Economic Growth In Malaysia: Is It Exogenous Or Endogenous?

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Abstract Long term development and sustained growth are important economic targets for all governments. If the growth process is endogenous, a policy implication is that governments can promote growth and raise social welfare by implementing the appropriate policies. Malaysia is regarded as one of the high-performing Asian economies with a remarkably high record of sustained economic growth. The aim of this paper is to examine two alternative models of economic growth for real income, namely exogenous and endogenous, and to determine the variables affecting economic growth in Malaysia. Two time series tests for endogenous growth are applied to the growth rate of Malaysia's real per capita GDP. Government policies are found to have a significant influence on the long run growth rate, which implies that economic growth in Malaysia is endogenous. The regression results indicate that the high growth performance of Malaysia can be linked to government policies which have emphasised physical and human capital accumulation, foreign investment (technological catch-up), export growth and macroeconomic stability.

1. Introduction

The growth of a country's per capita output is a major indicator of its long run economic performance and stability. Realised growth rates seem not to be the outcome of a random process but relate systematically to a number of variables that describe the economic and political environment. This explains the increased attention currently paid to the remarkably high records of sustained growth in several East Asian countries, which raises the issue as to the driving forces behind the East Asian growth process. Young (1995) indicated that the high record of economic growth for the Four Asian Tigers (namely, Hong Kong, Singapore, South Korea and Taiwan) can be attributed to an extraordinarily high accumulation of factor inputs.

A major task is to formulate a theoretical framework that can explain the observed behaviour of economic growth and can quantify various influences on growth. A pioneering work of modern growth theory in the 1950s is the neoclassical growth model developed by Solow (1956). This model applies the law of diminishing returns with technological progress and population growth as the main determinants of an economy's continual growth, which are viewed as largely exogenous. While the new growth theory that has emerged in the 1980s from Romer (1986) and Rebelo (1991) was aimed at capturing the external effects generated by technological progress and factors of production, they also stated that long run growth in output could be sustained. If the growth process is endogenous, governments can promote growth and raise social welfare by implementing the appropriate policies. Brindley (1995) argued that cross-country studies using postwar data could not differentiate between the neoclassical and endogenous specifications. Thus, the motivation for this paper is to examine the growth process of a fast-growing country like Malaysia in a time series context.

With a remarkably high record of sustained economic growth, Malaysia is regarded as one of the eight high-performing Asian economies by the World Bank (1993). Its real Gross Domestic Product (GDP) has grown at an annual average rate of 8.5 percent in the 1990s, and at 6.9 percent over the period 1965-1995. As a small country, rich in natural and mineral resources, the Malaysian economy has always been trade dependent, influenced by both its major trading partners and by commodity prices. Such dependence implies exogenous growth, whereby the major determinants of economic growth are outside the control of the government. However, the high growth performance of Malaysia since the mid-1980s can be attributed to the adoption of export-oriented trade policies, accumulation of physical and human capital, the rapid inflow of foreign direct investment (technological catch-up), and sound macroeconomic policies. These developments are in line with endogenous growth theory, which attempt to explain growth endogenously, including the influential role of government policies. The essential question is whether the economic growth in Malaysia is exogenous or endogenous. What are the factors that have determined Malaysia's persistently high growth over the last three decades? Will the country be able to sustain its current growth rate in the long run? Is it simply a short-run phenomenon which will eventually revert to the lower rates of growth currently experienced in the developed countries? Does the government have a significant role to play in stimulating economic growth?

The aims of this paper are to provide answers to the questions raised above using two alternative models of economic growth, namely exogenous and endogenous, and to determine the variables affecting economic growth in Malaysia. The plan of the paper is as follows. Section 2 outlines the methodology used to distinguish between the two types of growth models. Section 3 examines the data for Malaysia and determines the variables to be included in the models. Section 4 analyses the empirical results, and some concluding remarks are presented in Section 5.

