, K, X, R)}$$

Totally differentiating Y will result in :

$$dY = \frac{\partial Y}{\partial L}\,dL + \frac{\partial Y}{\partial k}\,dK + \frac{\partial Y}{\partial R}\,dR + \frac{\partial y}{\partial X}\,dX$$

Dividing through by Y and additional manipulation will give:

$$\frac{dy}{Y} = \frac{\partial Y}{\partial L}\frac{dL}{Y}\frac{L}{L} + \frac{\partial Y}{\partial K}\frac{dK}{Y}\frac{K}{K} + \frac{\partial Y}{\partial R}\frac{dR}{Y}\frac{R}{R} + \frac{\partial Y}{\partial X}\frac{dX}{Y}\frac{X}{X}$$

or:

$$\frac{dY}{Y} = \frac{\frac{\partial Y}{Y}}{\frac{\partial L}{L}}\frac{dL}{L} + \frac{\frac{\partial Y}{Y}}{\frac{\partial K}{K}}\frac{dK}{K} + \frac{\frac{\partial Y}{Y}}{\frac{\partial R}{R}}\frac{dR}{R} + \frac{\frac{\partial Y}{Y}}{\frac{\partial X}{X}}\frac{dX}{X}$$

Alternatively, we can write:

$$\dot{Y} = a_0 + a_1\dot{L} + a_2\dot{K} + a_3\dot{R} + a_4\dot{X}$$

Where a dot over a variable indicates its rate of growth and a_1, a_2, a_3 and a_4 are the elasticities of output with respect to **L, K, R,** and **X**.

The justification for inclusion of exports in the production function was discussed earlier in the discussion pertaining to the second model.

Just as in Salvatore and Hatcher's (1991) study, R is here used as an index or measure of the structural changes that are caused or followed by economic growth and development. These include the transfer of labor and capital from agricultural and other traditional sectors. Lewis (1954), attributes the rapidity of this growth process to the rate at which capital formation takes place. Salvatore (1983) argues that, since the index of industrial production reflects the rate of past investments, R can be used as a Proxy for the rate of investment and the concomitant introduction of new technologies in the pervious years. Salvatore & Hatcher refer to the findings by Pack (1988), indicating that a relatively high and rising level of industrial production is an indication that the developing nation is already likely to have many of the preconditions for structural growth, such as basic infrastructures and some skilled labor.

Salvatore and Hatcher later modify this model by substituting per capita output for total output (Y) and also by dropping L as an explanatory factor. Their justification for this, according to them, is that unless population growth is more than matched by economic growth, economic development does not materialize. Also, dropping L as an explanatory variable is justified by Salvatore and Hatcher on the ground that in most underdeveloped countries, we witness large unemployment and underemployment.

The present study applies none of these modifications. Salvatore and Hatcher's argument concerning validity of per capita income, rather than total income, is not justified. If testing the model results in high elasticity of output growth with respect to exports growth, it implies that export promotion benefits economic growth. This is true regardless of its impact on per capita income growth. The other argument concerning the presence of high unemployment in most developing countries, at least for the last decade, does not apply in the case of Malaysia.

The present study improves on that of Salvatore and Hatcher's in the following respects:

a) it includes labor variables. The data on Malaysia do exist and inclusion of labor will allow us to test the impact of increases in labor productivity on growth.

b) it applies to the specific case of Malaysia. Salvatore and Hatcher's study, although it included Malaysia, was primarily concerned with comparison of groups of countries (i.e., lower income, middle income, etc.).

c) the data in this study covers a significantly wider and more recent time period. Malaysia's export-led and income growth has been especially impressive during the period not covered in Salvatore and Hatcher's study.

Since there are no sufficient data concerning K for Malaysia, following Tyler (1981), we can substitute $\dot{I}$ (the gross fixed capital formation) for $\dot{K}$ Therefore, for the purpose of econometric analysis, we test the model for Malaysia for the period of 1966-1994.

$$Y = a_0 + a_1 \dot{L} + a_2 \dot{I} + a_3 \dot{X} + a_4 \dot{R} + E$$

Where:
Y = The growth of the real GDP is constant dollars
I = gross capital formation as a percentage of GDP
X = The growth is real value of the real export
R = The growth of real industrial production.
a, x constant, a marginal physical capital products of and capital, respectively and a and a respectively, are industrialization and export elasticities of Income.

Ceteris Paribus, a_1 and a_2 are expected to be positive and significant. The positive relationship between export growth and income growth is supported by theory, as discussed in a previous section, and has been empirically confirmed by many researchers who tested different models for different countries in different time periods. These include, and are not limited to, Michaely (1977), Balassa (1978,1985), Tyler (1981), Feder (1982), Kavoussi (1982), Salvatore (1983), Ram (1985 and 1987), all of which are discussed in this study under the Review of Literature. So a_3 is expected to be positive. In this study, the elasticity of income with respect to exports (a_3) will provide information concerning the contribution of export growth to economic development in the case of Malaysia. Industrialization, in the case of Malaysia, where it has been pursued under a strongly outward trade orientation, is expected to have led to efficiency gains that will in turn lead to income growth. Since the mid 1960s, however, for the most part, industrialization was pursued under heavy government controls. Due to inefficiencies normally associated with government involvement, the sign of a_4 may be negative.

This model will be estimated using the method of Ordinary Least Squares.

Model 4 - A Simultaneous-Equations Model of Exports and Growth

In the single-equation models of export and growth, such as those introduced in the previous sections, the crucial assumption made is that all the explanatory variables (L,K,X and R) are independent of the error term ε. In reality, however, because of probable mutual dependence of the explanatory (independent variables $\dot{X}$ & $\dot{R}$) and the dependent variable ($\dot{Y}$), a persistent bias may be present which overstates or understates the role of exports and industrialization in the growth process. In cases such as these, and also to overcome the shortcomings from the partial and static nature of the single-equation approach, we can introduce a simultaneous-equation model of trade, industrialization and economic development.

Except for Salvatore (1983), all of the empirical studies of trade and development in the last three decades have utilized single-equation models. This has been the case despite the fact that some of those researchers have conceded the fact that their models suffer from simultaneity bias. This study, following Salvatore (1983), introduces a simultaneous-equations model of exports, industrialization and growth. The model of this study, however, differs with that of Salvatore's in several respects. The differences, and the justifications for them, are discussed below.

We begin by postulating, like before, the output as a function of labor and capital inputs (L & K), industrialization (R) and exports (X):

$$\dot{Y} = \mathbf{f}(\dot{L} , \dot{I} , \dot{X} , \dot{R})$$

Dividing by Y and performing algebraic manipulations such as those in the previous model (model 2) results in the following equation:

$$\dot{Y} = a_0 + a_1 \dot{L} + a_2 \dot{I} + a_3 \dot{X} + a_4 \dot{R}$$

where a dot over a variable indicates its rate of growth.

In order to take account of the importance and contribution of investment to the development process, the rate of investment should be endogenized. Therefore, an investment function is introduced. Theoretically, several variables could be considered as determining the rate of investment such as the level of savings, interest rate, foreign capital inflows, governmental decisions and so on. This study postulates the domestic saving rate as the main determinant of the investment rate. This notion is well established in the classic economic literature since Adam Smith. The rate of domestic saving itself, especially for the developing nations, is expected to be determined by the level of growth of output; a notion well established in the literature, both theoretically and empirically [Douglas (1971), Mikesell and Zisner (1973) and Chenery and Carter (1976)]. Growth of exports can lead to increase in saving, through taxation (public savings) and due to increased income (private savings). Exports can also provide a nation with the foreign exchange needed to import capital goods (investment). Studies of Chenery and Eckstein (1970), Maizels (1968), and Lee (1971) provide conclusive evidence for this argument. Thus, saving is viewed to be a function of the output

and exports. That is: S = S(Y,X.F) and, therefore, $\dot{I}$ (investment growth) is expected to be a function of, and positively related to, $\dot{Y}$ and $\dot{X}$ and $\dot{F}$, That is:

$$\dot{I} = \mathbf{b}_0 + \mathbf{b}_1 \dot{Y} + \mathbf{b}_2 \dot{X} + \mathbf{b}_3 \dot{F} \qquad (2)$$

It is apparent from (2) and (1) that there exists a simultaneity link in this model, since $\dot{Y}$ in equation (1) is a function of $\dot{I}$, and $\dot{I}$ is a function of $\dot{Y}$ in equation (2). Also, $\dot{Y}$ is postulated as being directly related to $\dot{X}$ in equation (1) and $\dot{I}$ is a function of $\dot{X}$ in equation (2).

Industrialization, as discussed in chapter four, has been a primary policy goal of the Malaysian government since the beginning of the New Economic Policy (1971). Therefore, in a third equation, we postulate industrial output growth ($\dot{R}$) to depend on the GDP growth ($\dot{Y}$) and the growth of exports and the level of industrial output growth in the previous year (Lag of $\dot{R}_t$). That is:

$$\dot{R}_t = \mathbf{c}_0 + \mathbf{c}_1 \dot{Y} + \mathbf{c}_2 \dot{X} + \mathbf{c}_3 \dot{R}_{t-1} \qquad (3)$$

Equation (3) will establish another simultaneity link in this model. $\dot{R}$ is a function of $\dot{Y}$ in equation (3) and $\dot{Y}$ depends on $\dot{R}$ in equation (1).

The rate of exports growth itself needs to be endogenized. In general, the level of exports for a nation is expected to depend on many factors including the

exchange rates at the domestic and world level, the economy's competitiveness with that of the world both in terms of costs of production and quality, the domestic price level, the world's economic conditions and the domestic level of industrialization. Also, as Freeman (1971) noted, for successful export-led growth to occur, export demand must be strong, with linkage between exports and domestic economy. This study postulates exports to be a function of the domestic price level as represented by the ratio of unit price of exports for Malaysia relative to that of the world. Also, due to Malaysia's special case, discussed in Chapter Four, we postulate exports growth to be also a function of foreign capital inflow and growth of investment. That is:

$$\dot{X} = \mathbf{d}_0 + \mathbf{d}_1\mathbf{P} + \mathbf{d}_2\mathbf{W} + \mathbf{d}_3 \dot{F} + d_4 \dot{I} \qquad (4)$$

where P is the ratio of unit price of export of Malaysia relative to that of the world, W is the index of real GDP for the world, $\dot{F}$ is the ratio of foreign capital inflow; $\dot{X}$ and $\dot{I}$ are defined earlier.

Through $\dot{I}$ and $\dot{F}$, another simultaneity link is established. $\dot{X}$ is related to $\dot{F}$ and $\dot{I}$ in (4) and it is related to $\dot{R}$ in equation (3), $\dot{I}$ and $\dot{R}$ link (3) and (4) to the rest of the model.

