Impact of Economic Liberalisation on Growth: Evidence from Malaysia

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Abstract: This study attempts to evaluate the impact of liberalisation on Malaysia's economic growth by analysing the 1970-2003 data using cointegration and error correction methods and Granger causality test. The findings suggest that long-run economic growth in Malaysia is largely explained by physical capital, labour force, human capital investment and trade openness. It is also evident that economic growth is not affected by trade, financial and capital account openness in the short run. While trade liberalisation has had a significant positive impact on economic growth in the long run, the effects of financial and capital account liberalisation were rather insignificant.

Keywords**:** Cointegration and causality, growth, liberalisation
JEL classification**:** F41, F43

1. Introduction

Malaysia adopted economic reforms in the mid-1960s. The process was initiated by liberalising its international trade. The financial liberalisation and capital account liberalisation were initiated during the late 1970s, although the country occasionally imposed controls on free market operations (for example, interest rate control(s) in 1985 due to the banking crisis and capital control in 1998 due to the Asian crisis). Over time, Malaysia achieved an acceptable level of economic liberalisation as well as a higher living standard. This study aims to establish a link between Malaysia's economic liberalisation and growth.

Empirical evidence on the effects of economic liberalisation on growth has been mixed. Romer (1989) using OLS (ordinary least squares) estimation of the neoclassical growth model, with technological change based on time series data for 1960-85 for 90 developing countries, found that economic openness (trade) increased growth rate. Edwards (1998),

using data for 1960-90 for 93 countries, conducted OLS estimation based on nine openness indicators that included Sachs and Warner index, WDR index, Leamer index, tariff rates and black market premium and found that total factor productivity growth was faster in more open economies. These studies provide strong evidence of an 'indirect' effect of trade liberalisation on growth. 'Indirect effect' refers to the effect of liberalisation that cannot be directly attributed to economic growth. For example, trade could have an 'indirect effect' on economic growth through technology transfer from abroad resulting in higher productivity, while the 'direct effect' would be an increase in GDP through higher export earnings.

A few studies, namely Ahmed (2001), Dollar and Kraay (2004) and Mamun and Nath (2005) established a 'direct' link (unidirectional causality) between export and growth. Ahmed (2001) used cointegration analysis and error correction models which included industrial production index, investment-GDP ratio, export-GDP ratio, secondary enrolment and customs duty in the model based on Bangladesh data for 1974-96. He found positive effects of trade liberalisation on economic growth. Dollar and Kraay (2004) used data for 100 countries for the 1980-97 period to test the link between export and growth. Using OLS estimation of a panel growth model, they found unidirectional causality from export to growth. Mamun and Nath (2005) using Bangladesh data for 1976-2003 conducted cointegration analysis and Granger causality tests and found unidirectional causality from export(s) to growth.

Some studies have, however, failed to establish any unidirectional link between exports and economic growth. Chow (1987), using data for 1960-80, conducted Sims causality test between export growth and development of manufacturing industries in Argentina, Brazil, Hong Kong, Israel, Korea, Mexico, Singapore and Taiwan, and found bidirectional causality between export growth and industrial development. Kwan and Cotsomitis (1991) conducted Granger's causality tests based on 1952-85 data for China, and reported bidirectional causality between size of export and national income per capita.

A number of studies have investigated the relationship between financial and capital account liberalisation and economic growth. Habib (2002), using pre-and post-liberalisation data until late 1990s, applied cointegration analysis and an error correction model to test whether Bangladesh's external financial openness and economic growth could be linked. He modeled economic growth as a function of long-term domestic investment (function of gross domestic savings, broad money and private sector credit) and productivity. He found that external financial openness had a positive impact on growth through financial deepening and long-term investment. Hermes and Lensink (2005), using data for 25 emerging economies for 1973-96, conducted OLS estimations with fixed effects by taking financial liberalisation on one hand and savings, investment and growth on the other hand. Their findings suggest that financial liberalisation leads to a substitution from public to private investment and thus contributes to higher economic growth.

On the other hand, some studies have found little evidence supporting any link between financial and capital account liberalisation and economic growth. Warman and Thirlwall (1994), using 1960-90 data for Mexico, estimated a growth equation by regressing growth rate of real GDP on real interest rates, government saving to GDP ratio and growth of exports. They failed to establish any significant relationship between interest rate and GDP growth. Edwards (2001) studied the effect of capital account liberalisation on economic growth in 62 countries using data for the 1980s. He conducted weighted least squares

estimation with instrumental variables, and found that capital account liberalisation had no effect on economic growth in poor countries.

Several other studies, including those of Reisen and Soto (2001) and Bashar and Khan (2007), report mixed findings on the linkage between financial and capital account liberalisation and economic growth. Reisen and Soto (2001) conducted panel data analysis for 44 countries for the period 1986-97. Their model included capital flow variables such as foreign direct investment, portfolio equity flows, bond flows, short-term and long-term bank credits as well as other explanatory variables such as lagged GNP, national saving and government consumption. They found mixed effects of capital account liberalisation on economic growth. Bashar and Khan (2007), using Bangladesh data for 1974-2002, applied cointegration analysis and error correction methods by including per capita GDP, gross investment, labour force, secondary enrolment, a dummy for trade openness, real interest rates and net capital inflows variables in the model. They found that financial liberalisation had negative effects on economic growth while the effects of trade liberalisation and capital account liberalisation were insignificant.