2. Methodology

In the time series literature, two methods have been used to determine if growth is exogenous or endogenous. The first method was developed in Lau (1994), which examines the time series properties of the output. In a basic neoclassical framework, investment and output grow at a constant rate when the growth path is in a steady state, which implies that the variables are trend stationary. On the other hand, the endogenous specification of growth will require the output to be difference stationary, a necessary condition for sustained growth in the long run. Thus, the exogenous and endogenous concepts of growth can be distinguished by examining the evidence for the nonstationarity of output. Dickey and Fuller's (1981) unit root tests, given in equation (1) below, are commonly used to test for the nonstationarity of time series data:

$$\Delta Y_t = a_0 + a_1 t + \beta Y_{t-1} + \sum_{i=1}^{j} \delta_i \Delta Y_{t-1} + \varepsilon_t . \quad (1)$$

Equation (1) is the standard specification for the augmented Dickey-Fuller (ADF) test, in which Y_t is the logarithm of output, ΔY_t approximates the growth rate, t is the deterministic time trend, i is the order of the autoregressive process, and the ΔY_{t-i} is included to accommodate autoregressive processes in the errors. If the null hypothesis, $\beta = 0$, is not rejected at conventional levels of significance, the series Y_t is said to have a unit root, or is nonstationary. This implies that the shock has a permanent effect on Y_t, and hence rejects the exogenous concept of growth. However, it is noted that interpreting the output shocks as either transitory or permanent from the unit root test may be extreme. Another drawback of this test is that no information is provided as to the factors affecting economic growth.

The second method for determining whether growth is exogenous or endogenous is the time series test on endogenous growth models in Jones (1995) and Kocherlakota and Yi (1996). In the Jones (1995) study, the effects of certain policy variables on economic growth are used to distinguish between the neoclassical and Rebelo-type endogenous models. When a permanent change in policy variable, such as an increase in the investment rate or in the level of resources devoted to research and development, has a permanent effect on the growth rate, this supports the endogenous specification. On the other hand, when the effect on the growth rate is transitory, then this supports the exogenous specification of growth.

The dynamic relationship between growth and investment suggested by Jones (1995, p.509) is as follows:

$$g_t = A(L)g_{t-1} + B(L)X_t + \varepsilon_t \quad (2)$$

where g_t is the growth rate of output, X_t is the investment rate, $A(L)$ and $B(L)$ are two polynomials, each of order p, with roots outside the unit circle, and ε_t is a zero mean stationary process. To test the endogenous growth model, equation (2) can be rewritten as:

$$g_t = A(L)g_{t-1} + B(1)X_t + C(L)\Delta X_t + \varepsilon_t \quad (3)$$

where $B(1)$ denotes the sum of coefficients ($b_0 + b_1 + b_2 + \cdots + b_p$) and $C(L)$ is another polynomial of order (p - 1), such that

$$c_k = -\sum_{i=k+1}^{p} b_i , \qquad k = 0, 1, \ldots, p\text{-}1 \quad (4)$$

with b_i and c_k being the coefficients in the polynomials $B(L)$ and $C(L)$, respectively. From equation (3), a permanent shock to X_t has a permanent positive effect on the growth rate if $B(1)$ is positive, which indicates the growth model is endogenous.

The study by Kocherlakota and Yi (1996) differs slightly from Jones (1995), in that the first authors examine the effects of temporary changes in several government policies on the level of per capita GNP. The following equation is related to the methodology used to assess long-run neutrality (see Fisher and Seater, 1993):

$$\Delta Y_t = a_0 + A(L)\Delta Y_{t-1} + B(L)X_t + \varepsilon_t \qquad (5)$$

where Y_t is the logarithm of per capita GNP, ΔY_t approximates the GNP growth rate, and X_t is the policy variable. Equation (5) is noted to have the same representation as equation (2), except for the constant term. However, the variable X_t in equation (5) is assumed to have no contemporaneous effects on the growth rates (i.e. $B(0) = 0$). If the variables Y_t and X_t are integrated of order one, ΔX_t is assumed to be independent of the ε_t process to ensure that the Ordinary Least Squares (OLS) t-statistic converges to an asymptotic standard normal distribution. The growth model is said to be exogenous if the sum of the coefficients of the lagged X_t variables is equal to zero, i.e. $B(1) = b_1 + b_2 + \cdots + b_p = 0$. If $B(1) \neq 0$, a temporary change in X_t has a permanent effect on Y_t, and its long-run impact upon Y_t is measured by $B(1)/(1 - A(1))$.

In this paper, the two methods discussed above will be used to differentiate between the exogenous and endogenous growth models. Given the relative low power of unit root tests, it is important to ensure that the OLS estimate of β in equation (1) is consistent by conducting diagnostic tests for serial correlation and heteroscedasticity. To determine the variables affecting economic growth in Malaysia, a simple statistical growth model can be derived by regressing the growth rate against the variables that are considered to have contributed to its growth.

