Export-led Growth Hypothesis in Malaysia: An Application of Two-Stage Least Square Technique

Choong Chee Keong[b], Zulkornain Yusop[a] and Venus Khim-Sen Liew[a]

[a]Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
[b]Faculty of Accountancy and Management, Universiti Tunku Abdul Rahman, Jalan Genting Kelang, 53000 Kuala Lumpur, Malaysia.

ABSTRACT

This paper aims to re-estimate the robustness of the relationship between export and economic growth in the Malaysian economy from 1959 to 2000. Combining both production function and international trade and development theories, a six variable (economic growth, exports, imports of consumption goods, capital formation, labour force and exchange rate) vector autoregression (VAR) model has been developed. Multivariate cointegration results revealed that there exists a single cointegrating vector in the estimated system. This means that these variables are linked together in achieving their steady state equilibrium in the long run. Resulting from the endogeneity problem of the variables involved, two-stage least squares was applied to estimate the short run causality model. From our error correction model, we reported that all variables, except exchange rate Granger-cause economic growth in the short run at 5 percent significance level. This implies that export-led hypothesis growth is valid in the Malaysian economy in both short- and long-run. Besides, our results suggest that the growth rate of capital formation and imports have positive impacts on economic growth, while labour has a negative impact in the short-term.

Keywords: Export-led growth hypothesis, endogeneity, multivariate cointegration test, two-stage least square, Granger-causality, production function theory.

JEL Classifications: F43

INTRODUCTION

Export-led growth hypothesis generally reflects the relationship between exports and economic growth, in particular, output growth is driven by exports. This relationship, however, remains the subject of debate. Some studies provided empirical results to support this hypothesis (Arnade and Vasavada 1995; Fosu 1996; Thornton 1996), some found contrasting evidence that export is Granger caused by the economic growth

(Henriques and Sadorsky 1996; Al-Yousif 1999), while others demonstrated that there exists a bi-directional relationship between these variables (Dutt and Ghosh 1994; Thornton 1997; Shan and Sun 1998a).

Since the mid-1980s, Malaysia has been growing very rapidly with a widely held view that such growth is export-led (Al-Yousif 1999; Reinhardt 2000). Empirical evidence, however, is generally not supportive of this view. For example, Dorado (1993) noted that export growth has had a negative (rather than positive) effect on the Malaysian economic growth. Doraisami (1996) showed that there is a two-way causality between Malaysian export and economic growth. Meanwhile, in a more recent paper, Al-Yousif (1999) claimed that in the long run, the Malaysia case is supportive of internally generated growth, instead.

In general, previous literature suggests that there are a number of factors influencing the economic growth and thus specification bias or spurious regression will be resulted if only relationship between exports and economic growth is being tested (Shah and Sun 1998b). Among others, imports, real effective exchange rate, capital expenditure and labor force are found to be determinative in influencing the economic growth (Riezman *et al.* 1996; Al-Yousif 1999; Reinhardt 2000).

Riezman *et al*. (1996) was among the few studies, which looked at the multiplicity of the relationship between economic growth and exports. They had investigated the validity of the export-led growth hypothesis for 126 countries' annual data running from 1965 to 1999. They conducted three types of cointegration procedures, namely: bivariate, tri-variate and 5-variable models. Their study is different from previous literature in the sense that they had included the variable of real import growth as one of the explanatory variables. Based on their argument, the omission of the important variable could lead to a bias finding. The variables selected are GDP, export growth, real import growth, primary school enrollment (as % of primary school age children) and the ratio of total investment over output. The authors reported that there was no short-run causal effect in the bivariate and five-variable causality tests in the

Malaysian case. Hence, they concluded that the hypothesis of export-led growth does not hold in the case of Malaysia.

On the other hand, Al-Yousif (1999) has evaluated the robustness of the relationship between exports and economic growth in the context of a single county, that is, Malaysia. The model constructed consists of five variables, namely: real GDP, real export, real effective exchange rate, labour and capital. He reported the results of two procedures of cointegration, that is, Engle-Granger (1987) bivariate cointegration and Johansen (1988) multivariate cointegration. He found that there was no long-run relationship between real GDP and real export if the bivariate cointegration was carried out. In contrast, using the multivariate framework in testing the long-run relationship between real GDP and some selected determinants, he reported that both the trace and maximum eigenvalue tests showed strong evidence that there exists a cointegrating vector among these variables. Therefore, the author concluded that bivariate method produced spurious result since it has omitted some relevant variables in its estimation and it is necessarily to specify and estimate broader models. Furthermore, after determining the number of cointegrating vectors, Al-Yuosif proceeds to investigate the short-run causal relationship among the variables. The five-variable model is then pooled and estimated as a vector error-correction model (VECM) using Zellner's seemingly unrelated regression (SUR) model. He reported that there appears a short-run dynamics causal effect from real exports to real GDP, but not for the inverse. Hence, Al-Yousif concludes that the hypothesis of export-led growth is supportive in the case of Malaysia.

