A NEOCLASSICAL MODEL OF THE ROLE OF EXPORTS IN THE ECONOMIC GROWTH OF MALYASIA

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INTRODUCTION

The Malaysian economy grew, over the past three decades(up to mid-1990s), on average by 6-3/4 percent a year with an annual per capita GDP growth of 4 percent. According to the International Monetary Fund, this performance placed 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 economy simultaneously underwent a structural transformation from one of high dependence on primary products to one in which manufacturing is the dominant sector. This 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 rose from 37 percent in 1970 to 70 percent in 1993. 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 exports in the Malaysian economic growth. A large number of studies in the last three decades have focused on exports and their contribution to economic growth. The hypothesis tested in these studies was that a rapid growth of exports accelerated the economy's growth. One simple way was to test this hypothesis in isolation, that is, without specifying a full model of exports and growth. The objective was to investigate the relationship between exports and growth by examining the correlation between the variables which represent these two magnitudes of economic performance. Several researchers undertook this approach; they all 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.

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, the production of non-export goods and capital efficiency, and capability to manage external

shocks. These studies also include the scale effects and externalities, resource reallocations, total factor productivities, and contribution of exports to the reduction of import shortages.

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. 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.

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

This study focuses on the role of exports in the Malaysian economy by testing a neoclassical model of exports and growth. Following Michalopoulos and Jay, we construct and test a simple production-function model. However, unlike in Michalopoulos and Jay, who included both foreign and domestic capital, 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:

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

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:

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

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

Dividing through by equation (1) results in:

or:

Noting that:

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

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

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

$dL/dt = L_{t+1} - L_t$

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

Substituting into (4) we get:

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

Or alternatively, we can write:

(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, $\mathbf{K = kY}$, where k is the marginal propensity to invest.

Just as in Michalopoulos and Jay's study, this study first tests a production function of the Cobb-Douglas type including $\mathbf{I}^{\cdot}$ and $\mathbf{L}^{\cdot}$ ($\mathbf{X}^{\cdot}$ 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 exports variable in the Cobb-Douglas model, of course, does not imply that it is treated as an input in the production function. It only suggests that exports contribute 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 this 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).

ANALYSIS OF DATA

Data for the empirical estimation of the models were 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. All data are annual series from 1966 to 1994.

RESULTS

The hypothesis to be tested in this model, 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

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

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

were tested:

This study first fit the equation (7) for Malaysiafor the period of 1966-1994. The following results were obtained (Table 1):

Y =	-0.036	+	3.44 L	+	0.38 I
(-0.61)	(1.51)			(4.84)	

Adj. $R^2 = 0.49$

Table 1
Parameter Estimates
Dependent Variable – YDOT

Variable	DF	Paramet. Estimate	Standard Error	T for HO: Paramet.=0	Prob> [T]
INTERCEP	1	0.035980	0.058856	-0.611	0.5465
LDOT	1	3.438504	2.277218	1.510	0.1436
IDOT	1	0.378050	0.078178	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 (X· or X dot) as a separate variable. The following results were obtained (Table 2):

$$\underset{\text{Adj. } R^2 = 0.85}{\dot{Y} = \underset{(0.525)}{-0.01} + \underset{(4.54)}{0.68\,\dot{L}} + \underset{(7.67)}{0.22\,\dot{I}} + 0.39\,\dot{X}}$$

Table 2
Parameter Estimates
Dependent Variable – YDOT

Variable	DF	Parameter Estimate	Standard Error	T for HO: Parameter=0	Prob > [T]
INTERCEP	1	0.010019	0.032874	0.305	0.7632
LDOT	1	0.683296	1.301134	0.525	0.6043
IDOT	1	0.216876	0.047796	4.537	0.0001
XDOT	1	0.386016	0.050302	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. 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 and 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 also 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 investment and export, these estimates are significant. The sign of the labor variable, as expected, is positive. It is not, however, significant. This result could be attributed to problems with the data, unemployment and underemployment which is typical of most developing countries. 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." 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 is higher than those for 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, it is always possible to find serial correlation of the error terms . 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 3).

Table 3
Durbin-Watson Statistic

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

SUMMARY OF FINDINGS

-- 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.

CONCLUSION

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. However, there is no indication that the growth of GDP has led to growth in Total factor productivity (TFP). 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).[1] Unfortunately, in the case of Malaysia, according to this study, there is no indications that exports growth has led to increase in domestic capital growth and labor productivity. 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, such as Taiwan and South Korea. These latter countries encouraged Direct Foreign Investment (DFI) in production for exports, but mostly in those sectors where transfer of labor skills and technology could be anticipated.

It is true that, as discussed before, the insignificant impact of labor growth on income growth may have to do mainly with the problem of data. This, on the other hand, as pointed out in the preceding, may have have resulted from the absence of the significant manpower skills transfer that has characterized the DFI-based growth of Malaysian exports

Since the relationship between exports and income growth is simultaneous in nature, more studies, utilizing simultaneou-equations models, are needde to investigate the factors through which exports growth can affect income growth.

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ENDNOTES

Theoretically, "TFP is measured as total output divided by labor and capital stock" [Chenery & Srinivasan (1988), page 364]. However, 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.