There have been some studies focusing on the effects of liberalisation on economic growth in Malaysia. Bahmani-Oskooee and Alse (1993), using data for 1973-88, conducted cointegration tests (real GDP and real exports) on 9 developing countries and found no causality between exports and economic growth in Malaysia. Ghatak *et al.* (1997), using 1955-90 data for Malaysia, applied cointegration analysis, an error correction model and causality tests and found unidirectional causality from aggregate export to real GDP. In their model, they used real GDP, real exports and non export real GDP variables. Islam (1998) conducted cointegration and Granger causality tests to establish a link between exports and economic growth in 15 Asian countries for the period 1967-91. The causality test results indicated that export expansion caused growth in two-thirds of these countries. The study, however, found growth-led exports for Malaysia. Rahman and Mustafa (1997), using data for 13 Asian countries for the period 1965-94 applied cointegration analysis and an error correction model and found bidirectional causality between export growth and economic growth in five countries (Pakistan, China, South Korea, Singapore and Malaysia). Thus the empirical evidence on effects of trade openness on economic growth in Malaysia has been mixed.

Unlike trade liberalisation, only a few studies looked at the effects of financial and capital account liberalisation on economic growth of Malaysia (some studies focused instead on cross-country effects). Ang and McKibbin (2007) using data for the period of 1960-2001 for Malaysia conducted cointegration analysis and causality tests by taking saving, investment, trade and interest rate as exogenous variables in the growth model. They found unidirectional causality from growth to financial depth in the long run. Klein (2003) in a cross-country study for the period of 1976-95 conducted OLS estimation of a growth model using three capital account openness indicators and found strong growth response to capital account liberalisation in middle income countries including Malaysia.

As mentioned above, empirical evidence on impact of economic liberalisation on growth is mixed. Why? First, different studies used different variables to capture the effects of liberalisation. For instance, in order to capture trade openness, Edwards (1998) used nine openness indicators including Sachs and Warner index, WDR index, Leamer index, tariff rates and black market premium. Ahmed (2001) used investment-GDP ratio, export-GDP

ratio, secondary enrolment and customs duty while Dollar and Kraay (2004), Mamun and Nath (2005) and Kwan and Cotsomitis (1991) used growth of export as openness indicators. In order to capture financial and capital account openness, Habib (2002) used long-term domestic investment (function of gross domestic savings, broad money and private sector credit), while Hermes and Lensink (2005) used real rate of interest only. Some studies, however, attempted to capture both trade and financial liberalisation at the same time: Warman and Thirlwall (1994) used real interest rate, government saving(s) to GDP ratio and growth of exports while Bashar and Khan (2007) included gross investment, labour force, secondary enrolment, a dummy for trade openness, real interest rate and net capital inflows variables in the model. In addition, in cross-country studies including those of Islam (1998), Rahman and Mustafa (1997) and Klein (2003), the choice of country specific variables contributed to different findings.

Second, the difference in methodology played a role in the mixed findings in the existing literature. Some studies (Romer 1989; Edwards 1998; Warman and Thirlwall 1994) deployed OLS estimation of growth model while others (Islam 1998; Mamun and Nath 2005; Ang and McKibbin 2007) applied cointegration and Granger causality tests. OLS estimation based on time-series data assumes that the underlying time-series are stationary. In this case, the classical t-test, F-test etc. are valid. However, if the time-series are non stationary, then the results of the regression analysis can be misleading, which is known as 'spurious regression' (Granger and Newbold 1974). Empirical studies by Nelson and Plosser (1982), Meese and Singleton (1982), DeJong *et al.* (1992) and Senhadji (1998) suggest that macroeconomic time series are non stationary in their levels. Thus findings of the studies based on simple OLS estimation (at levels) are viewed as non representative and we are in favour of applying cointegration and Granger causality tests that tackle this issue.

A major limitation of the above studies is that they tested the effects of economic liberalisation either through cross-country analysis or in a country-specific study on Malaysia from *separate* policy reforms points of view (either trade liberalisation or financial liberalisation) and thus were unable to determine the total effects of reforms in a comprehensive manner in a specific country like Malaysia. Cross-country studies in many cases fail to take into account country-specific variables in the model while studies based on piecemeal measures of liberalisation are likely to represent only a partial picture as they cannot capture the interaction and linkages between various liberalisation measures in their impact analysis. Unlike the previous studies, the present study defines economic liberalisation in a broader context by combining trade, financial and capital account liberalisation and thus seeks to measure the total impact of economic reform programmes in Malaysia. It is hypothesised that trade liberalisation and financial and capital account liberalisation led to higher economic growth in Malaysia and in order to verify this hypothesis, we analysed the annual data for a period of 34 years from 1970 to 2003. We used cointegration and error correction methods to analyse the data. Additionally, we also used Granger causality tests to identify any causal relationship between selected liberalisation measures and economic growth.

This paper is organised as follows: After an introduction to the subject matter that includes a brief review of the literature in Section 1, the methodological issues are explained in Section 2. The results are given in Section 3. Section 4 discusses policy implications.

Finally, conclusions are stated in Section 5. It also covers limitations of our analysis and future directions for research.

2. Methodology

We begin with a review of economic growth theories. The foundations of modern growth theory were laid in the 1950s. The neoclassical models of Solow (1956) and Swan (1956) describe an economy of perfect competition and diminishing marginal returns for each input. They attempt to explain economic growth by the growth rate of population (or labour force) and the rate of technological progress. In these models, technological progress is considered to be exogenous. There are two important implications of the Solow and Swan models for the neoclassical growth theory. First, as the stock of capital expands at a rate faster than the labour force, growth slows and eventually returns to the point where, to keep growing, the economy must benefit from continual infusions of technological progress. Second, due to diminishing marginal returns, poor countries should grow faster than rich ones.

However, these models have some shortcomings. First, in the case of the Solow model, the adjustment towards its steady state is relatively slow, partly due to the (assumed) inability of the natural rate to adjust to changes in capital intensity as the economy moves from one equilibrium to another in response to an exogenous shock. Second, the Solow model's assumption of an exogenously determined rate of technological progress is based on the proposition that labour has no endogenous growth component since population in many countries appears to grow independently of the economic system. Nevertheless in reality some technical change is endogenous and partly labour-augmenting.