3. Data

This paper uses time series data from Malaysia over the period 1965 to 1995, unless stated otherwise. Data are extracted from the World Bank World Table (dX Databases), Government Finance Statistics Yearbook and various reports of Malaysia's government agencies. The annual growth rate of income is measured as the log-difference of real GDP per capita (DLGDP). Other variables to be tested include the following:

Exogenous Variables

- Growth rate of US real GNP (USGRO)
- Growth rate of Singapore real GDP (SGRO)

Policy Variables

- Ratio of domestic investment to real GDP (INVR)
- Government expenditure on education (1970-1995) (EDEXP)
- Ratio of students enrolled in secondary education (SECR)
- Ratio of manufacturing to real GDP (1970-1995) (MFRR)
- Export growth (EXGRO)
- Import growth (IMGRO)
- Inflation rate (INF)
- Foreign debt (1970-1995) (DEBT).

All the variables listed above may have contributed to the high growth in Malaysia, and they can be divided into exogenous variables and policy variables. The exogenous variables attempt to capture the nature of a small open economy like Malaysia, which is dependent on world trade and commodity prices. In 1995, the three major trading partners of Malaysia are the United States, Singapore and Japan, which accounted for more than 50% of its total exports, i.e. 20.7%, 20.3% and 12.7%, respectively. If Malaysia is trade dependent, the growth performances of the U.S. and Singapore, in particular, should have significant impacts on Malaysia's economy.

The policy variables are selected based on the economic success of Malaysia, which has been linked to government policies in relation to physical and human capital accumulation, foreign investment (technological catch-up), outward orientation, and macroeconomic stability (World Bank, 1993).

1) Physical and human capital accumulation:
Physical capital has always been regarded as the key contributor in the production of output. The share of investment in real GDP is often used as a proxy for capital stock in the empirical growth literature. As for human capital accumulation, the focus of recent growth studies on the possibility of knowledge externalities has led to a greater emphasis of its role in determining growth. Government expenditure on education and the school enrolment ratio for secondary education are the standard proxy variables for human capital investment.

2) Foreign investment (technological catch-up):
Foreign direct investment (FDI) has been a source of additional capital that has brought along with it technology, management know-how, and market access. A major proportion of the FDI in Malaysia is concentrated in the manufacturing sector. This explains the rapid growth in the manufacturing sector, taking over from the agricultural sector as the major contributor to national income. The share of manufacturing in real GDP is used to test the impact of foreign investment and industrialisation on the Malaysian economy.

3) Outward orientation:
Openness to international trade and export-oriented strategies are generally cited as one of the common characteristics found in the economic policies of the Four Asian Tigers. In the past two decades, total exports for Malaysia have been growing at an average rate of 15% each year, which is higher than the 10% average annual growth rate in world trade. The degree of openness in an economy can be represented by import tariffs or import growth. Hence, export growth and import growth are used to examine the effects of outward orientation on Malaysia's growth.

4) Macroeconomic stability:
The ability of the government to monitor its economy and flexibility to adapt to changing circumstances are important for the success of long-term economic development. It is imperative for the government to provide a politically stable and economically conducive business environment to stimulate growth in the economy. Low rates of inflation and manageable internal and external debts are two common indicators for a country's macroeconomic stability. Both the inflation rate and foreign debt are expected to be inversely related to the growth rate.

4. Empirical Results

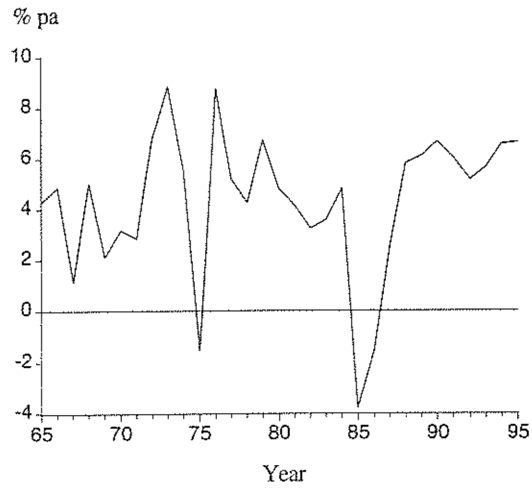
All estimation and test results are derived using the Microfit 4.0 econometric software program (Pesaran and Pesaran, 1996). For the testing of unit roots for logarithm of real GDP per capita for Malaysia (LGDP), the DF and ADF tests (with and without a time trend) were used. The optimal lag length for the ADF test is determined by the Schwarz Bayesian Criterion. Tests for possible breaks in the output series, as suggested by Perron (1989), are not considered because of the small sample size and the lack of any distinct breaks observed in the growth rates (see Figure 1). The estimated t-statistics and non-standard critical values for the DF and ADF tests are presented in Table 1.