As a small open economy, Malaysia is highly dependent on the foreign trade. Any change in the international markets, either the prices of commodities or international demand, will give a great impact on both exports and economic growth. This phenomenon could be clearly reflected by the Malaysian trade dependency ratio as depicted in Table 1. In the fifth column, we found that dependency ratio has been increasing from 1980 until 2000, and it is expected that the ratio will continue to grow in the future. This implies that the Malaysian economy is highly dependent on foreign trade, especially during the Asian financial crisis, that is, from 1997 to 2000, in which the

volume of foreign trade (both exports and imports) doubles that of GDP. Obviously, the Malaysian government has been implementing the export-promotion policy in order to revive the economy performance.

The causality directions between economic growth and exports have very crucial policy implications. If there exist a relationship between export and economic growth (that is, export growth does lead to the output growth), we can go on to explore what has governed the rate of growth in the past and what will govern how fast we can and will grow in the future. Therefore, this study is conducted to investigate the relationship between output and export in the case of Malaysia by using the most recent econometric methodology, Johansen and Juselius (1990) multivariate cointegration test and Granger causality test. We attempt to explain the country's GDP growth in terms of the exports, imports on consumption goods, gross fixed capital formation, labor force and exchange rate. Unlike other previous studies, the study decomposes imports into two components: imports of consumption goods and investment goods and our focus is only on the former[1]. Our specific objectives are as follows: (1) to examine the short run and long run causality relationship between output and its key determinants; (2) to examine the robustness of the hypothesis of export-led growth in the case of Malaysia by including selected control variables in the model. (3) to suggest some policy implications to monetary authorities to enhance the fundamental of the economy and stimulate long run economic growth with a stable level of inflation and unemployment rate. This is important in reviving the Malaysian economic growth from the 1997 financial crisis.

The remainder of the paper is organized as follows. The next section provides review on the theoretical and empirical models, data analysis and the sets out of the econometric methodologies used. This is followed by a discussion on the empirical results of this study. The final section provides some summary conclusions and a discussion on the implications of the findings.

[1] After observing the correlation matrix, we found that there exists a very high correlation (99.65%) between imports of consumption goods and investment goods (results are available upon request). Hence, if both variables are included, multicollinearity problem may appear in our estimated model thereby leading to a biased conclusion.

Table 1: Malaysia: Dependency Ratio

Year	GDP (RM Millions) (a)	Exports (RM Millions) (b)	Imports (RM Millions) (c)	Dependency Ratio [(b) + (c)]/ (a)
1980	53308	30676	29342	1.1259
1985	77547	42537	38561	1.0458
1990	119081	88675	86241	1.4689
1991	135123	105161	110107	1.5931
1992	150681	114494	112450	1.5061
1993	172193	135896	136068	1.5794
1994	195460	174255	177389	1.7991
1995	222472	209323	218077	1.9211
1996	253732	232359	228842	1.8177
1997	281889	262713	260093	1.8547
1998	284474	325325	263319	2.0692
1999	299662	363591	289364	2.1790
2000	339420	426523	359015	2.3144

Source: International Monetary Fund (IMF), *International Financial Statistics*, various issues.

Export-led Growth Hypothesis

Theoretical Model

The above revision on the export-led growth hypothesis gives an insightful guide in choosing variables for this study on the determinants of Malaysian economic growth. Basically, our model is formulated based on the studies conducted by Riezman *et al*. (1996) and Al-Yousif (1999). The identified model is a six-variable model, which hypothesizes that economic output (GDP) is a function of exports, imports, gross fixed capital formation, labour force and exchange rate. Notably,

$$GDP_t = f(\overset{+}{EXPORT}_t, \overset{-}{IMPCONS}_t, \overset{+}{GFCF}_t, \overset{+}{POPU}_t, \overset{+}{ER}) \quad (1)$$

where GDP = real GDP

EXPORT = real export

IMPCONS = real import of consumption goods

GFCF = gross fixed capital formation

POPU = Labor force (as measured by total population)