In the 1980s, the new growth theory (also known as endogenous growth theory) questioned some assumptions of the neoclassical growth model. Romer (1986) concentrated on technological progress and showed that if human capital (the knowledge and skills embodied in the workforce) is taken into account as part of broader capital, the law of diminishing returns may not apply. Mankiw *et al.* (1992) augmented the Solow model by including accumulation of human capital in the model. The main contribution of their study is that they firmly challenged the idea of most endogenous growth theorists in that the neoclassical model along the lines of Solow cannot explain cross-country differences in economic growth.

Lucas (1988) and Romer (1986; 1990), utilising the learning-by-doing model of Arrow (1962) and Uzawa's (1965) model of investment in human capital, postulate that under increasing returns to scale, investment in physical and human capital could result in sustained growth in real per capita income without a fall in the marginal productivity of capital to the level of the prevailing interest rate. A special feature of the model is the existence of an externality which is taken into account by the spillover effects of human capital accumulation. As the accumulation of knowledge continues, due to the assumption of non diminishing returns in the production of knowledge technology in the endogenous growth model, the economy drives to a sustainable positive growth rate. The possibility of sustainable growth rate in the endogenous growth model is different from the exogenous productivity model of Solow and augmented Solow models.

Following broadly the approach adopted in Lucas (1988), we specify the economic growth function for Malaysia as follows:

$$Y = f(K, L, H, OI) \tag{1}$$

where Y is output, K is physical capital, L is labour, H is human capital, and OI is openness indicator. We consider three types of openness indicators - trade liberalisation, financial liberalisation and capital account liberalisation. We use trade (export plus import) as share of GDP *(TRY)* as trade openness indicator, real interest rate *(R)* as financial reform indicator and net capital inflows as share of GDP *(CAPFLOWY)* as capital market openness indicator.[1] For capital *(K)*, we use ratio of investment to GD *(IY)*. For labour *(L)*, we use labour force as share of population *(LFORCE)*. Following Mankiw *et al.* (1992), the effective workforce of Lucas *(H)* is proxied by the variable *EDU,* which measures the percentage of the working-age population that is in secondary schools.[2] Thus our growth function becomes

$$\ln PY_t = \alpha_0 + \alpha_1 IY_t + \alpha_2 LFORCE_t + \alpha_3 EDU_t + \alpha_4 TRY_t + \alpha_5 R_t + \alpha_6 CAPFLOWY_t + u_t \tag{2}$$

where

PY	= per capita GDP
IY	= gross investment as share of GDP
LFORCE	= labour force as share of population
EDU	= human capital investment in terms of schooling (secondary enrolment ratio)
TRY	= total trade as share of GDP (trade openness indicator)
R	= real rate of interest (financial openness indicator)
CAPFLOWY	= net capital inflows as share of GDP (capital account openness indicator)

Expected sign : $\alpha_1 > 0$; $\alpha_2 > 0$; $\alpha_3 > 0$; $\alpha_4 > 0$; $\alpha_5 > 0$; or $\alpha_5 > 0$; $\alpha_6 >$

The expected signs of the parameters follow the basic growth concept: higher levels of investment, labour, human capital, trade and net capital inflows (through investment) are expected to result in higher levels of income. The early hypotheses of McKinnon (1973) and Shaw (1973) assumed that financial liberalisation which would be associated with

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[1] There have been a number of indicators that can be used to capture the effects of capital account liberalisation. These include *IMF, SHARE, QUINN, BHL, EW, CAPFLOWS* and *MINIANE* indices. *CAPFLOWS* indicator is based on actual capital flows constructed as a percentage of GDP. An advantage of using *CAPFLOWS* over other indicators is that it is available for all countries with balance of payment statistics. For a comprehensive discussion on capital account openness indicators, see Edison *et al.* (2002) and Miniane (2004).

[2] For details, see Lucas (1988). The endogenous growth model considers three cases:
i) a model emphasising physical capital accumulation and technological change;
ii) a model emphasising human capital accumulation through schooling; and
iii) a model emphasising specialised human capital accumulation through learning-by-doing.

Of these, the model which emphasises human capital accumulation through schooling has received the greatest attention. The decision to accumulate human capital through schooling is equivalent to a decision to withdraw effort from production. One of the important features of the Lucas model is the dual role of human capital - internal and external. Internal role is related to the effect of an individual's human capital on one's own productivity. External role, on the other hand, pertains to the productivity of all factors of production.

higher real interest rates would stimulate saving as controls on these are lifted. The higher savings rate would then finance a higher level of investment leading to higher growth. On the other hand financial liberalisation can reduce real interest rates by increasing (the) available funds.

Though McKinnon and Shaw agree that liberalisation is necessary for getting rid of financial repression, their transmission mechanism point of view differs. McKinnon's view is based on 'complementarity hypothesis, which states that it is necessary to accumulate money balances (save) before investment can take place; thus money and investments are essentially complementary. A higher real deposit rate is expected to influence accumulation of money balances (savings) positively, which in turn can lead to higher levels of investment. Shaw, on the other hand, takes a debt-intermediation view that emphasises the increased role of financial intermediaries. Increased financial intermediation allows intermediaries to offer more attractive deposit accounts (higher interest rates or higher liquidity) and lower borrowing rates. This encourages saving and investment resulting in higher economic growth.