The study, therefore, seeks to investigate the impact of export growth and industrialization using the following simultaneous-equation model:

$$\dot{Y} = a_0 + a_1\dot{L} + a_2\dot{I} + a_3\dot{X} + a_4\dot{R} + \epsilon_Y$$

$$\dot{I} = b_0 + b_1\dot{Y} + b_2\dot{X} + b_3\dot{F} + \epsilon_I$$

$$\dot{R} = C_0 + C_1\dot{Y} + C_2\dot{X} + C_3\dot{R}_{t-1} + \epsilon_R$$

$$\dot{X} = d_0 + d_1P + d_2W + d_3\dot{F} + d_4\dot{I} + \epsilon_X$$

The models represented by the structural equations (1) and (2), (3) and (4) are jointly dependent on endogenous variables $\dot{L}$, $\dot{I}$, $\dot{X}$, $\dot{R}$ and 4 exogenous variables ($\dot{L}$, $\dot{F}$, P and W). There are 25 observations on each of these variables. The system of equations (1) through (4) is complete in the sense that there are as many equations as there are dependent variables. Following standard notations (e.g. adding a disturbance term, etc.), the system can be represented as an econometric model. Assumptions regarding completeness and linearity of the distribution of the disturbance terms and full rank and non-stochasticity of predetermined variables will be imposed on the model. The identification conditions, both the order and rank conditions, will be verified before estimating the model.

Methods of Estimation

The present study uses two estimation methods to test the models proposed. These methods are Ordinary Least Squares (OLS), for the simple regression models (models 1 & 2 & 3), and Full Information Maximum Likelihood (FIML), for estimating the simultaneous-equations models. Methods of Two-stage Least

Square (2SLS) and Three-stage Least Square (3SLS) are also used, and reported as an appendix, for the purpose of examining the differences between methods of estimation.

Ordinary Least Squares (OLS) Method

Under a set of assumptions (e.g. no autocorrelation between the error terms, no autocorrelation between the error term and the explanatory variables, no specification error), the OLS estimates produce consistent and efficient estimators of the regression Parameters.

In brief, the OLS method involves finding the least squares line and its equation, least squares prediction equation, that satisfies the least square criterion; that is, the sum of squared errors will be smaller than for any other straight line models.

Two-Stage Least Squares (2SLS) Method

When using OLS, the crucial assumption made is that the explanatory variables are independent of the error term ϵ, if the independent variables (or some of them) appear as the dependent variable. In another equation (that is, when the endogenous variable in one equation appear as an explanatory variable in another equation within simultaneous equation models) then such endogenous explanatory variables will become Stochastic and are usually correlated with the error term of the equation. In cases such as this, the OLS estimators will be inconsistent. This means they do not converge to the true values of the population regardless of how large the sample size is. In cases such as these, alternative estimating techniques,

such as Two-stage Least Squares techniques (2SLS), are used to circumvent this difficulty (Maddala, 1988).

Two-stage Least Squares (2SLS), as the name implies, involves conducting an analysis in two steps, both of which are (successive) applications of OLS.

Stage 1. Estimating the reduced-form equations by OLS and obtain the predicted value for the endogenous variables.

Stage 2. Replacing the right-hand side endogenous variables by their predicted values and reestimate the equation by OLS.

Thus in stage 2 of the 2SLS methods we can replace all the endogenous variables in the equation by their predicted values from the reduced-forms and then estimate the equation by OLS.

Reduced-Form Equations

The equations formulated at the time one builds a model are called the structural equation, such as those in the simultaneous-equations model of the present study. The coefficients estimated are called structural parameters. However, from the structural equations, one can solve for all the endogenous variables and derive the reduced-form equations variables and the associated reduced-form coefficients. A reduced-form equation is one that expresses an endogenous variable solely in terms of predetermined variables and error terms. The derivation of the reduced-form for the simultaneous equation in the present study appears in appendix 4.

Full-Information Maximum Likelihood (FIML) and Three-Stage Least Squares (3SLS)

In the Two-stage Least Squares method, it is assumed that the error terms of each equation are correlated with the endogenous independent variables (in the right-hand side of the equation). However, it is assumed that there are no correlations between the error terms of different equations within the simultaneous-equation model. Davidson and Mckinnon (1993) classify the methods for estimating simultaneous-equation models in two different ways. One natural division, according to them, is between single equation methods such as 2SLS, estimate the model one equation at a time. The other, write Davidson and Mckinnon, estimates all the parameters of the model at once. These are the methods of Full-Information Maximum Likelihood (FIML) and Three-stage Least Squares (3SLS). Single equation methods are easier to use; full-system methods potentially yield more efficient estimates since they take into account the correlation between equations. Another problem with single equation methods is that they ignore the possibility of cross-equation restrictions; Full-Information Systems such as FIML (and 3SLS) take it into account. When the full system is set up, parameters that appear in more than one equation are automatically treated differently from parameters that appear in only one.

The Three-Stage Least Squares (3SLS) can be computed in three stages. The first two stages are those of 2SLS, applied separately to each equation of the system. In the third stage, it estimates the whole model using the method of

Generalized Least Square (GLS). The 3SLS method, unlike FIML does not require the normality of the distribution of error terms and therefore as compared with FIML, it is applicable to a variety of alternative distributions. However, under asymptotic conditions, FIML produces more efficient estimates of the parameters.

Specification Problem: Hauseman Test

The estimation method of Ordinary Least Squares will produce a consistent and efficient estimate of parameters if there is no simultaneity problem. Simultaneity problems arise if the regressors (independent variables) are themselves endogenous and are, therefore, likely to be correlated with the error term. Therefore, before using OLS, one needs to test whether there is a significant simultaneous-equations bias; if so, then the single-equation model will be inadequate. A test for simultaneity is essentially a test of whether an endogenous regressor is correlated with the error term. If it is, then alternative methods of Two-Stage Least Square will produce consistent and efficient estimators.

Additionally, as noted earlier, if we assume the error terms of equations are also correlated, then 3SLS and FIML estimation methods are appropriate. The Hauseman Specification test or m-statistic can be used to test the hypothesis in terms of bias or inconsistency of the estimators where the bias is due to error in specification of the model. The m-statistic can also be used to compare the 3SLS estimators with the FIML estimators and to test the null hypothesis of normality of the error distribution.

The m-statistic is given by:

$$m = \hat{q}' (\hat{V}_1 - \hat{V}_0)^{-1} \hat{q}$$

where $\hat{V}_1$ and $\hat{V}_0$ represent consistent estimates of variance-covariance matrices of β_0 and β_1, and β_0 and β_1 represent the predicted values of β_0 and β_1, the parameters in the model as estimated by FIML and 3SLS respectively and

$$q = \beta_1 - \beta_0$$

The m-statistic has a χ^2 distribution with K degrees of freedom, where K is the rank of the matrix ($\hat{V}_1 - \hat{V}_0$)

In practice, according to Fair (1984, pages 246-247), if ($\hat{V}_1 - \hat{V}_0$) is not a positive-definite matrix, then the test for the normality of the error distribution cannot be performed and the Hauseman test fails to produce useful results.

In either case, as any non-introductory econometric textbook (e.g. Gujarati, 1995 page 655) will admonish, it is up to the model builder to specify, a priori, which variables are endogenous and which are exogenous and whether, from the theoretical point of view, simultaneity exists. If theory indicates the existence of simultaneity between the variables in the model, then one needs to forego the single-equation model and choose a simultaneous-equation model instead. This is true regardless of whether or not any specification test will justify the use of a simultaneous-equation model. The simultaneity of the trade-growth relationship is

theoretically established and, with respect to the present study, was discussed earlier in this chapter.

Appendix 4

DERIVATION OF THE REDUCED-FORM EQUATIONS

As discussed in chapter four, derivation of the reduced-form equations entails solving of the structural equations of the simultaneous-equation model for the endogenous variables. This will allow us to have only the exogenous (Pre-determined) variables on the right-hand side of each equation.

With respect to the simultaneous-equations model of this study, that is the following:

$$\dot{Y} = a_0 + a_1\dot{L} + a_2\dot{I} + a_3\dot{X} + a_4\dot{R} + \epsilon_Y$$

$$\dot{I} = b_0 + b_1\dot{Y} + b_2\dot{X} + b_3\dot{F} + \epsilon_I$$

$$\dot{R} = C_0 + C_1\dot{Y} + C_2\dot{X} + C_3\dot{R}_{t-1} + \epsilon_R$$

$$\dot{X} = d_0 + d_1P + d_2W + d_3\dot{F} + d_4\dot{I} + \epsilon_X$$

We need to solve this system of equations with respect to $\dot{Y}$, $\dot{I}$, $\dot{R}$, and $\dot{X}$. To do this, we can rewrite the system in the matrix form as follows:

$$(\dot{Y}\ \dot{I}\ \dot{X}\ \dot{R}) \begin{bmatrix} 1 & -b_1 & -c_1 & 0 \\ -a_2 & 1 & 0 & -d_4 \\ -a_3 & -b_2 & -c\text{-}2 & 1 \\ -a_4 & 0 & 1 & 0 \end{bmatrix} = (\dot{F}\ \dot{L}\ P\ \dot{R}_{t-1}\ W\ 1) \begin{bmatrix} 0 & b_3 & 0 & d_3 \\ a_1 & 0 & 0 & 0 \\ 0 & 0 & 0 & d_1 \\ 0 & 0 & c_3 & 0 \\ 0 & 0 & 0 & d_2 \\ a_0 & b_0 & c_0 & d_0 \end{bmatrix}$$

$$+ \quad (\epsilon_Y\ \epsilon_I\ \epsilon_R\ \epsilon_X)$$

Or:

$$(\dot{Y}\ \dot{I}\ \dot{X}\ \dot{R}) = (1\ \dot{L}\ \dot{F}\ \dot{R}_{t-1}\ P\ W) \begin{bmatrix} a_0 & b_0 & c_0 & d_0 \\ a_1 & 0 & 0 & 0 \\ 0 & b_3 & 0 & d_3 \\ 0 & 0 & c\text{-}3 & 0 \\ 0 & 0 & 0 & d_1 \\ 0 & 0 & 0 & d_2 \end{bmatrix} \begin{bmatrix} 1 & -b_1 & -c_1 & 0 \\ -a_2 & 1 & 0 & -d_4 \\ -a_3 & -b_2 & -c_2 & 1 \\ -a_4 & 0 & 1 & 0 \end{bmatrix}^{-1}$$

Solving the preceding system results in the following reduced-form equations in which the endogenous variables are defined solely in terms of the exogenous variables. Now, since there are no endogenous variables on the right-hand side, we can use OLS to estimate the coefficients of the parameters which are themselves defined in terms of the parameters of the structural equations:

$$\dot{Y} = \frac{1}{s}(s_0\dot{F} + s_1\dot{L} + s_2P + s_3\dot{R}_{t-1} + s_4\dot{W} + s_5) + \mu_Y$$
$$\dot{I} = \frac{1}{s}(t_0\dot{F} + t_1\dot{L} + t_2P + t_3\dot{R}_{t-1} + t_4\dot{W} + t_5) + \mu_I$$
$$\dot{X} = \frac{1}{s}(u_0\dot{F} + u_1\dot{L} + u_2P + u_3\dot{R}_{t-1} + u_4\dot{W} + u_5) + \mu_R$$
$$\dot{R} = \frac{1}{s}(v_0\dot{F} + v_1\dot{L} + v_2P + v_3\dot{R}_{t-1} + u_4\dot{W} + u_5) + \mu_X$$

In matrix form:

$$(\dot{Y}\ \dot{I}\ \dot{X}\ \dot{R}) = \frac{1}{s}(\dot{F}\ \dot{L}\ P\ R_{t-1}\ \dot{W}\ 1)\begin{bmatrix} s_0 & t_0 & u_0 & v_0 \\ s_1 & t_1 & u_1 & v_1 \\ s_2 & t_2 & u_2 & v_2 \\ s_3 & t_3 & u_3 & v_3 \\ s_4 & t_4 & u_4 & v_4 \\ s_5 & t_5 & u_5 & v_5 \end{bmatrix} + (\mu_Y\ \mu_I\ \mu_R\ \mu_X)$$

where μ is the error term of the reduced-form equations.