Table 1
DF and ADF Tests for Nonstationarity

Variables	Period of estimation	t-value	p	Critical value
DLGDP	1966-1995	-4.082*	0	-2.9627
With a linear trend				
LGDP	1965-1995	-2.059	1	-3.5615

Notes: p is the lag length determined by Schwarz's Bayesian Criterion.
* indicates significant at the 5% level.

Figure 1: Growth Rate of Real GDP Per Capita in Malaysia, 1965-1995

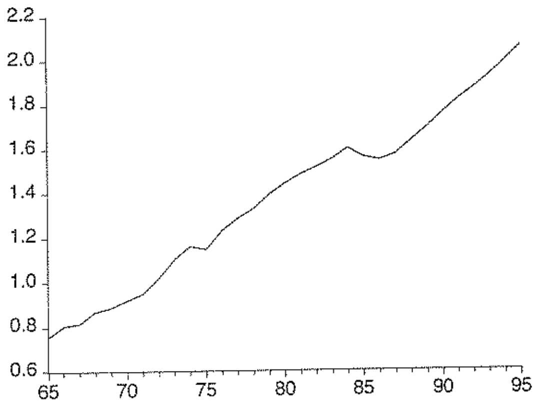


As depicted in Figure 2, Malaysia's real GDP per capita (in natural logarithms) over the period 1965 to 1995 can be estimated by a simple linear trend ($\bar{R}^2 = 0.98$). Intuitively, it means Malaysia's growth rates are exogenous, described by a process that has a constant mean with little persistence. This scenario is not supported by the ADF test with a linear trend, which rejects the null hypothesis of nonstationarity in the series at the 5% level of significance. The test of the series in first differences (DLGDP) indicates it is difference stationary, which supports the endogenous concept of growth (see Table 1).

To test for further support of endogenous growth in Malaysia, equation (3) is estimated by OLS. The effect of a permanent change in the share of domestic investment in real GDP (in logarithms) on the growth rate is examined. Equation (3) is estimated with three and six lags to determine the robustness of the results. Both empirical estimates of $B(1)$ are significantly less than zero, which indicates that a permanent shock to investment does not have a permanent effect on the growth rate. This lack of an increase in per capita growth rates implies that the long run growth rate does not vary with the government policy variable, and hence does not support the endogenous version of growth.

All policy variables listed in Section 3 are tested individually using equation (5) to determine the factors affecting the level of real per capita GDP in Malaysia. In this study, the effects of current and lagged policy variables on the growth rate are examined using the Wald procedure, which tests the restriction that the coefficients of the current and lagged variables sum to zero. The estimates of the policy variables are not sensitive to lag length as the test results for three lags and six lags are identical. Export growth and import growth are the only two variables to reject the restriction at the 5% level of significance. Although the investment rate is not statistically significant, its growth rate is tested to have a positive effect on the level of real GDP per capita. These results indicate that government policies can and do influence Malaysia's economic growth.

Figure 2: Real GDP Per Capita in Malaysia, 1965-1995 (Natural logarithm)



To determine the factors affecting economic growth in Malaysia, a statistically simple empirical growth model is derived by regressing output growth against all the variables listed in Section 3. The estimated coefficients of the statistically significant variables and their corresponding t-ratios are reported in Table 2. Diagnostic tests suggest the estimated model is free from the problems of serial correlation, functional form misspecification, non-normality and heteroscedasticity. Tests for predictive failure and the possibility of a structural break in 1985, when Malaysia experienced negative growth, are also calculated. The test results indicate that there is no problem of predictive failure and that the regression model is stable at the 5% significance level.