Again from the theoretical point of view, financial liberalisation has an ambiguous effect on the level of saving. According to Bandiera *et al.* (2000), the long-term effect of financial liberalisation on saving can be significantly different from the impact effect observed in the aftermath of financial reform. Thus an evaluation of the potential effect of financial liberalisation on national saving implies analysing the different channels through which this impact can take place as well as distinguishing between short-term and long-term effects involved in the transmission process. Two effects can be distinguished - a direct short-run effect that reduces saving and an indirect long-run effect that boosts saving:

i) *Direct effect* - a larger supply of consumer credit allows households to consume at the optimal level determined by their life-cycle position and thus could lead them into revising their precautionary saving levels. This would allow young households that had been constrained, to consume more than they would over a full unconstrained lifetime. This suggests that saving(s) can fall temporarily below its steady-state level, leading to a temporary consumption boom. The direct effect can be split into two parts: a credit channel related to the impact of financial reform on interest rates and a quantity channel involving availability of credit.

ii) *Indirect effect* - in the long run, saving(s) could be raised not directly through structural changes to the financial system, but by one of the by-products of financial development: GDP growth and higher levels of income.

Thus the expected sign of the parameter of real interest rate could be positive or negative. The error correction *(EC)* term lagged one period which integrates short-term dynamics in the long-run growth function is shown below through the error correction model (ECM):

$$(3)$$

$$\Delta \ln PY_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta \ln PY_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta IY_{t-i} + \sum_{i=0}^{n} \gamma_{3i} \Delta LFORCE_{t-i} + \sum_{i=0}^{n} \gamma_{4i} \Delta EDU_{t-i}$$

$$+ \sum_{i=0}^{n} \gamma_{5i} \Delta TRY_{t-i} + \sum_{i=0}^{n} \gamma_{6i} \Delta R_{t-i} + \sum_{i=0}^{n} \gamma_{7i} \Delta CAPFLOWY_{t-i} + \gamma_8 EC_{t-1} + \varepsilon_t$$

where EC_{t-1} is the error correction term lagged one period. The ECM introduces an additional channel through which Granger causality could be detected. If two variables are cointegrated, there exists a causal relationship between them (Granger 1988).

We use annual data for the period 1970-2003 and all variables are expressed in real terms (2000 prices). In order to derive real interest rate, nominal interest rate (deposit rate, 3-6 months) has been adjusted with inflation (GDP deflator, per cent).

Data sources include various international compilations such as *UN Statistical Yearbooks* by the United Nations, *International Financial Statistics* by the International Monetary Fund (IMF), *EIU Country Data* by the Economist Intelligence Unit (EIU), *World Development Indicators* by the World Bank and *ADB Key Indicators* by the Asian Development Bank (ADB), and Department of Statistics Malaysia publications such as *Statistics Handbook, Malaysia* and *Yearbook of Statistics, Malaysia.*

The modeling strategy follows a four-step procedure:

1. Determine the order of integration of the variables using Augmented Dickey-Fuller (Dickey and Fuller 1981) and Phillips-Perron (1988) unit root tests. In case of contradictory findings, use Kwiatkowski-Phillips-Schmidt-Shin (KPSS 1992) test of unit root.

2. If the variables are found to be integrated of the same order, apply the Johansen-Juselius (1990; 1992; 1994) maximum likelihood method of cointegration to determine the number of cointegrating vectors. On the other hand, if the variables are found to be integrated of different order, they will be integrated of the same order through differencing before determining the number of cointegrating vectors. We would apply the trace test and maximum eigenvalue test of cointegration. If the tests give contradictory results, we would stick to the results based on the maximum eigenvalue test which is usually preferred for pinning down the number of cointegrating vectors (Enders 2004: 354).

3. If the variables are found to be cointegrated, estimate the error correction model using standard methods. We will include the I(0) variables (which have been omitted in cointegration tests) while estimating vector error correction models.

4. Run the Granger causality test in order to determine the causal relationship among the variables and conduct diagnostic tests.

3. Results

Figure 1 shows trends during 1970 to 2003 in per capita GDP, investment as share of GDP, labour force as share of population, secondary enrolment ratio, trade as share of GDP, real interest rate and net capital inflows as share of GDP. A clear upward trend in per capita GDP, labour force, secondary school enrolment and trade in Malaysia in the post-liberalisation period (1980s) is visible in Figure 1. Investment shows an upward trend from mid-1980s to mid-1990s and then the trend declines while net capital inflows register an upward trend from mid-1980s to early 1990s and since then, it has maintained a downward trend. Real interest rate although showing an increase an average over time, does not show a clear upward trend.

In order to analyse the time-series properties of the annual data for the period 1970-2003, we conducted Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests at both
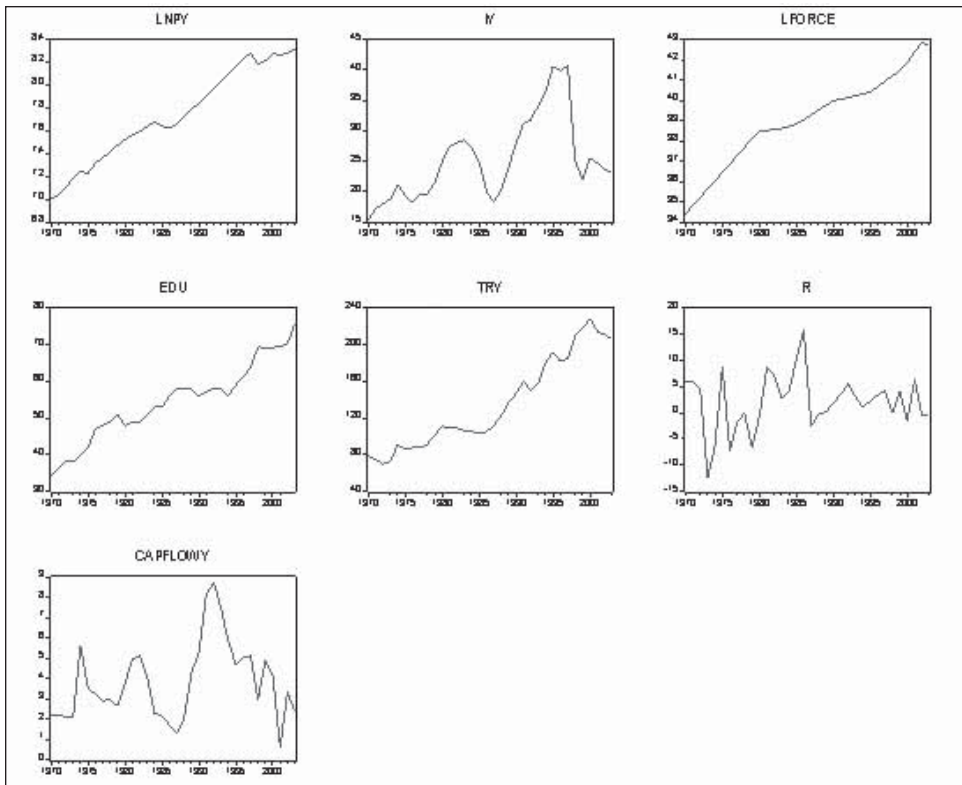
Figure 1: *Growth model data (1970-2003)*