Solving the above reduced-form equations results in the following solutions for the coefficient of the reduced-form parameters:

$$s_0 = a_2(b_2d_3 + b_3) + (a_3 + a_4c_2)(d_3 - b_3d_4)$$

$$s_1 = a_1(b_2d_4 + 1)$$

$$s_2 = d_1(a_2b_2 + a_3 + a_4C_2)$$

$$s_3 = a_4c_3(b_2d_4 + 1)$$

$$s_4 = d_2(a_2b_2 + a_3 + a_4c_2)$$

$$s_5 = a_0(b_2d_4 + 1) + a_2(b_0 + b_2d_0) + a_3(d_0 + b_0d_4) - a_4(b_0c_2d_4$$

$$s = a_2b_1 - a_3b_1d_4 + a_4(c_1(b_1d_4 + 1) - b_1c_2d_4) - b_2d_4 - 1$$

$$t_0 = a_3b_1d_3 + a_4(b_1c_2d_3 - c_1(b_2d_3 + b_3) + b_2d_3 + b_3)$$
$$t_1 = a_1b_1$$
$$t_2 = d_2(a_3b_1 + a_4(b_1C_2 - b_2c_1) + b_2)$$
$$t_3 = a_4b_1c_3$$
$$t_4 = d_2(a_3b_1 + a_4(b_1c_2 - b_2c_1) + b_2$$
$$t_5 = a_0b_1 + a_3b_1d_0 - a_4(b_0c_1 - b_1(c_0 + c_2 + d_0) + b_2c_1d_0)b_0d_2d_$$

$$u_0 = a_2b_1d_3 + (d_3 - b_3d_4)(a_4c_1 - 1)$$
$$u_1 = a_1d_1d_4$$
$$u_2 = d_1(a_2b_1 + a_4c_1 - 1)$$
$$u_3 = a_4b_1c_3d_4$$
$$u_4 = d_2(a_2b_2 + a_4c_1 - 1)$$
$$u_5 = a_0b_1d_4 + a_2b_1d_0 - a_4(b_0c_1d_4 - b_1c_0d_4 - c_1d_0) + b_0d_4 - d_0)$$

and,

$$v_0 = a_2(b_1c_2d_3 - c_1(b_2d_3 + b_3)) + (a_3c_1 + c_2)(b_3d_4 - d_3)$$
$$v_1 = a_1(b_1c_2d_4 - c_1(b_2d_4 + 1)$$
$$v_2 = d_1(a_2(b_1c_2 - b_2c_1) - a_3c_1 - c_2)$$
$$v_3 = c_3(a_2b_1 - a_3b_1d_4 - b_2d_4 - 1)$$
$$v_4 = d_2(a_2(b_1c_2 - b_2c_1) - a_3c_1 - c_2)$$

$$v_5 = a_0(b_1c_2d_4 - c_1(b_2d_4 + 1)) - a_2(b_0c_1 - b_1(c_0 + c_2d_0) + b_2c_1d_0) + a_3(b_0c_1d_4 - b_1c_0d_4 - c_1d_0) + b_0c_2d_4 - b_2c_0d_4 - c_0 - c_2d_0$$

Chapter V

PRESENTATION AND ANALYSIS OF DATA

The purpose of this study was to investigate the role of exports and industrialization in the economic growth of Malaysia. Several models of exports and economic growth were utilized and tested. Data for the empirical estimation of the models was obtained from secondary sources in the Statistical Publications of World Bank (World Tables on Disk) and International Monetary Fund (International Financial Statistics). The main sources of data were obtained through library research as well as direct contact with the World Bank which provided data on disk. Also, the International Monetary Fund sent information and data upon request. Data for manufacturing employment and industrial production for the years prior to 1968 were not available (1967 & 1966). In those cases, the missing values were extrapolated based on the average rate of growth of the subsequent years.

Growth of population was used as a proxy for the growth of the labor force to test the neoclassical model of exports and growth. Data for manufacturing labor were used to estimate the simultaneous equation model. All data are annual series from 1966 to 1994 and, except for the indices, are current value series for the entire data set in terms of local currency (Millions of Ringgit).

Analysis of the Estimation Results

Model 1 - Simple Regressions

The first model tested was the following:

$$\textbf{Log Y = a + b log X}$$

In Model 1, this study examined the effect of export growth on income for 1966 to 1994. The Durbin-Watson test revealed no autocorrelation among the error terms. Table 1 provides the results of regression using 1966-1994 data.

Table 1

Parameter Estimates Dependent Variable - LOGY					
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**T for HO: Parameter=0**	**Prob > [T]**
INTERCEP	1	1.823881	0.13802019	13.215	0.0001
LOGX	1	0.623702	0.01378489	45.245	0.0001
n = 28			*Adjusted R-Squared = 0.9865*		

To account for the impact of the government policy in the period after 1985, in which the export-push strategy was much more aggressively pursued, a dummy variable (Ind. and Ind Xlog) was introduced. In table 2, the variable IND represents the impact of the government policy on the intercept and INDXLOG stands for the policy impact on the slope of the dependent variable.

The result of the estimates, as seen in table 2, indicates a significant impact both on the intercept and the slope of the independent variable. The

adoption of a more aggressive export-push strategy has increased the intercept by 1.235247 and has decreased the slope by (-) 0.130815.

Table 2

Parameter Estimates Dependent Variable - YLOG					
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**T for HO: Parameter=0**	**Prob > [T]**
INTERCEP	1	1.117215	0.10089882	11.073	0.0001
XLOG	1	0.701613	0.01067051	65.753	0.0001
IND	1	1.235240	0.44352866	2.785	0.0101
INDXLOG	1	-0.130815	0.03953917	-3.308	0.0028
n = 28			*Adjusted R-Squared = 0.9968*		

The unusually high value of R^2 for the model indicates the possibility for the presence of multicollinearity between logX and logY. To account for this, the present study postulated growth of Y (Y dot) as a function of growth of X (X dot). The results of the estimate are presented in table 3.

Table 3

Parameter Estimates Dependent Variable - YDOT					
Variable	**DF**	**B Value**	**Standard Error**	**t Ratio**	**Prob**
INTERCEP	1	0.041680	0.00937	4.447	0.0001
XDOT	1	0.492950	0.0565	8.718	0.0001
n = 28			*Adjusted R-Squared = 0.7451*		

Again, as seen in the table, there exists a significant relationship between export growth and income growth. The elasticity of income growth with respect to export growth is 0.49. The adjusted R^2 is 0.745.

The export coefficient is positive and highly significant at one percent level of significance. The model tested indicated, therefore, that export makes a positive contribution to income growth. Specifically, a one percent increase in exports contributed 0.87 percent to income growth over the period tested (1966-1994). The elasticity of income with respect to export is high (0.817) compared to other middle income developing countries, and even neighboring countries investigated by previous researchers. For example, Hutabarat (1992) found the income elasticity with respect to exports for Indonesia during 1968 to 1990 to be equal to 0.328.

Michaely (1977) has argued that if exports account for a large portion of income, then the relationship tested in equation 1 is no more than a correlation between a variable and part of itself. M. & Jay (1973) suggest that, to account for this eventuality, exports could be correlated with GNP after adjusting for the value added in GNP accounted for by the exports sector. The problem with this approach, M. & Jay argue, "is that exports are measured in gross value terms while GNP is measured in value added or at factor cost--and no easy adjustment is available" (p. 9). They claim, however, that, in general, this is not a significant problem since under most reasonable assumptions about the ratio of value added to gross output in the export sector, exports do not amount to a large portion of GNP.

To account for the preceding concern, the present study, following Michaely (1977) investigated the relationship between income growth and the rate of the expansion of growth. The basic hypothesis to be tested was that the rate of growth of "exports as a proportion of income" and "the growth of income" are correlated.

The following equation, therefore, was tested:

$$\dot{Y} = a + b\left(\frac{X}{Y}\right)^{\cdot}$$

where $\dot{Y}$ is the growth of income and $(X/Y)^{\cdot}$ is the growth ratio of exports as a proportion of total income.

Table 4 shows the results of the regression using data for the period 1966 to 1994.

Table 4

Parameter Estimates **Dependent Variable - YDOT**					
Variable	**DF**	**B Value**	**Standard Error**	**t Ratio**	**Prob**
INTERCEP	1	0.088661	0.0118	7.533	0.0001
$(X/Y)^{\cdot}$	1	0.453212	0.1439	3.151	0.0041
n = 28			*Adjusted R-Squared = 0.2763*		

As seen in the table, the export ratio coefficient is again positive and highly significant. One percent increase in the share of exports in total income leads to

0.45 percentage point increase in income. Kavoussi (1984) argues that an important drawback of the variable X/Y is that it is biased against those economies where the ratio of exports to GNP was high in the initial year of the period over which exports performance is to be measured. This concern does not apply to Malaysia, in which the ratio of exports to income was relatively low in the beginning of the period and grew gradually throughout the 1980s and 1990s.

Model 2-A Neoclassical Model of Exports and Growth

The hypothesis to be tested in this model, like that of M. & Jay (1973), was that, ceteris paribus, productivity growth would be greater, the faster the export sector growth and hence the rate at which overall efficiency in resource utilization is increased over time through participation in international trade. Specifically, the hypothesis to be tested was whether the effect of export growth on income growth was in fact additional to the effect of changes in primary factors of production. The test will indicate whether the inclusion of exports in the production function equation will raise the explanatory power of the equation (adjusted R^2) and also if the coefficient of exports is positive and significant. Therefore, the following two models were tested:

$$\dot{Y} = a\dot{I} + b\dot{L} + \varepsilon \qquad (7)$$

$$\dot{Y} = a\dot{I} + b\dot{L} + c\dot{X} + \varepsilon \qquad (8)$$

This study first fit the equation (7) for Malaysia for the period of 1966-1994. The following results were obtained (Table 5):

$$\dot{Y} = -0.036 + 3.44\ \dot{LP} + 0.38\ \dot{I}$$

(-0.611) (1.51) (4.836)

Adj. R^2 = 0.49

Table 5

Parameter Estimates Dependent Variable - YDOT					
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**T for HO: Parameter=0**	**Prob > [T]**
INTERCEP	1	-0.035980	0.05885677	-0.611	0.5465
LPDOT	1	3.438504	2.27721874	1.510	0.1436
IDOT	1	0.378050	0.07817868	4.836	0.0001
n = 28			*Adjusted R-Squared = 0.4910*		

The study then, by means of equation 8, reestimated equation 7 to include export growth ($\dot{X}$ or X dot) as a separate variable. The following results were obtained (Table 6):

$$\dot{Y} = -0.01 + \underset{(0.525)}{0.68\ \dot{LP}} + \underset{(4.54)}{0.22\ \dot{I}} + \underset{(7.67)}{0.39\ \dot{X}}$$

Adj. R^2 = 0.85

Table 6

Parameter Estimates Dependent Variable - YDOT					
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**T for HO: Parameter=0**	**Prob > [T]**
INTERCEP	1	0.010019	0.03287443	0.305	0.7632
LPDOT	1	0.683296	1.30113446	0.525	0.6043
IDOT	1	0.216876	0.04779647	4.537	0.0001
XDOT	1	0.386016	0.05030212	7.674	0.0001
n = 28			*Adjusted R-Squared = 0.8465*		

As hypothesized, the regression coefficient for exports is not only large, but also highly significant at 1 percent level, and the overall fit of the model was increased significantly due to inclusion of the exports variable. This improvement was due to a substantial improvement of the adjusted R^2 from 0.49 to 0.85.