ER = exchange rate (measured as RM/US$)

The signs above the variables demonstrate the anticipated relationship between each explanatory variable with the dependent variable (real GDP), as proposed by a priori. These relationships are hypothesized based on two theories, namely: trade and development theory and the aggregate production function. The international trade and development theory suggests that there exists a positive correlation between economic and export growth. Export expansion is a significant catalyst in improving productivity growth, that is, total factor productivity (TFP). Various explanations have been put forward to relate export and TFP growth rates together in developing countries. For example, Balassa (1985) argued that in general, the production of export goods is focused on those economic sectors of the economic which are already more efficient. Therefore, export expansion helps to concentrate investment in these sectors, which in turn increase the overall total productivity of the economy. Moreover, the growth of exports has a stimulating effect on total productivity of the economy as a whole through its positive impact on higher rates of capital (Kavoussi 1984). The theory also recognises that the causality may run from output to export. Lancaster (1980) and Krugman (1984), for example, justify a one-way causality from output to exports. They argue that output growth has a positive impact on productivity growth and improved productivity, while cost reduction in labour and capital are expected to promote exports. Clearly, these arguments lead us to hypothesize that a causal relationship exists from export growth to output growth.

The inclusion of imports is based on the argument of Riezman *et al*. (1996) that imports are crucial in testing this hypothesis to avoid producing a spurious causality results. They also pointed out that the finding of no cointegration between exports and output may be due to the omitted variable such as imports. Moreover, considering the fact that export externality effects are possibly due to the role of exports in relieving a foreign borrowing constraints (Serletis 1992), the influence of imports is expected to be significant in the analysis. Besides, increase in imports may reduce the country's international reserves, thereby slowing down the economic growth. Thus, negative relationship between imports and economic growth is hypothesised.

In studying the export-led growth hypothesis, many models were adopted. The most common approach taken in the previous studies of the production growth relationship is based on the neoclassical aggregate production function. According to this theory – assuming Hicks-neutral technological change – aggregate growth can be written as the total factor productivity (TFP) growth and the weighted sum of the growth rate of factor inputs. The weights are the elasticities of output with respect to each input (that is, labour and capital), and under competitive conditions will equal their respective factor shares. As the input increases, it will shift the production function to the higher position and hence, increase the total output. As suggested by production function, capital and labour are the main catalysts to increase the production productivity.

Actually, the relationship between output and export growth is not simple and directly related. Price volatility and political intervention, for example, have great impacts in affecting the relationship. As a consequence, exchange rate is included in the model to reflect the price competitiveness in the international markets (Henriques and Sadorsky 1996) and its indirect influence on economic performance via export channel (Al-Yousif 1999). Besides, according to the “new growth theory” or neoclassical growth theory, exports in developing countries depend on the world demand for exported goods, and world demand depend on the price of goods and the income of buyers. Thus, the variability of the exchange rate is especially crucial for a small open economy like Malaysia, which is sensitively influenced by the changes in the world prices. This means that exchange rate can be viewed as a mechanism for adjusting the impacts of such external shocks. Indeed, as contended by Henriques and Sadorsky, Canada has had better economic performance than other nations such as United States mainly due to the lower Canadian dollar. It is expected that positive correlation exists between exchange rate (RM/US$) and economic growth. If the Malaysian ringgit depreciates (i.e. RM/US$ increases), then this will raise the competitiveness of the domestic commodities, and hence encourages exports.

Stationarity and Order of Integration

In order to avoid spurious regression, we need to discern the stationarity of the series. By doing so, we ensure the validity of the usual test statistics (t- and F-statistics, and R^2). Stationarity could be achieved by appropriate differencing and this appropriate number of differencing is called order of integration. We use Augmented Dickey Fuller (ADF) [Dickey and Fuller 1979] and Phillips-Perron (PP) [Phillips and Perron 1988] tests to check the stationarity of the variables.