levels and first difference for all variables in the model. Results of the unit root tests are shown in Table 1. As all variables in the model except LFORCE and R are found to be I(1), we took the first difference of the I(2) variable LFORCE and conducted Johansen-Juselius cointegration analysis excluding the I(0) variable R from the model.

We specified the relevant order of lags $p = 2$ of the VAR model (implies a lag length of 1 in VEC model) before conducting cointegration tests. Given the nature of the data which is annual, $p = 1$ instead seemed to be a reasonable choice as we can capture effects of events that occurred up to a year back. However, our findings suggest divergence to the long run equilibrium when we use $p = 1$. Results of the Johansen-Juselius cointegration analysis using $p = 2$ are shown in Table 2.

At 5 per cent significance level, both trace test and maximum eigenvalue test indicate 1 cointegrating equation among the variables. When normalised for a unit coefficient on *LNPY*, the cointegrating regression of economic growth in Malaysia can be given as follows (standard errors in parentheses): [3]

$$LNPY = 6.33 + 0.007IY - 0.37\Delta LFORCE + 0.01EDU + 0.004TRY - 0.004CAPFLOWY \quad (4)$$
$$ (0.001) (0.04) (0.001) (0.0003) (0.003)$$

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[3] The standard errors for the cointegrating vector are computed following Boswijk (1995).

Table 1: Unit root tests for stationarity

Variables	Level/ First difference	Augmented Dickey-Fuller (ADF) test statistic		Phillips-Perron (PP) test statistic		Conclusion
		Without trend	With trend	Without trend	With trend	
LNPY	Level	-1.37 (0)	-1.70 (0)	-1.33	-1.88	I(1)
	First difference	-4.72* (0)	-4.85* (0)	-4.73*	-4.86*	
IY	Level	-2.23 (1)	-2.27 (1)	-1.87	-1.49	I(1)
	First difference	-4.20* (0)	-4.22* (0)	-4.15*	-4.12*	
LFORCE	Level	-2.37 (2)	-2.81 (1)	-1.82	-2.45	I(2)
	First difference	-2.70 (1)	-3.24 (1)	-2.10	-2.39	
EDU	Level	-0.33 (0)	-2.04 (0)	- 0.35	-2.04	I(1)
	First difference	-4.72* (0)	-4.59* (0)	-4.72*	-4.59*	
TRY	Level	-0.16 (0)	-2.25 (0)	-0.09	-2.27	I(1)
	First difference	-4.63* (0)	-4.52* (0)	-4.56*	-4.42*	
R	Level	-4.77* (0)	-4.79* (0)	-4.78*	-4.79*	I(0)
	First difference	-7.16* (1)	-7.04* (1)	-15.91*	-14.85*	
CAPFLOWY	Level	-2.44 (0)	-2.31 (0)	-2.51	-2.40	I(1)
	First difference	-6.06* (0)	-6.05* (0)	-6.07*	-6.05*	

Note: i. In ADF tests, optimum lag lengths, shown in parentheses in the test statistic column, have been determined using Schwartz Bayesian Criterion (SBC).

ii. In PP tests, Bartlett kernel (default) spectral estimation method and Newey-West bandwidth (automatic selection) have been used.

iii. Conclusion about the order of integration of a particular variable is based on the test that did not include the trend in the test equation. Test statistics 'with trend' have been shown for the purpose of reporting only.

iv. * denotes significance at 5 per cent level. MacKinnon (1998) one-sided *p*-values have been used for this purpose.

Table 2: Johansen-Juselius maximum likelihood cointegration tests

Trace test			Maximum eigenvalue test		
Null hypothesis	Alternative hypothesis	Test statistic	Null hypothesis	Alternative hypothesis	Test statistic
r = 0	r > 0	103.89*	r = 0	r = 1	56.01*
r ≤ 1	r > 1	47.88	r = 1	r = 2	20.19

Note: i. r refers to number of cointegrating equations.

ii. Test has been conducted assuming linear deterministic trend.

iii. * denotes rejection of null hypothesis of no cointegration at 5 per cent significance level. MacKinnon *et al.* (1999) *p*-values have been used for this purpose.

In the estimated model above, none of the coefficients of the explanatory variables of economic growth are found to be greater than unity indicating low responsiveness of economic growth to changes in these variables.

The coefficient estimates of the variables *IY*, *EDU* and *TRY* in the equilibrium relation are significant at 5 per cent level and have the expected signs. The coefficient estimate of the variable *ÄLFORCE* in the equilibrium relation is significant at 5 per cent level with an unexpected sign. The coefficient estimate of the variable *CAPFLOWY* in the equilibrium relation is insignificant at 5 per cent level with an unexpected sign. Thus physical capital (investment-GDP ratio), labour force, human capital investment (secondary enrolment ratio) and trade openness (trade-GDP ratio) are found to be the main determinants of economic growth.