As mentioned earlier in this study, the inclusion of exports in the production function, of course, does not imply that export is treated as a factor of production. The role of exports in the production function is perceived as one of several factors that result in a productivity increase yet is normally left unexplained by simple aggregate production functions such as in a Cobb-Douglas function.

The results of these tests clearly indicate that we could reject the hypothesis that export growth inhibits income growth or, as suggested by trade pessimists, that trade is harmful in the development process. More importantly, the value of the export coefficient for Malaysia is substantially higher than in those studies reported earlier in this study. Additionally, the improvement of the adjusted R^2 is substantially higher than those reported in several previous studies. In light of

these latter findings, this study is inclined to reject the hypothesis that export growth is a hand-maiden to GDP growth in which both are dependent on growth of primary inputs. Export growth, in the case of Malaysia, definitely makes substantial contribution to explaining GDP growth. This is over and above the contribution of primary inputs.

As hypothesized, all coefficients of independent variables are positive, and in cases of both investment and export, these estimates are significant. The coefficient of labor, although it has the expected positive sign, is not significant. This finding may represent the problems associated with data. As pointed out by several researchers [e.g., Adams et al. (1992), Salvatore and Hatcher (1991), and Little (1994)], in many developing countries, due to high unemployment and even higher underemployment, worker-hours of labor input may deviate greatly from the labor force. This may be especially true in the case of the present model, since the growth of population was used as a proxy for the labor force.

The value of export coefficient is 0.34, meaning for each one percentage point increase in export growth, the income will increase by 0.34 percentage points. The export coefficient in this model, just like that of the first model, is higher than many developing countries investigated by previous researchers. This is to be expected since, especially in the last decade, Malaysia has pursued a very aggressive export-led growth.

When dealing with time-series data, serial correlation of the error terms is always possible to find. The present study, however, did not find serial correlation among the error terms. The Durbin-Watson statistics indicate no serious

autocorrelation. The value of the first order D.W. statistics is 1.54, which is not significant at the 5% level (Table 7).

Table 7

Durbin-Watson Statistics	
Durbin-Watson D	1.774
(For Number of Obs.)	28

Model 3 - The effect of exports and industrialization in economic growth

The hypotheses to be tested in this model were that growth of labor, capital, exports and industrial production positively contribute to the growth of income in the case of Malaysia. The model tested was:

$$Y\cdot = a_0 + a_1L\cdot + a_2I\cdot + a_3X\cdot + a_4R\cdot + E$$

The model was estimated by Ordinary Least Square (OLS) using SAS Auto Reg. Procedure. The results of the estimating equation are presented below in Table 8.

Table 8

Parameter Estimates Dependent Variable - YDOT					
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**T for HO: Parameter=0**	**Prob > [T]**
INTERCEP	1	-0.002966	0.03467795	-0.086	0.9326
LPDOT	1	0.805347	1.29862258	0.620	0.5413
IDOT	1	0.215009	0.04756607	4.520	0.0002
XDOT	1	0.343105	0.06293842	5.451	0.0001
RDOT	1	0.192687	0.17147738	1.124	0.2727
n = 28			*Adjusted R-Squared = 0.8481*		

As we can see from Table 8, all coefficients are positive, but only those of export and investment are significant. This is not contrary to our expectation. The model tested indicates that growth of both exports and investment positively contribute to income growth. The high level of significance and relatively high value of the coefficient of exports indicate that growth of exports has played an important role in Malaysia's economic growth. The sign of the labor variable, as expected, is positive. It is not, however, significant. As in the case of the previous model, this result could be attributed to problems with the data, unemployment and underemployment which is typical of most developing countries. The test of the same model, using population growth as a proxy for growth of labor force, as done by other researchers, did not significantly change the result of the labor coefficient. As pointed out by Little (1994), "growth of population, even if it means 'growth of the economically active population' is a poor measure of actual labor input, since average hours worked per annum can change markedly."

The coefficient of $\dot{R}$ is positive, but not significant. As pointed out by Salvatore and Hatcher (1991), in theory, the sign of $\dot{R}$ is expected to be positive, but due to problems mentioned earlier, it may not be significant or even may be negative. In the case of Malaysia, this lack of significance of the variable could be attributed to the inefficiencies associated with the inward-looking approach of industrialization in the first 20 years covered in the study. Even since 1986, the period in which Malaysia has taken an outward-looking path, the process

of privatization has moved slowly, however, according to World Bank's reports [The East Asian Miracle (1993)]. The sign of the coefficient of $\dot{R}$, given these facts, is a matter of empirical question. In view of these findings, we should reserve the judgement on the hypothesis that the growth of industrial production has positively contributed to Malaysian income growth. Since trade-development relationship is simultaneous in nature, any empirical study dealing with this issue and using the single-equation will suffer from single-equation bias. A final judgement on the role of industrialization, therefore, is deferred until the simultaneous- equation model of trade and industrialization for Malaysia is tested and analyzed.

The R^2 for the model equal to 0.87·6 indicate a good fitness for the model and the Durbin-Watson test (table 9) indicated no autocorrelation between the error terms.

Table 9

Durbin-Watson Statistics	
Durbin-Watson D	1.683
(For Number of Obs.)	28

The coefficient of investment is, as expected, positive and significant. In the process of development, factors of production are transferred from sectors with low productivity, such as the primary products sector, to those with higher productivity including the industrial sector. The rapidity of this process depends on the rate of capital formation. In view of the capital shortage in most developing

countries, the contribution of the growth of capital, as pointed out by Robinson (1971) and Taylor (1979), is expected to be even higher than capital growth contribution in the developed nations.

Model 4 - A Simultaneous-Equation Model of Industrialization, Export and Growth

To test the role of trade and industrialization on the growth of the income in Malaysia, borrowing from Salvatore (1983) and applying several relevant modifications, the following simultaneous equation model was constructed.

$$\dot{Y} = a_0 + a_1\dot{L} + a_2\dot{I} + a_3\dot{X} + a_4\dot{R} + \epsilon_Y$$

$$\dot{I} = b_0 + b_1\dot{Y} + b_2\dot{X} + b_3\dot{F} + \epsilon_I$$

$$\dot{R} = C_0 + C_1\dot{Y} + C_2\dot{X} + C_3\dot{R}_{t-1} + \epsilon_R$$

$$\dot{X} = d_0 + d_1P + d_2W + d_3\dot{F} + d_4\dot{I} + \epsilon_X$$

Where:

$\dot{Y}$ = growth of income (GNP)

$\dot{I}$ = growth of investment (Fixed Capital Formation)

$\dot{R}$ = Industrial Output (manufacturing plus electricity plus construction)

$\dot{X}$ = growth of export

$\dot{L}$ = growth of labor force (as measured by manufacturing labor)

$\dot{F}$ = growth of capital inflow (proxied by total imports of goods and services)

P = ratio of the unit price of Malaysia export over the unit price of the World export.

W = index of real GDP of the world.

The model was estimated by Full Information Maximum Likelihood (FIML), which according to asymptotic theory appears to be the best estimator, using SAS' Proc Model procedure. Given OLS estimates as initial values, convergence was achieved after 21 iterations with 0.001 as the tolerance for convergence on the parameters.

The results are presented in Tables 10 and 11.

Table 10

MODEL PROCEDURE
FIML Estimation

FIML Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj. R-Sq.
YDOT	5	20	0.0205	0.001026	0.03204	0.8403	0.8084
IDOT	4	21	0.1348	0.006420	0.08013	0.6548	0.6055
RDOT	4	21	0.0238	0.001133	0.03366	0.4453	0.3660
XDOT	5	20	0.1707	0.008536	0.09239	0.5324	0.4389

Table 11

FIML Parameter Estimates				
Parameter	**Estimate**	**Approx. Std. Err.**	**'T' Ratio**	**Approx. Prob>[T]**
a_0	0.00907929	0.01092	0.83	0.4154
a_1	0.073556	0.10793	0.68	0.5034
a_2	0.229603	0.08323	2.76	0.0121
a_3	0.305487	0.09094	3.36	0.0031
a_4	-0.023746	0.11880	-0.20	0.8436
First Equation's Adjusted R-Squared 0.8084				
b_0	-0.013386	0.03292	-0.41	0.6884
b_1	2.988873	1.00814	2.96	0.0074
b_2	-1.155321	0.38996	-2.96	0.0074
b_3	0.360852	0.35441	1.02	0.3202
Second Equation's Adjusted R-Squared 0.6055				
c_0	0.059243	0.01367	4.33	0.0003
c_1	0.023773	0.29990	0.08	0.9376
c_2	0.290801	0.16451	1.77	0.0916
c_3	-0.230440	0.13736	-1.68	0.1082
Third Equation's Adjusted R-Squared 0.3660				
d_0	0.093999	0.04900	1.92	0.0695
d_1	-0.086358	0.03852	-2.24	0.0365
d_2	0.021308	0.0091923	2.32	0.0312
d_3	0.939638	0.29179	3.22	0.0043
d_4	-0.300062	0.33365	-0.90	0.3792
Fourth Equation's Adjusted R-Squared 0.4389				
Number of Observations				
Used 25				
Missing 3				

The following results were, therefore, obtained:

$$\dot{Y} = \underset{}{\mathbf{0.009}} + \underset{(0.68)}{\mathbf{0.07}\ \dot{L}} + \underset{(2.76)}{\mathbf{0.23}\ \dot{I}} + \underset{(3.36)}{\mathbf{0.31}\ \dot{X}} - \underset{(-0.20)}{\mathbf{0.02}\ \dot{R}}$$

$$\dot{I} = \underset{}{\mathbf{-0.01}} + \underset{(2.96)}{\mathbf{2.99}\ \dot{Y}} - \underset{(-2.96)}{\mathbf{1.15}\ \dot{X}} + \underset{(1.02)}{\mathbf{0.36}\ \dot{F}}$$

$$\dot{R} = \underset{}{\mathbf{0.06}} + \underset{(0.08)}{\mathbf{0.024}\ \dot{Y}} + \underset{(1.77)}{\mathbf{0.291}\ \dot{X}} - \underset{(-1.68)}{\mathbf{0.23R_{t-1}}}$$

$$\dot{X} = \underset{}{\mathbf{0.294}} - \underset{(-2.24)}{\mathbf{0.08\ P}} + \underset{(2.32)}{\mathbf{0.021\ W}} + \underset{(3.22)}{\mathbf{0.94}\ \dot{F}} \underset{(-0.90)}{\mathbf{-0.3}\ \dot{I}}$$

The numbers in the parentheses are the t-statistics.