As shown in Table 2, the policy variables that determine economic growth in Malaysia over the period 1971 to 1995 are investment growth (DLINVR), growth rates of educational expenditure (DLEDEXP), the manufacturing share in GDP (MFRR), export growth (EXGRO), import growth (IMGRO) and foreign debt (DEBT). All the estimated coefficients have the expected signs except for import growth, the proxy variable for openness. However, the combined effect from the growth rates of total exports and imports is still positive. The negative effect of import growth seems to capture the inverse relationship between the total imports and GDP. Overall, the results support the four criteria discussed in Section 3 which have contributed to the high record of sustained growth in Malaysia.

Table 2
OLS Estimation of Economic Growth in Malaysia

Dependent variable is DLGDP
25 observations from 1971 to 1995

Regressor	Coefficient	t-ratio[Prob]*
Intercept	-0.0391	-2.9736[0.009]
SGRO	0.4215	5.4585[0.000]
DLINVR	0.1415	4.2521[0.001]
DLEDEXP	0.0449	2.0383[0.057]
MFRR	0.3222	3.0630[0.007]
EXGRO	0.1237	6.6899[0.000]
IMGRO	-0.1022	-3.6002[0.002]
DEBT	-0.0010	-2.2217[0.040]
$\overline{R}^2$		0.9203
Serial correlation	Chi-Sq(1)	0.8008[0.371]
Functional form	Chi-Sq(1)	0.0028[0.958]
Normality	Chi-Sq(2)	1.7763[0.411]
Heteroscedasticity	Chi-Sq(1)	0.0947[0.758]
Predictive failure	Chi-Sq(10)	8.6904[0.562]
Chow test	Chi-Sq(8)	10.0827[0.259]

* Probability values are given in brackets.

As for the two exogenous variables, only the growth rate of Singapore (SGRO) has a significant influence on Malaysia's growth. It is not especially surprising to find this result, given the historical relationship between the two countries. In addition, the growth process of Singapore may be similar to that of Malaysia, since the economy of Singapore has been experiencing the same persistent high growth over the past three decades. Removing the SGRO variable from the equation (Table 2) would cause $\overline{R}^2$ to decrease from 0.92 to 0.79 and the growth rates of educational expenditure to become insignificant. In this regression, human capital has a less important role in determining Malaysia's growth, given that the statistical significance of the DLEDEXP variable is sensitive to the regressors included in the model. It is apparent from the empirical results that the economic growth of Malaysia is endogenous, which suggests that the government has a significant role in promoting growth and raising the standard of living by implementing the appropriate policies.

5. Conclusion

Long term development and sustained growth are important economic targets for all governments. If the growth process is endogenous, a policy implication is that governments can promote growth and raise social welfare by implementing the appropriate policies. In determining the driving forces behind Malaysia's rapid growth performance, two alternative models of economic growth in real GDP per capita have been examined. Two methods of time series analysis have been used to differentiate between exogenous and endogenous growth models. Testing the time series properties of Malaysia's real GDP per capita indicates that it is nonstationary, which implies that the economic growth of Malaysia is not exogenous. The test for an endogenous growth model, which requires a permanent increase in investment rate to have a permanent effect on the growth rate, is not supported by the time series evidence. However, policy variables such as export growth and import growth are found to have significant effects on the per capita level of GDP. Clearly, the ability to differentiate between the exogenous and endogenous growth models is an area of applied research to be explored further. It is, however, important to stress that the sample size of 30 years may be too short when analysing the long run growth rate.

To determine the variables affecting economic growth in Malaysia, an empirical growth model is derived by regressing the growth rate against all the exogenous and policy variables. The results indicate that the economic success of Malaysia can be linked to government policies which have emphasised physical and human capital accumulation, foreign investment (technological catch-up), export growth and macroeconomic stability. Since the long-run growth rate can be influenced by government policies, it indicates that the economic growth in Malaysia is endogenous. The ability to sustain its current growth rate in the long run will depend on the appropriate policies implemented by the Malaysian government to stimulate growth, bearing in mind the fact that the government can only influence the policy variables.

6. Acknowledgements

I would like to thank Michael McAleer for helpful comments and suggestions, and to acknowledge the financial support of a University Postgraduate Award at the University of Western Australia and the Faculties of Economics & Commerce, Education and Law at the University of Western Australia for an Individual Research Grant.

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