We estimated the error correction model in order to determine the dynamic behaviour of economic growth; results are displayed in Table 3. While estimating the error correction model, we included the I(0) variable *R* which was previously excluded in cointegration analysis.

The estimated coefficient of the error term (-0.36) has been found to be statistically significant at the 10 per cent level with the appropriate (negative) sign.[4] This suggests that the system corrects its previous period's disequilibrium by 36 per cent a year.

The cointegrating relationship among the variables suggests existence of Granger causality in at least one direction, but does not indicate the direction of temporal causality between the variables. In order to determine the direction of causality, we ran the Granger causality test within the ECM and the results are shown in Table 4.

The Granger causality test results indicate unidirectional causality from physical capital to trade openness, capital account openness to labour force, trade openness to real interest rate, human capital investment to physical capital and growth to physical capital. We found no causal relationship among other variables.

Finally we performed diagnostic tests using correlogram of the residuals which indicate presence of no serial correlation at 5 per cent significance level. Figure 2 displays the diagnostic test results.

4. Policy Implications

Our study found the coefficient of the trade liberalisation policy variable to be positive and significant, implying a positive impact of trade liberalisation on Malaysia's economic growth in the long run. This finding is supported by most of the recent growth literature on trade liberalisation including those of Romer (1989), Edwards (1998), Ahmed (2001), Dollar and Kraay (2004), Mamun and Nath (2005) and Ghatak *et al*. (1997). However we found no causal relationship between trade liberalisation and economic growth in the short run. Second, the coefficients of financial and capital account liberalisation policy variables were found to be insignificant both in the short and long runs; implying that these policies were largely ineffective in propelling the country's economic growth. This could be attributed to a lack of programme credibility owing to economic agents' belief that the new policy regime

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[4] Though the estimated coefficient of the error term has not been found to be statistically significant at 5 per cent level, it is found to be statistically significant at 10 per cent level.

Table 3: Estimated error correction model

	Dependent variable: Ä*LNPY*	
Regressors	Parameter estimate	*t*-ratio (absolute value)
Intercept	0.03	1.89*
Ä*LNPY*$_{t-1}$	0.52	1.21
Ä*IY*$_{t-1}$	-0.005	1.07
ÄÄ*LFORCE*$_{t-1}$	-0.02	0.16
Ä*EDU*$_{t-1}$	-0.009	1.64*
Ä*TRY*$_{t-1}$	-0.001	0.99
Ä*R*$_{t-1}$	-0.0005	0.37
Ä*CAPFLOWY*$_{t-1}$	-0.002	0.36
EC$_{t-1}$	-0.36	1.64*

Note:* denotes significance at 10 per cent level.

Table 4: Granger causality test

	Dependent variable						
	Ä*LNPY*	Ä*IY*	ÄÄ*LFORCE*	Ä*EDU*	Ä*TRY*	Ä*R*	Ä*CAPFLOWY*
Ä*LNPY*		4.62*	3.40	1.63	3.71	0.19	0.05
		(0.03)	(0.07)	(0.20)	(0.054)	(0.67)	(0.83)
Ä*IY*	1.14		0.12	0.61	5.85*	0.47	0.62
	(0.29)		(0.73)	(0.43)	(0.02)	(0.49)	(0.43)
ÄÄ*LFORCE*	0.03	0.04		0.003	2.88	0.006	0.85
	(0.87)	(0.84)		(0.95)	(0.09)	(0.94)	(0.36)
Ä*EDU*	2.67	11.73*	1.48		1.79	0.002	1.53
	(0.10)	(0.001)	(0.22)		(0.18)	(0.96)	(0.22)
Ä*TRY*	0.98	0.42	0.10	0.06		4.01*	0.02
	(0.32)	(0.52)	(0.75)	(0.81)		(0.045)	(0.88)
Ä*R*	0.14	0.29	2.48	0.06	0.56		0.12
	(0.71)	(0.59)	(0.12)	(0.81)	(0.45)		(0.73)
Ä*CAPFLOWY*	0.13	0.002	4.48*	0.49	2.50	0.56	
	(0.72)	(0.96)	(0.03)	(0.49)	(0.11)	(0.45)	