We begin the analysis of the results with the variable $\dot{R}$. As discussed earlier in this chapter and also in the previous chapter, industrialization, if pursued under inward-looking trade policies, is associated with serious inefficiencies that could have a negative rather than positive impact on growth of income. In the case of Malaysia, only after 1985 was industrialization pursued under strongly outward-looking orientation. During the first 20 years of the 28-year period covered in the present study, industrialization in Malaysia was not pursued under strong outward-oriented strategy. The sign of the coefficient for $\dot{R}$ was a matter of empirical question. The results of the present model show that coefficients of $\dot{R}$ in the first equation ($\dot{Y}$) is negative. However, it is not statistically significant.

The R^2 for the third equation, although acceptable, is relatively small. This indicates that there may be other variables that have been omitted. An omitted variable in this equation, and as Ram (1987) points out, an important one, is the one pertaining to government size. However, the study of government size is beyond the scope of this study.

The variable pertaining to labor growth, although having the expected positive sign, is not significant. As pointed out in the discussion regarding the previous model, this may be related to the problem with data, unemployment and underemployment. The adjusted R^2 for the other three equations indicate a good fitness for the model.

Looking at the whole system, considering the absolute size of the coefficients, we can conclude that the growth of income depends primarily on investment growth and export growth. Coefficients for both $\dot{I}$ (a_2), and $\dot{X}$ (a_3) are fairly high and significant. Investment growth ($\dot{I}$) depends primarily on the income growth with both high coefficient (b_1) and is significant (t-Ratio = 4.20). Industrial output growth ($\dot{R}$) depends primarily on the growth of income ($\dot{Y}$) Export growth depends primarily on the growth of capital inflows. The coefficient for price has the expected negative sign. It is statistically significant, but its absolute value is relatively small, indicating weakness of competition and the international market based on price. Other factors such as governmental

relationships or the corporate strategies of multinational corporations investing in Malaysia, may determine the value of exports to any country. Also, a great deal of the value of exports and trade are with the countries such as Japan and NICs which have invested heavily in the Malaysian export industry. However, the price elasticity coefficient is in agreement with Houtaker and Mangee (1969) who estimated demand for eight developing countries (Malaysia not included). The price elasticity of exports in their study ranged from -0.07 to 0.70. They also found the income elasticity to range from 0.34 to 4.0. The coefficient pertaining to World Income (W) also has the expected positive sign and is significant. Its absolute value is small, as expected. Malaysian export will depend on the World Income, but since its value is not a significant portion of the World Income, the income elasticity of demand for it will not be high when compared with the income elasticity of exports for countries such as Brazil, Chile, and India that were included in the study by Houtaker and Mangee (1969).

In view of the statistical significance of the parameter pertaining to the export variable, and especially its relatively high absolute value, and with respect to the main focus of the present study, it is concluded that exports growth has made a significant contribution to growth of the Malaysian income. The notion of exports as a handmaiden to economic growth is, therefore, in the case of Malaysia, rejected. The value of the export coefficient for Malaysia (Equation 1) is $a_3 = 0.23$, as compared with those of Salvatore's study in which he characterized trade as a "handmaiden, not an engine of growth," is significantly higher. In his study, the coefficient of exports for the Small Industry-oriented was 0.0274, for the Small

Primary-oriented was equal to 0.0214 and for the larger nations was equal to 0.007. Clearly, a value of this magnitude ($a_3 = 0.23$), in the present study, indicates a much higher significance for the role of exports in the Malaysian economy, as compared with the countries in Salvatore's study.

In light of the indeterminate role of industrialization as indicated by the simultaneous-equation model just reported, this study constructed a new simultaneous-equation model, without the variable and the equation pertaining to industrialization. The model was as follows:

$$\dot{Y} = a_0 + a_1\dot{L} + a_2\dot{I} + a_3\dot{X} + \epsilon_Y$$

$$\dot{I} = b_0 + b_1\dot{Y} + b_2\dot{X} + b_3\dot{F} + \epsilon_I$$

$$\dot{X} = d_0 + d_1 P + d_2 W + d_3\dot{F} + d_4\dot{I} + \epsilon_X$$

The following results were obtained:

$$\dot{Y} = \underset{}{\mathbf{0.008}} + \underset{(0.93)}{\mathbf{0.09}\ \dot{L}} + \underset{(2.16)}{\mathbf{0.18}\ \dot{I}} + \underset{(4.70)}{\mathbf{0.35}\ \dot{X}}$$

$$\dot{I} = \underset{}{\mathbf{-0.01}} + \underset{(2.81)}{\mathbf{3.03}\ \dot{Y}} - \underset{(-3.18)}{\mathbf{1.34}\ \dot{X}} + \underset{(1.59)}{\mathbf{0.49}\ \dot{F}}$$

$$\dot{X} = \underset{}{\mathbf{0.33}} - \underset{(-1.78)}{\mathbf{0.06\ P}} + \underset{(2.61)}{\mathbf{0.03\ W}} + \underset{(3.42)}{\mathbf{1.07}\ \dot{F}} - \underset{(-1.18)}{\mathbf{0.43}\ \dot{I}}$$

All the variables and parameters were the same as those in the four-equation system previously estimated.

The model was again estimated by Full Information Maximum Likelihood. The results of the FIML Estimations are presented in the appendix to this chapter. The signs and significance of the parameters, as could be seen, were consistent with those of the previous model. The absolute values of the parameter were, as expected, somewhat different. However, the new model indicated a much better

fitness with the data with still a high value of R^2 for each equation. More interesting, the statistics for the system (The systems R squared) significantly improved, indicating a better overall fit of the model. The interpretation of the results of the estimates is the same as in the previous model. This last model is a better model if we are concerned with the role of trade in growth without regard to industrialization factors.

Hauseman Test

The Hauseman Specification test resulted in a negative value for the m-statistics. SAS does not, therefore, report the probability distribution (prob) for the χ^2 (chi-square). This, as discussed in the previous chapter, is an indication that, for the present model, the Hauseman Specification test will not produce useful results. The results of the Hauseman test are presented in the table below. In any case, the simultaneous nature of the relationship among the variables in the model is theoretically established. Therefore, the Hauseman Test, or any other specification test, cannot be a determining factor in formulating the model (Table 12).

Table 12

HAUSEMAN TEST

MODEL PROCEDURE

Hauseman's Specification Test Results

Comparing To	DF	m-Statistic	Prob.
OLS to 3SLS	18	-17.753	.
2SLS to 3SLS	18	- 6.126	.

The tables pertaining to the covariance of estimates from which the Hauseman test's m-statistics are included in the appendix 5.a.

Summary of Findings

A. Findings Related to the Simple Regression

--A strong, positive and highly significant relationship between exports growth and income growth was observed with high explanatory powers for the models.

-- The introduction of dummy variables clearly indicated that the structural relationship between exports and income growth shifted up for the period beyond 1986 in which the policy of export-led growth and privatization was much more aggressively perceived.

-- The elasticity of income with respect to exports was high as compared with other developing countries.

B. Findings Related to the Neoclassical Model

-- Export growth in Malaysia contributed to income growth over and above the contribution of the primary factors of production (labor and capital).

-- Introducing exports as an argument in the production function model significantly increased the explanatory power of the model.

-- The elasticity of income with respect to exports was significantly higher than that of other developing countries previously investigated by other researchers.

C. Findings Related to the Single-Equation Model of Export, Industrialization and Income Growth

-- Growth of income was primarily dependent on growth of exports and growth of investment.

-- The contribution of industrialization and labor force growth to income growth was not significant.

D. Findings Related to the Simultaneous-Equation Model

-- Growth of income primarily depended on growth of exports and growth of capital.

-- Growth of investment primarily depended on growth of income but was negatively affected by growth of exports.

-- Industrialization primarily depended on export growth.

-- Export growth inversely related to the unit price of exports, and it positively related to the world income and foreign capital inflow; the primary determinant of export growth was the growth of foreign capital inflow.

Chapter VI

SUMMARY AND CONCLUSIONS

The purpose of this study was to investigate the role of international trade and industrialization in the growth of the Malaysian economy. In spite of the impressive export-led income growth and industrialization of this country, no other study has exclusively investigated the role of exports and industrialization in the economic development of Malaysia. Moreover, despite the well-established theoretical notion that the trade-growth relationship is simultaneous in nature, no other empirical study, except for that of Salvatore's (1983) has constructed a simultaneous-equations model that captures the most important quantitative aspects of exports-growth-industrialization relationship. The present study differs from that of Salvatore's because it exclusively investigates the Malaysian case and improves on it by including in the model those variables that are more relevant to the particular case of Malaysia, and also by extending the coverage of data to a significantly wider time period, ending in 1994.

Additionally, the present study investigated the export-growth relationship using simple regressions and the neoclassical model of trade and growth and improved upon previous studies of the type by using time-series data exclusively for Malaysia, as compared with the cross-country comparison approach of those studies and by covering a significantly more recent time period. A review of literature was conducted covering the theoretical framework of the role of international trade in economic development and the empirical studies pertaining to

export-growth relationships and an overview of the Malaysian economy with an emphasis on the industrialization process in Malaysia. The literature reviewed revealed that while considerable research has been conducted to investigate the "East Asian" Miracle concerning the success of the Newly Industrializing Countries (NIC)--Hong Kong, Korea, Singapore, and Taiwan, a shortage of research exists relative to the success of the 'next-tier NICS'--such as Malaysia.

Procedure

To empirically estimate the theoretical models of this study, data covering the period from 1966 to 1994 was obtained either by using the publications of World Bank and International Monetary Fund or by directly contacting these organizations. This study tested: exports-growth relationships and international trade and industrialization and income growth relationships:

(a) Simple regressions to investigate the relation between export growth and income growth, which postulated income growth as a function of export growth. This model was estimated by Ordinary Least Squares (OLS);

(b) The Neoclassical model of exports and economic growth using Cobb-Douglas Model, postulating first output as a function of primary factors of production (Capital and Labor), and then testing the same model with exports added as an additional variable to see if the model would improve due to the addition of the exports variable (improvement of the adjusted R^2 and the significance of the estimated export parameter). This model was also estimated using Ordinary Least Squares (OLS);

(c) A single-equation model postulating income as a function of the primary inputs and export and level of industrialization. This model tests the hypotheses concerning the significance of the exports and industrialization variables in income growth. This model was estimated by OLS;

(d) A simultaneous-equation model of trade, industrialization and growth, postulating, as in the previous model, income growth as a function of the growth of the primary inputs and exports and industrial output with 3 additional equations endogenizing the rate of investment growth, industrial output growth and exports growth. The rate of investment growth was modeled as a function of the income growth, export growth and the growth of foreign capital inflow; the growth of industrial output was conjectured to be a function of income growth, export growth and the lag of the same variable; growth of exports was hypothesized to be a function of the relative price of an export unit, world income, growth of foreign capital inflow and growth of investment. This model was tested by Full-Information Maximum Likelihood. For the purpose of comparison, estimations by Two-stage Least Squares (2SLS) and Three-Stage Least Squares (3SLS) were also performed and presented in the appendix.

Conclusions

1. Export-led strategy in Malaysia has had a profound positive impact on the impressive income growth of the country and has operated as a causal factor in breaking the vicious circle of poverty. This is not unexpected. Except for a short period following World War II during which the structuralists' views dominated the theories of trade and economic development, economists have always emphasized the role of exports and trade as a key factor in economic development, and sometimes referred to it as the "engine of growth."

In the case of Malaysia, it could be asserted that trade has acted as the engine of success in so far as it concerns the impressive growth of GDP. Concerning the growth of Total Factor Productively (TFP), however, for the following reasons, and as verified by this study, the definition of exports as an "engine of growth" is not applicable.

There is little disagreement among economists that sustained and continued economic growth can only be caused by the growth of factors of production and technical progress, namely the growth in Total Factor Productivity (TFP).[2] Unfortunately, in the case of Malaysia, as indicated by the finding of this study,

---

[2]Theoretically, "TFP is measured as total output divided by labor and capital stock" [Chenery & Srinivasan (1988), page 364]. However, as mentioned in chapter II of this study, several studies [Balassa (1978), Feder (1983), Michaely (1977), Michalopoulos and Jay (1973), Kavoussi (1984) and others], have explained productivity growth in terms of changes in the labor force, capital stock, and exports. The coefficient of labor and capital variables, in these studies, serve as a measure of productivity growth.

export growth has not led to increase in domestic capital growth and labor productivity. Nor has the growth of domestic investment has made any positive contributions to the growth of exports. As argued by the World Bank's " East Asian Miracle " (1993),

> "Most explanations of link between TFP growth and exports emphasize such static factors as economies of scale and capacity utilization. While these may account for an initial surge of productivity soon after the start of an export push, they are insufficient to explain continuing high TFP growth rate. Rather, the relationship between exports and productivity growth may arise from exports' role in helping economies adopt and master international best-practices technologies. High level of labor force cognitive skills permit better firm-level adoption, adaptation, and master of technology. Thus, exports and human capital interact to provide a particularly rapid phase of productivity-based catching up" (page 317).

In this respect, Malaysia differs from some other High Performing Asian Economies (HPAE), such as Taiwan and South Korea. These latter countries encouraged DFI in production for export but mostly in those sectors where transfer of labor skills and technology could be anticipated.

The insignificant impact of labor growth on income growth, as discussed before, may have to do mainly with the problem of data. However, this, as pointed out in the preceding, may have a lot to do with the absence of the

significant manpower skills transfer that has characterized the DFI-based growth of Malaysian exports.

The negative (though insignificant) impact of industrialization on economic growth may be due to the fact that industrialization in Malaysia has, for the most part, been pursued under heavy governmental control and involvement. This, as expected, will entail such serious inefficiencies as to lead, ceteris paribus, to lower rather than higher income growth.

During certain parts of the time period this study covered, import-substitution characterized Malaysian industrial policy. As Salvatore and Hatcher (1991) have argued, an "inward-orientation characterized by import-substitution leads to gross inefficiencies and retards rather than promotes economic development" (page 13).

2. Growth of income as predicted in economic theory has been the most important determinant of growth of domestic investment in Malaysia. Higher income leads to higher saving, both private and public. Increased saving leads to increased investment. What is peculiar in the case of Malaysia, as revealed by this study is the (seemingly) counter-intuitive findings that growth of exports has had a significantly negative impact on investment growth.

Theoretically, as predicted by the hypothesis formulated in this study, export growth, through its contribution to income and thereby to savings growth and also through its impact in earning foreign exchange, a priori, is expected to lead to increased domestic capital formation. Export earnings allow the country to pay for capital imports. What might explain the inverse relationship between

export growth and investment growth in Malaysia, ex post, is the fact that, as described in chapter 3, a significant portion of export growth in Malaysia is credited to DFI and to the firms that are fully or partially owned by foreign investors. This implies that a significant portion of export earnings has not been reaped by the domestic economy or not much of the country's earnings have been directed toward investment. It is also possible that growth of domestic savings has been less-than-proportional as compared with export growth.

It is important to remember, however, that the models in this study investigated the relationship between independent and dependent variables based on the change in their rate of growth. Therefore, the relationship between export growth and investment growth is inverse not because export growth has led to reduction in investment, but because it has been associated with a reduction in the rate of growth of investment.

The preceding argument concerning the role of DFI, can also explain why growth of foreign capital inflow has not had a significant impact on the growth of investment. Theoretically, however, the latter is not paradoxical since normally, foreign capital inflow is expected to be partly neutralized by reduction in domestic savings -- thus the imperative and urge for both private and domestic saving is usually alleviated by inflow of foreign capital.

3. Growth in the rate of industrialization, as expected, a priori, has depended on both income growth, and much more significantly, on export growth. Along with growth of income and exports, the country's infrastructure has to also grow. In order to accommodate the rapidly growing export sector, construction,

electricity and other basic infrastructure of the country has to improve. Also, a significant portion of export growth is reflected in manufacturing output growth and the latter is included in the industrial output.

4. Growth of export has been significantly impacted by relative price of exports, and the world income as theoretically predicted. Price and income are the most important determinants of demand, as in the case of Malaysia, where these impacts on export demand have been statistically significant. The magnitude of these impacts, however, has been small. This is because the markets to which the Malaysian products are sold are not primarily determined by the competitive pricing of these products by the Malaysians. Rather, the foreign firms who are investing in Malaysia have established markets and marketing networks all over the world and have subsidiaries in countries other than Malaysia.

By far, the most important determinant of Malaysian export growth has been the growth of foreign capital inflow. This comes as no surprise, since as previously discussed in this study, a significant portion of Malaysian export growth is owed to the growth in Direct Foreign Investment.

Implications and Policy Recommendations

The analysis of the models in this study indicated that while export growth has an undeniable positive impact on GDP growth, this latter growth does not automatically imply growth in factors of production and technical progress. Manufacturing export growth induced by foreign investment, unless it is associated with forward and backward linkage with domestic economy, will not lead to

growth in domestic investment and increased labor productivity. It is, therefore, recommended that the policy makers in Malaysia:

- Maintain and further develop outward-oriented policies and move faster with the process of economic liberalization.
- Consider a re-examination of the FTZs and DFI, so as to encourage the types of investments that would provide more linkage with the domestic economy and increased transfer of technology and skills.
- Increase investment in domestic industries parallel to those owned by the foreign investors; take advantage of the opportunities for spill-over of knowledge and skill. This could ensure that the manufacturing sector is capable of self-sustained reproduction in the absence of the Multi-National Corporations (MNC). This absence could come as a result of shifts in the corporate strategies of MNCs, such as the relocation of offshore processing plants from Malaysian FTZs to other countries. Also, as Salih and Young (1986) have cautioned, over-reliance on MNCs expose the economy even more severely to global downturns; it will also spell the loss of autonomy, especially since the country may be unable to adopt the level of technology to local requirements.
- Promote export-oriented industrialization in the sectors that can best take advantage of Malaysia's comparative advantage.

-- Renegotiate and approve licensing of DFI projects on the basis of the degree to which these projects can create linkages to domestic economy.

Direction for Future Research

The analysis in this study unveiled several possibilities for future research as follows:

-- The simultaneous-equation models of this study should be replicated for other next-tier NICs such as Thailand and Indonesia.

-- Studies that investigate the specific relationship between exports growth and TFP growth are needed.

-- A study that investigates the role of exports in saving in Malaysia is needed.

-- Studies that investigate the role of DFI in technology and skill transfers are needed.

-- Studies that compare the role of exports of different sectors (e.g., manufacturing vs. primary exports) in TFP growth in Malaysia and other next-tier NICs are needed.

-- Studies that compare the role of different export sectors in creating backward and forward linkage with the rest of the economy is needed.

APPENDIX 5.a

FIML ESTIMATION RESULTS

MODEL Procedure

FIML Estimation

FIML Estimation Summary

Dataset Option	**Dataset**
DATA=	ONE
Parameters Estimated	18

Minimization Summary

Method	GAUSS
Hessian	GLS
Covariance Estimator	GLS
Iterations	26
Subiterations	1
Average Subiterations	0.04

Final Convergence Criteria

Log Likelihood	175.665196

Observations Processed

Read	29
Solved	28
First	2
Last	29
Used	25
Missing	3
Lagged	1

MODEL PROCEDURE
FIML Estimation

FIML Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj. R-Sq.
YDOT	5	20	0.0205	0.001026	0.03204	0.8403	0.8084
IDOT	4	21	0.1348	0.006420	0.08013	0.6548	0.6055
RDOT	4	21	0.0238	0.001133	0.03366	0.4453	0.3660
XDOT	5	20	0.1707	0.008536	0.09239	0.5324	0.4389

FIML Parameter Estimates				
Parameter	**Estimate**	**Approx. Std. Err.**	**'T' Ratio**	**Approx. Prob>[T]**
a_0	0.00907929	0.01092	0.83	0.4154
a_1	0.073556	0.10793	0.68	0.5034
a_2	0.229603	0.08323	2.76	0.0121
a_3	0.305487	0.09094	3.36	0.0031
a_4	-0.023746	0.11880	-0.20	0.8436
First Equation's Adjusted R-Squared 0.8084				
b_0	-0.013386	0.03292	-0.41	0.6884
b_1	2.988873	1.00814	2.96	0.0074
b_2	-1.155321	0.38996	-2.96	0.0074
b_3	0.360852	0.35441	1.02	0.3202
Second Equation's Adjusted R-Squared 0.6055				
c_0	0.059243	0.01367	4.33	0.0003
c_1	0.023773	0.29990	0.08	0.9376
c_2	0.290801	0.16451	1.77	0.0916
c_3	-0.230440	0.13736	-1.68	0.1082
Third Equation's Adjusted R-Squared 0.3660				
d_0	0.093999	0.04900	1.92	0.0695
d_1	-0.086358	0.03852	-2.24	0.0365
d_2	0.021308	0.0091923	2.32	0.0312
d_3	0.939638	0.29179	3.22	0.0043
d_4	-0.300062	0.33365	-0.90	0.3792
Fourth Equation's Adjusted R-Squared 0.4389				
Number of Observations				
Used 25				
Missing 3				

MODEL PROCEDURE FIML Estimation				
Correlation of Residuals Matrix Used for Estimation				
S	**YDOT**	**IDOT**	**RDOT**	**XDOT**
YDOT	0.000821	-0.001990	0.0000366	0.001474
IDOT	-0.001990	0.005393	-0.000299	-0.002376
RDOT	0.0000366	-0.000299	0.000952	-0.000984
XDOT	0.001474	-0.002376	-0.000984	0.006829

Correlation of Residuals				
Corr S	**YDOT**	**IDOT**	**RDOT**	**XDOT**
YDOT	1.000	-0.9457	0.0414	0.6223
IDOT	-0.9457	1.0000	-0.1320	-0.3916
RDOT	0.414	-0.1320	1.0000	-0.3859
XDOT	0.6223	-0.3916	-0.3859	1.0000