Note: i. A VAR lag length of 2 has been used in Granger causality test.
ii. Corresponding probabilities have been shown in parentheses.
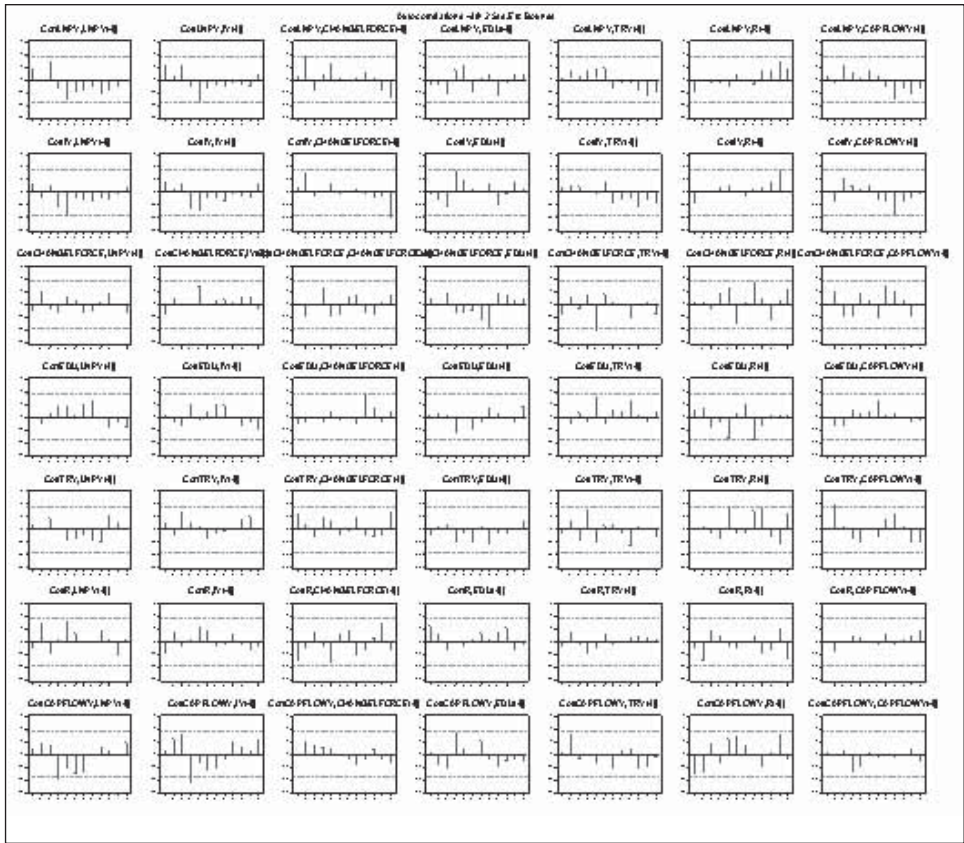iii. * denotes significance at 5 per cent level. It indicates causal relationship.

Figure 2: *Diagnostic test of the residuals*

is not permanent especially after the Asian crisis of 1997. Even though the government undertook a number of measures to liberalise the financial and capital markets, it still holds a significant level of authority over market functioning. For example, the Governor of Bank Negara Malaysia is selected by the Ministry of Finance which hinders the Bank's autonomy.

We found unidirectional causality from growth to physical capital (investment) in the short run which is supported by the study of Ang and McKibbin (2007). However our findings are different from that of Klein (2003) and this could be due to differences in models, methodology and coverage of the study. We included all three measures of liberalisation–trade, financial and capital account liberalisation policy variables–in our model whereas Klein (2003) only took into account capital account liberalisation. Our findings are not surprising; rather they strengthen the view that a developing country like Malaysia would not be able to reap in full the substantial benefits from a comprehensive set of liberalisation measures unless economic agents perceive the programmes as sustainable.

5. Conclusion

In this paper we have examined the effects of economic liberalisation on economic growth in Malaysia by means of cointegration analysis, error correction method and Granger causality test using annual data for a period of 34 years. Our study shows that long-run economic growth in Malaysia is largely explained by physical capital, labour force, human capital investment and trade openness. It is also evident that economic growth is not affected by trade, financial and capital account openness in the short run. Rather, there is a unidirectional causality from economic growth to physical capital. The estimated coefficient of the ECM indicates a moderate speed of adjustment to equilibrium. The sign of the error correction term is negative and significant confirming that there exists a long-run equilibrium relationship among the variables. Our findings suggest that in the long run, trade liberalisation has had significant positive impacts on economic growth while the effects of financial and capital account liberalisation were rather insignificant. This could be attributed to a weak supply response due to a lack of credibility of the reform programme(s). It is imperative that developing countries like Malaysia meet the preconditions such as institutional development as well as government commitment before embarking on broad liberalisation programmes.

Like most other empirical studies, our study suffers from inherent limitations pertaining to data and methodology. The length of the data period is limited to only 34 years which might not be sufficient to capture the effects of reform programmes spread over a long periods of time. The selected methodology also suffers from standard limitations. Finally our study did not take into account other reforms that took place in Malaysia alongside various economic liberalisation measures. Future research studies could focus on evaluating the effects of liberalisation on growth more comprehensively, that is, by taking into account other liberalisation measures such as agricultural reform and public sector reform.

References

Ahmed, N. 2001. *Trade Liberalization in Bangladesh: An Investigation into Trends.* Dhaka: The University Press Limited.

Ang, J.B. and W.J. McKibbin. 2007. Financial liberalization, financial sector development and growth: evidence from Malaysia. *Journal of Development Economics* **84(1):** 215-233.

Arrow, K.J. 1962. The economic implications of learning by doing. *The Review of Economic Studies* **29(3):** 155-173.

Asian Development Bank. *Key Indicators (various issues).* Manila.

Bahmani-Oskooee, M. and J. Alse. 1993. Export growth and economic growth: an application of cointegration and error-correction modeling. *Journal of Developing Areas* **27(4):** 535-542.

Bandiera, O., G. Caprio, P. Honohan and F. Schiantarelli. 2000. Does financial reform raise or reduce savings? *The Review of Economics and Statistics* **82(2):** 239-263.

Bashar, O. and H. Khan. 2007. Liberalization and growth: an econometric study of Bangladesh. U21Global Working Paper No. 001/2007. Singapore: U21 Global.

Boswijk, H.P. 1995. Identifiability of cointegrated systems. Technical Report. Netherlands: Tinbergen Institute.

Chow, P.C.Y. 1987. Causality between export growth and industrial performance: evidence from NICs. *Journal of Development Economics* **26:** 55-63.

DeJong, D.N., J.C. Nankervis, N. E. Savin and C. H. Whiteman. 1992. Integration versus trend stationarity in time series. *Econometrica* **60(2):** 423-433.

Department of Statistics Malaysia. *Statistics Handbook, Malaysia* (various issues).

Dickey, D.A. and W.A. Fuller. 1981. Likelihood ratio statistics for autoregressive time-series with a unit root. *Econometrica* **49(4):** 1057-1072.

Dollar, D. and A. Kraay. 2004. Trade, growth, and poverty. *The Economic Journal* **114 (493):** F22-F49.