COVARIANCE OF ESTIMATES						
Co vB	a_0	a_1	a_2	a_3	a_4	b_0
a_0	0.000119	0.0000133	-0.000189	-0.000162	-0.000584	-0.000231
a_1	0.0000133	0.0116	-0.004621	6.1714E-6	-0.004030	0.002144
a_2	-0.000189	-0.004621	0.006927	-0.004070	0.001951	-0.000276
a_3	-0000162	6.1714E-6	-0.004070	0.008271	-0.003844	0.000669
a_4	-0.000584	-0.004030	0.001951	-0.003844	0.0141	-0.000679
b_0	-0.000231	0.002144	-0.000276	0.000669	-0.000679	0.001084
b_1	0.001233	-0.0867	-0.002561	0.0294	0.0275	-0.0224
b_2	0.000348	0.002718	0.0228	-0.0283	-0.000905	0.000496
b_3	0.000138	0.0357	-0.0185	0.003144	-0.0113	0.006739
c_0	-7.631E-6	-5.028E-6	-6.19E-6	-0.000088	0.000265	-0.000037
c_1	-0.000137	0.000233	0.000814	-0.001380	0.002321	0.000498
c_2	0.0000279	-0.000120	-0.000401	0.000743	-0.000721	-0.000077
c_3	0.000214	0.0000141	-0.000125	0.001413	-0.004708	-0.000054
d_0	0.000112	0.000877	-0.001321	0.000604	-0.000322	-0.000078
d_1	0.0000487	-0.002034	0.001428	-0.001115	0.000724	-0.000345
d_2	-0.000012	0.000502	-0.000352	0.000275	-0.000178	0.000085
d_3	-0.000585	-0.0131	-0.001456	0.0119	0.004548	-0.000955
d_4	-0.000102	0.0150	0.005278	-0.0109	-0.005181	0.002404

MODEL PROCEDURE FIML Estimation						
Covariance of Estimates						
CovB	b_1	b_2	b_3	c_0	c_1	c_2
a_0	0.001233	0.000348	0.000138	-7.631E-6	-0.000137	0.0000279
a_1	-0.0867	0.002718	0.0357	-5.028E-6	0.000233	-0.000120
a_2	-0.002561	0.0228	-0.0185	-6.19E-6	0.000814	-0.000401
a_3	0.0294	-0.0283	0.003144	-0.000088	-0.001380	0.000743
a_4	0.0275	-0.000905	-0.0113	0.000265	0.002321	-0.000721
b_0	-0.0224	0.000496	0.006739	-0.000037	0.000498	-0.000077
b_1	1.0163	-0.2161	-0.2591	0.000354	-0.0278	0.0139
b_2	-0.2161	0.1521	-0.0138	-0.000075	0.0135	-0.008332
b_3	-0.2591	-0.0138	0.1256	0.0000567	0.000515	-0.000163
c_0	0.000354	-0.000075	0.0000567	0.000187	-0.000959	0.0000472
c_1	-0.0278	0.0135	0.000515	-0.000959	0.0899	-0.0447
c_2	0.0139	-0.008332	-0.000163	0.0000472	-0.0447	0.0271
c_3	0.002085	0.000111	-0.001011	-0.001058	-0.009612	0.003049
d_0	-0.000146	-0.002668	0.002593	-0.000097	0.002086	-0.000965
d_1	0.008037	0.002678	-0.004971	-0.000018	-0.000786	0.000841
d_2	-0.001983	-0.000661	0.001227	4.3325E-6	0.000194	-0.000207
d_3	0.1017	-0.0334	-0.0252	0.000238	0.0213	-0.0152
d_4	-0.1335	0.0405	0.0265	0.000328	-0.0333	0.0182

MODEL PROCEDURE FIML Estimation						
Covariance of Estimates						
CovB	c_3	d_0	d_1	d_2	d_3	d_4
a_0	0.000214	0.000112	0.0000487	-0.000012	-0.000585	-0.000102
a_1	0.0000141	0.000877	-0.002034	0.000502	-0.0131	0.0150
a_2	-0.000125	-0.001321	0.001428	-0.000352	-0.001456	0.005278
a_3	0.001413	0.000604	-0.001115	0.000275	0.0119	-0.0109
a_4	-0.004708	-0.000322	0.000724	-0.000178	0.004548	-0.005181
b_0	-0.000054	-0.000078	-0.000345	0.000085	-0.000955	0.002404
b_1	0.002085	-0.000146	0.008037	-0.001983	0.1017	-0.1335
b_2	0.000111	-0.002668	0.002678	-0.000661	-0.0334	0.0405
b_3	-0.001011	0.002593	-0.004971	0.001227	-0.0252	0.0265
c_0	-0.001058	-0.000097	-0.000018	4.3325E-6	0.000238	0.000328
c_1	-0.009612	0.002086	-0.000786	0.000194	0.0213	-0.0333
c_2	0.003049	-0.000965	0.000841	-0.000207	-0.0152	0.0182
c_3	0.0189	0.000134	-0.000259	0.0000645	-0.001319	0.001390
d_0	0.000134	0.002401	-0.001229	-0.000011	0.001259	-0.003559
d_1	-0.000259	-0.001229	0.001484	-0.000222	-0.000231	-0.001022
d_2	0.0000645	-0.000011	-0.000222	0.0000845	-0.000087	0.000377
d_3	-0.001319	0.001259	-0.000231	-0.000087	0.0851	-0.0857
d_4	0.001390	-0.003559	-0.001022	0.000377	-0.0857	0.1113

APPENDIX 5.b
2SLS ESTIMATION RESULTS
Tables

2SLS Parameter Estimates				
Parameter	**Estimate**	**Approx. Std. Err.**	**'T' Ratio**	**Approx. Prob > [T]**
a_0	0.023365	0.03052	0.77	0.4529
a_1	0.107905	0.15407	0.70	0.4918
a_2	0.177625	0.11446	1.55	0.1364
a_3	0.480261	0.18227	2.63	0.0159
a_4	-0.421506	0.59912	-0.70	0.4898
			Adjusted R-Squared	0.7628
b_0	0.00853551	0.02017	0.42	0.6765
b_1	2.242556	0.56437	3.97	0.0007
b_2	-1.154570	0.31911	-3.62	0.0016
b_3	0.661013	0.18492	3.57	0.0018
			Adjusted R-Squared	0.7795
c_0	0.066333	0.01564	4.24	0.0004
c_1	-0.093533	0.30049	-0.31	0.7587
c_2	0.315767	0.17586	1.80	0.0870
c_3	-0.243622	0.16748	-1.45	0.1606
			Adjusted R-Squared	0.3529
d_0	-0.134050	0.09083	-1.48	0.1555
d_1	0.025128	0.05438	0.46	0.6490
d_2	0.040216	0.01169	3.44	0.0026
d_3	0.881599	0.27949	3.15	0.0050
d_4	-0.258174	0.31885	-0.81	0.4276
			Adjusted R-Squared	0.5847
Number of Observations				
Used	25			
Missing	3			

MODEL PROCEDURE
2SLS Estimation

2SLS Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj. R-Sq.
YDOT	5	20	0.0254	0.001271	0.03565	0.8023	0.7628
IDOT	4	21	0.0754	0.003588	0.05990	0.8071	0.7795
RDOT	4	21	0.0243	0.001157	0.03401	0.4338	0.3529
XDOT	5	20	0.1264	0.006318	0.07949	0.6539	0.5847

MODEL PROCEDURE
2SLS Estimation

Correlation of Residuals

Corr S	YDOT	IDOT	RDOT	XDOT
YDOT	1.000	-0.6727	0.5731	0.2060
IDOT	-0.6727	1.0000	-0.3001	0.1376
RDOT	0.5731	-0.3001	1.0000	-0.1795
XDOT	0.2060	0.1376	-0.1795	1.0000

COVARIANCE OF ESTIMATES						
CovB	a_0	a_1	a_2	a_3	a_4	b_0
a_0	0.000932	0.001928	-0.001477	0.003952	-0.0168	0
a_1	0.001928	0.0237	-0.0112	0.0123	-0.0484	0
a_2	-0.001477	-0.0112	0.0131	-0.0127	0.0281	0
a_3	0.003952	0.0123	-0.0127	0.0332	-0.0926	0
a_4	-0.0168	-0.0484	0.0281	-0.0926	0.3589	0
b_0	0	0	0	0	0	0.000407
b_1	0	0	0	0	0	-0.004399
b_2	0	0	0	0	0	0.000117
b_3	0	0	0	0	0	0.000513
c_0	0	0	0	0	0	0
c_1	0	0	0	0	0	0
c_2	0	0	0	0	0	0
c_3	0	0	0	0	0	0
d_0	0	0	0	0	0	0
d_1	0	0	0	0	0	0
d_2	0	0	0	0	0	0
d_3	0	0	0	0	0	0
d_4	0	0	0	0	0	0

MODEL PROCEDURE 2SLS Estimation						
Covariance of Estimates						
CovB	**b_1**	**b_2**	**b_3**	**c_0**	**c_1**	**c_2**
a_0	0	0	0	0	0	0
a_1	0	0	0	0	0	0
a_2	0	0	0	0	0	0
a_3	0	0	0	0	0	0
a_4	0	0	0	0	0	0
b_0	-0.004399	0.000117	0.000513	0	0	0
b_1	0.3185	-0.1343	-0.0375	0	0	0
b_2	-0.1343	0.1018	-0.0142	0	0	0
b_3	-0.0375	-0.0142	0.0342	0	0	0
c_0	0	0	0	0.000244	-0.000921	0.0000853
c_1	0	0	0	-0.000921	0.0903	-0.0484
c_2	0	0	0	0.0000853	-0.0484	0.0309
c_3	0	0	0	-0.001802	-0.004918	0.000326
d_0	0	0	0	0	0	0
d_1	0	0	0	0	0	0
d_2	0	0	0	0	0	0
d_3	0	0	0	0	0	0
d_4	0	0	0	0	0	0

MODEL PROCEDURE 2SLS Estimation						
Covariance of Estimates						
CovB	c_3	d_0	d_1	d_2	d_3	d_4
a_0	0	0	0	0	0	0
a_1	0	0	0	0	0	0
a_2	0	0	0	0	0	0
a_3	0	0	0	0	0	0
a_4	0	0	0	0	0	0
b_0	0	0	0	0	0	0
b_1	0	0	0	0	0	0
b_2	0	0	0	0	0	0
b_3	0	0	0	0	0	0
c_0	-0.001802	0	0	0	0	0
c_1	-0.004918	0	0	0	0	0
c_2	0.000326	0	0	0	0	0
c_3	0.0281	0	0	0	0	0
d_0	0	0.008249	-0.004163	-0.000543	-0.002066	0.001991
d_1	0	-0.004163	0.002957	0.0000338	0.001681	-0.003822
d_2	0	-0.000543	0.0000338	0.000137	0.0000336	0.0000519
d_3	0	-0.002066	0.001681	0.0000336	0.0781	-0.0782
d_4	0	0.001991	-0.003822	0.0000519	-0.0782	0.1017

Appendix 5.c
3SLS Estimation Results

APPENDIX 5.c
3SLS ESTIMATION RESULTS
Tables

MODEL Procedure	
3SLS Estimation	
3SLS Estimation Summary	
Dataset Option	Dataset
DATA=	ONE
Parameters Estimated	18
Minimization Summary	
Method	GAUSS
Iterations	1
Observations Processed	
Read	29
Solved	28
First	2
Last	29
Used	25
Missing	3
Lagged	1

MODEL PROCEDURE 3SLS Estimation							
3SLS Summary of Residual Errors							
Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj. R-Sq.
YDOT	5	20	0.0337	0.001684	0.04104	0.7380	0.6856
IDOT	4	21	0.0972	0.004629	0.06804	0.7511	0.7155
RDOT	4	21	0.0301	0.001435	0.03788	0.2977	0.1973
XDOT	5	20	0.1291	0.006457	0.08036	0.6463	0.5755

3SLS Parameter Estimates				
Parameter	**Estimate**	**Approx. Std. Err.**	**'T' Ratio**	**Approx. Prob > [T]**
a_0	0.034972	0.02203	1.59	0.1281
a_1	0.120060	0.10598	1.13	0.2707
a_2	0.133468	0.09641	1.38	0.1815
a_3	0.559969	0.13712	4.083	0.0006
a_4	-0.632716	0.40703	-1.55	0.1358
			Adjusted R-Squared	0.6856
b_0	0.00191201	0.01975	0.10	0.9238
b_1	2.722419	0.47956	5.68	0.0001
b_2	-1.320365	0.30633	-4.31	0.0003
b_3	0.568244	0.16247	3.50	0.0021
			Adjusted R-Squared	0.7155
c_0	0.060355	0.01507	4.00	0.0006
c_1	-0.300461	0.27729	-1.08	0.2908
c_2	0.416514	0.16630	2.50	0.0206
c_3	-0.111047	0.14694	-0.76	0.4582
			Adjusted R-Squared	0.1973
d_0	-0.086999	0.08731	-1.00	0.3309
d_1	-0.00160244	0.05210	-0.03	0.9758
d_2	0.036891	0.01149	3.21	0.0044
d_3	0.929193	0.27726	3.35	0.0032
d_4	-0.272989	0.31721	-0.86	0.3997
			Adjusted R-Squared	0.5755
Number of Observations				
Used	25			
Missing	3			

MODEL PROCEDURE 3SLS Estimation				
Correlation of Residuals Matrix Used for Estimation				
S	**YDOT**	**IDOT**	**RDOT**	**XDOT**
YDOT	0.001271	-0.001436	0.000695	0.000584
IDOT	-0.001436	0.003588	-0.000611	0.000655
RDOT	0.000695	-0.000611	0.001157	-0.000485
XDOT	0.000584	0.000655	-0.000485	0.006318

Correlation of Residuals				
Corr S	**YDOT**	**IDOT**	**RDOT**	**XDOT**
YDOT	1.0000	-0.7493	0.8168	0.1376
IDOT	-0.7493	1.0000	-0.4268	0.0031
RDOT	0.8168	-0.4268	1.0000	-0.1698
XDOT	0.1376	0.0031	-0.1698	1.0000

COVARIANCE OF ESTIMATES						
CovB	**a_0**	**a_1**	**a_2**	**a_3**	**a_4**	**b_0**
a_0	0.000485	0.001002	-0.000714	0.001440	-0.007614	-0.000120
a_1	0.001002	0.0112	-0.005397	0.006308	-0.0247	0.000164
a_2	-0.000714	-0.005397	0.009295	-0.007701	0.0112	0.000151
a_3	0.001440	0.006308	-0.007701	0.0188	-0.0407	0.000691
a_4	-0.007614	-0.0247	0.0112	-0.0407	0.1657	-0.000636
b_0	-0.000120	0.000164	0.000151	0.000691	-0.000636	0.000390
b_1	-0.001382	-0.0119	-0.0109	0.000377	0.0462	-0.003178
b_2	0.000527	0.000142	0.0144	-0.0144	-0.008294	-0.000214
b_3	0.000911	0.006253	-0.008455	0.008138	-0.0165	0.000187
c_0	-0.000025	-0.000252	-0.000162	-0.000680	0.002209	-0.000076
c_1	-0.000081	0.001779	0.009690	-0.005719	-0.007555	0.000196
c_2	-0.000410	-0.001245	-0.005269	0.005467	0.006705	0.000174
c_3	0.001397	0.003418	0.000424	0.006321	-0.0316	0.000209
d_0	-0.000291	0.001346	0.000340	-0.002908	0.006596	0.000221
d_1	0.000190	-0.001773	0.000333	0.001120	-0.002962	-0.000068
d_2	0.0000252	0.000291	-0.000299	0.000398	-0.000727	-0.00002
d_3	-0.000785	-0.007521	0.001885	-0.000487	0.0151	0.0000326
d_4	0.000324	0.008861	0.0000864	-0.000635	-0.0119	-0.000246

MODEL PROCEDURE 3SLS Estimation						
Covariance of Estimates						
CovB	b_1	b_2	b_3	c_0	c_1	c_2
a_0	-0.001382	0.000527	0.000911	-0.000025	-0.000081	-0.000410
a_1	-0.0119	0.000142	0.006253	-0.000252	0.001779	-0.001245
a_2	-0.0109	0.0144	-0.008455	-0.000162	0.009690	-0.005269
a_3	0.000377	-0.0144	0.008138	-0.000680	-0.005719	0.005467
a_4	0.0462	-0.008294	-0.0165	0.002209	-0.007555	0.006705
b_0	-0.003178	-0.000214	.000187	-0.000076	0.000196	0.000174
b_1	0.2300	-0.1103	-0.0138	0.001203	-0.0141	0.008880
b_2	-0.1103	0.0938	-0.0191	-0.000339	0.0154	-0.0114
b_3	-0.0138	-0.0191	0.0264	-0.000014	-0.007681	0.003999
c_0	0.001203	-0.000339	-0.000014	0.000227	-0.001242	0.000232
c_1	-0.0141	0.0154	-0.007681	-0.001242	0.0769	-0.0418
c_2	0.008880	-0.0114	0.003999	0.000232	-0.0418	0.0277
c_3	-0/0151	0.006356	0.001799	-0.001477	0.002678	-0.003239
d_0	-0.008355	0.001719	0.002095	-0.000037	0.003627	-0.001337
d_1	0.004350	-0.001302	-0.000972	-0.000014	-0.001930	0.000934
d_2	0.000488	0.0000992	-0.000251	9.5297E-7	-0.000109	-0.000035
d_3	-0.0227	0.0114	0.003232	0.000121	0.0132	-0.008772
d_4	0.0237	-0.0122	-0.001347	0.000158	-0.0159	0.009111

MODEL PROCEDURE 3SLS Estimation Covariance of Estimates						
CovB	c_3	d_0	d_1	d_2	d_3	d_4
a_0	0.001397	-0.000291	0.000190	0.0000252	-0.000785	0.000324
a_1	0.003418	0.001346	-0.001775	0.000291	-09.007521	0.008861
a_2	0.000424	0.000340	0.000333	-0.000299	0.001885	0.0000864
a_3	0.006321	-0.002908	0.001120	0.000398	-0.000487	-0.000635
a_4	-0.0316	0.006596	-0.002962	-0.000727	0.0151	-0.0119
b_0	0.000209	0.000221	-0.000068	-0.00002	0.0000326	-0.000246
b_1	-0.0151	-0.008355	0.004350	0.000488	-0.0227	0.0237
b_2	0.006356	0.001719	-0.001302	0.0000992	0.0114	-0.0122
b_3	0.001799	0.002095	-0.000972	-0.000251	0.003232	-0.001347
c_0	-0.001477	-0.000037	-0.000014	9.5297E-7	0.000121	0.000158
c_1	0.002678	0.003627	-0.001930	-0.000109	0.0132	-0.0159
c_2	-0.003239	-0.001337	0.000934	-0.000035	-0.008772	0.009111
c_3	0.0216	-0.001376	0.000692	0.000150	-0.001427	0.0000114
d_0	-0.001376	0.007623	-0.003785	-0.000507	-0.002470	0.001926
d_1	0.000692	-0.003785	0.002714	0.0000179	0.001808	-0.003671
d_2	0.000150	-0.000507	0.0000179	0.000132	0.000103	0.0000127
d_3	-0.001427	-0.002470	0.001808	0.000103	0.0769	-0.0772
d_4	0.0000114	0.001926	-0.003671	0.0000127	-0.0772	0.1006

APPENDIX 5.d

DATA FOR THE STUDY

YEAR	Y	LP	I	EXP	R	XPMALAY	XPWORLD	W	L	F
1966	9394	9.47	1456	3846	14.9	34.4	22	7454585257984	26.412	3940
1967	9774	9.71	1480	3724	15.8	32.9	22.1	7787625054208	27.106	3901
1968	10160	9.94	1479	4123	16	28.8	21.4	8228148084736	28.308	4253
1969	11629	10.15	1630	5055	17.5	31	22.1	8701815029760	29.738	4349
1970	12155	10.39	2152	5163	18.9	34.8	23.2	9085298671616	33.201	5397
1971	12955	10.7	2701	5017	19.3	34.2	24.6	9423427731456	36.568	5037
1972	14220	11	3211	4854	21.2	32.8	26.8	9899813634048	42.781	5246
1973	18723	11.31	4219	7372	24.1	50.4	33	10551780442112	56.153	6682
1974	22858	11.65	5798	10195	26.8	85.5	45.8	10711670456320	57.116	11210
1975	22332	11.9	5602	9231	26.8	77.1	49.6	11117369753600	59.561	10531
1976	28085	12.3	6206	13442	31	79.3	50.2	11669649489920	67.267	11803
1977	32340	12.58	7465	14959	33.6	95.5	54.8	12175119745024	70.756	13788
1978	37886	12.91	9381	17074	36.9	99.8	60.5	12678870335488	78.200	16477
1979	46424	13.45	12250	24222	40.1	135.4	72.2	13163399479296	86.742	21884
1980	53308	13.7	16597	28172	42.4	158	85.3	13387859755008	96.947	29342
1981	57613	14.11	20759	27109	43.8	148.4	84.1	13601669644288	108.353	33717
1982	62579	14.51	22745	28108	46.2	136.6	80.4	13656320376832	100.058	37300
1983	69941	14.89	25213	32771	51.9	130.1	76.7	14064280403968	95.144	39793
1984	79550	15.27	25391	38647	60.3	140.7	74.7	14677500231680	96.309	41653
1985	77547	15.68	23124	38017	58.8	119	73.4	15160360042496	91.939	38561
1986	71594	16.11	18865	35319	64.4	79.1	80.3	15624360165376	92.424	35941

DATA FOR THE STUDY										
YEAR	Y	LP	I	EXP	R	XPMALAY	XPWORLD	W	L	F
1987	79625	16.53	18280	45225	69.8	96.7	89.1	16178890145792	100.000	39592
1988	90861	16.94	21922	55260	79.7	102	92	16874140073984	115.695	52011
1989	102587	17.35	30063	67824	89.2	101.1	93	17449169715200	133/037	68792
1990	115828	17.76	37490	79646	100	100	100	17824829407232	161/374	85920
1991	129559	18.18	46181	94497	111.2	100.8	998.7	17971269337088	187.490	109686
1992	147784	18.61	50697	103657	120.9	105.6	100.9	18199020044288	202.624	111766
1993	163039	19.06	57358	121238	132.4	109.3	96	18526649712640		131302
1994	185344	19.65	70748	153688	148.3	113.38	98.9			169382

Y=GDP
LP=Population (Labor Proxy) in Millions
I =Gross Fixed Capita Formation
X=Exports
R=Industrial Production
XPMalay=The Unit Price of Export (Malaysia)
XPWorld=The Unit Price of Export (World)
W=World GDP
L=Manufacturing Labor
F=Foreign Capital Inflow

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