Edison, H.J., M.W. Klein, L. Ricci and T. Sløk. 2002. Capital account liberalization and economic performance: survey and synthesis. NBER Working Paper No. 9100. Cambridge, MA: National Bureau of Economic Research.

Edwards, S. 1998. Openness, productivity and growth: what do we really know? *The Economic Journal* **108(447):** 383-398.

Edwards, S. 2001. Capital mobility and economic performance: are emerging economies different? NBER Working Paper No. 8076. Cambridge, MA: National Bureau of Economic Research.

Enders, W. 2004. *Applied Econometric Time Series*. USA: John Wiley & Sons, Inc.

Ghatak, S., C. Milner and U. Utkulu. 1997. Exports, export composition and growth: cointegration and causality evidence for Malaysia. *Applied Economics* **29(2):** 213-223.

Granger, C.W.J. 1988. Some recent developments in a concept of causality. *Journal of Econometrics* **39(1-2):** 199-211.

Granger, C.W.J. and P. Newbold. 1974. Spurious regressions in econometrics. *Journal of Econometrics* **2(2):** 111-120.

Habib, S.M.A. 2002. Can Bangladesh's external financial openness be linked to the country's economic growth? *Bank Parikrama* **27(2 & 3):** 5-31.

Hermes, N. and R. Lensink. 2005. Does financial liberalization influence saving, investment and economic growth? Evidence from 25 emerging market economies: 1973-96. *UNU*-WIDER Research Paper No. 2005/69. Finland: United Nations University.

International Monetary Fund. 2004. *International Financial Statistics CD-ROM 2004*. Washington, DC.

Islam, M.N. 1998. Export expansion and economic growth: testing for cointegration and causality. *Applied Economics* **30(3):** 415-425.

Johansen, S. and K. Juselius. 1990. Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics* **52(2):** 169-210.

Johansen, S. and K. Juselius. 1992. Testing structural hypothesis in a multivariate cointegration analysis of the PPP and the UIP for UK. *Journal of Econometrics* **53(1-3):** 211-244.

Johansen, S. and K. Juselius. 1994. Identification of the long-run and the short-run structure: an application to the ISLM Model. *Journal of Econometrics* **63(1):** 7-36.

Klein, M.W. 2003. Capital account openness and the varieties of growth experience. NBER Working Paper No. 9500. Cambridge, MA: National Bureau of Economic Research.

Kwan, A. and C. Cotsomitis. 1991. Economic growth and the expanding export sector: China 1952-1985. *International Economic Journal* **5(1):** 105-117.

Kwiatkowski, D., P.C.B. Phillips, P. Schmidt and Y. Shin. 1992. Testing the null hypothesis of stationary against the alternative of a unit root. *Journal of Econometrics* **54:** 159-178.

Lucas, R.E. 1988. On the mechanics of development planning. *Journal of Monetary Economics* **22(1):** 3-42.

MacKinnon, J.G. 1998. Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics* **11(6):** 601-618.

MacKinnon, J.G., A.A. Haug and L. Michelis. 1999. Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of Applied Econometrics* **14(5):** 563-577.

Mamun, K.A. and H.K. Nath. 2005. Export-led growth in Bangladesh: a time series analysis. *Applied Economics Letters* **12:** 361-364.

Mankiw, N.G., D.Romer and D.N. Weil. 1992. A contribution to the empirics of economic growth. *The Quarterly Journal of Economics* **107(2):** 407-437.

McKinnon, R.I. 1973. *Money and Capital in Economic Development.* Washington: The Brookings Institution.

Meese, R. and K. Singleton. 1982. On unit roots and empirical modeling of exchange rates. *Journal of Finance* **37(4):** 1029-1035.

Miniane, J. 2004. A new set of measures on capital account restrictions. *IMF Staff Papers* **51(2):** 276-308.

Nelson, C. and C. Plosser. 1982. Trends and random walks in macroeconomic time series: some evidence and implications. *Journal of Monetary Economics* **10(2):** 139-162.

Phillips, P.C.B. and P. Perron. 1988. Testing for a unit root in time series regression. *Biometrica* **75(2):** 335-346.

Rahman, M. and M. Mustafa. 1997. Dynamics of real exports and real economic growth in 13 selected Asian countries. *Journal of Economic Development* **22(2):** 81-95.

Reisen, H. and M. Soto. 2001. Which types of capital inflows foster developing-country growth? *International Finance* **4(1):** 1-14.

Romer, P.M. 1986. Increasing returns and long-run growth. *Journal of Political Economy* **94(5):** 1002-1037.

Romer, P.M. 1989. What determines the rate of growth and technological change? Policy, Planning and Research Working Paper No. 279. Washington, DC: World Bank.

Romer, P.M. 1990. Endogenous technological change. *Journal of Political Economy* **98(5):** S71-S102.

Senhadji, A. 1998. Time-series estimation of structural import demand equations: a cross-country analysis. *IMF Staff Papers* **45(2):** 236-268.

Shaw, E. 1973. *Financial Deepening in Economic Development.* New York: Oxford University Press.

Solow, R. 1956. A contribution to the theory of economic growth. *The Quarterly Journal of Economics* **70(1):** 65-94.

Swan, T. 1956. Economic growth and capital accumulation. *The Economic Record* **32(2):** 334-361.

The Economist. *EIU Country Data Online.*

United Nations. *Statistical Yearbook* (various issues). New York.

Uzawa, H. 1965. Optimal technical change in an aggregative model of economic growth. *International Economic Review* **6(1):** 18-31.

Warman, F. and A.P. Thirlwall. 1994. Interest rates, saving, investment and growth in Mexico 1960-90: tests of the financial liberalization hypothesis. *Journal of Development Studies* **30(3):** 629-649.

World Bank. 2004. *World Development Indicators CD-ROM 2004.*