Augmented Dickey Fuller (ADF) Test

Consider the equation

$$\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta y_{t-i} + \varepsilon_t \qquad (2)$$

where y_t = is our variable of interest = {GDP_t, $EXPORT_t$, $IMPCONS_t$, $GFCF_t$, $POPU_t$, ER_t}, Δ is the differencing operator, t is the time trend and ε is the white noise residual of zero mean and constant variance. $\{\beta_1, \beta_2, \delta, \alpha_1, ..., \alpha_m\}$ is a set of parameters to be estimated. Both of the null and alternative hypotheses in unit root tests are:

$H_{0:}$ $\delta = 0$ (y_t is non-stationary / a unit root process)

H_1: $\delta \neq 0$ (y_t is stationary)

The unit root hypothesis of the Dickey-Fuller can be rejected if the t-test statistic from these tests is negatively less than the critical value tabulated. In other words, by the Augmented Dickey Fuller (ADF) test, a unit root exists in the series y_t (implies non-stationary) if the null hypothesis of δ equals zero is not rejected (Gujarati 1995, p. 719-720).

Cointegration Test

To perform cointegration test, this study utilizes the Johansen and Juselius (1990) Multivariate Cointegration test, which involves three steps. First, determine the order of integration for each of the variables under observation. Second, estimate cointegrating regression with vector autoregression (VAR) model. Finally, if the time series are cointegrated, then construct the error-correction modeling (ECM). To carry out the Johansen and Juselius test, we first formulate the VAR model:

$$y_t = \Gamma_1(L)y_{t-1} + \Gamma_2(L)y_{t-1} + ... + \Gamma_p(L)y_{t-1} + \varepsilon_{t-p} \quad (3)$$

where y_t = [GDP_t $EXPORT_t$ $IMPCONS_t$, $GFCF_t$ $POPU_t$, ER_t]' is a column vector and Γ_i (L) with $i = 1, \ldots, p$ is a lag operator. ε is the white noise residual of zero mean and constant variance. The order of the model, p must be determined in advance using Akaike's Information Criterion (AIC). Then, as described in Greene (2000, p. 795-796), we can test the null hypothesis that there are r or fewer cointegrating vectors using the following two likelihood ratio tests statistics:

a) Trace Test

$$\tau_{trace} = -N \sum_{i=r+1}^{M} \ln[1-(r_i^*)^2] \quad (4)$$

where N is the total number of observations, M is the number of variables and r_i^* is the i correlation between i-th pair of variables. τ_{trace} has a chi-square distribution with M – r degrees of freedom. Large values of τ_{trace} give evidence against the hypothesis of r or fewer cointegration vectors.

b) Maximal Eigenvalue Test

The second test statistic is the maximal eigenvalue test. which evaluates the null hypothesis H_0: r = r_0 against H_A: r = r_0 + 1,

$$\tau_{max} = -T \ln (1-\lambda_{r+1}) \quad (5)$$

In that test, the null hypothesis of r cointegrating vectors is tested against the alternative of r+1 cointegrating vectors. Nevertheless, Johansen and Juselius (1990) suggest that the maximal eigenvalue test is more powerful than the trace test.

Granger Causality Test

The model as described in (3) can be adapted for the Malaysian economy, particularly in examining the export-led growth hypothesis in the multivariate framework. The identified variables[2] in our study include real gross domestic products (GDP), real exports (EXPORT), real imports of consumption goods (IMPCONS), gross fixed capital formation (GFCF), labour force (POPU) and exchange rate (ER). Equation (3) can be explicitly expressed as follows, which include error-correction term (ECT):

$$\Delta \mathrm{GDP}_t = a_0 + \sum_{i=1}^{p} a_1 \Delta \mathrm{GDP}_{t-i} + \sum_{i=1}^{p} a_2 \Delta \mathrm{EXPORT}_{t-i} + \sum_{i=1}^{p} a_3 \Delta \mathrm{IMPCONS}_{t-i}$$

$$+ \sum_{i=1}^{p} a_4 \Delta \mathrm{GFCF}_{t-i} + \sum_{i=1}^{p} a_5 \Delta \mathrm{POPU}_{t-i} + \sum_{i=1}^{p} a_6 \Delta \mathrm{ER}_{t-i} + a_7 \mathrm{ECT}_{t-1} + \varepsilon_t \quad (6)$$

where ECT_{t-1} is the error-correction term derived from the long run cointegrating relationship. Therefore, the estimated coefficient of ECT (a_7) measures the long-run equilibrium relationship while $a_1, a_2, ..., a_6$ measure the short-run causal relation. The cointegration between two or more variables is already sufficient to indicate that the presence of causality at least in one direction (Granger 1988). The structure lag is determined by using Akaike's minimum Final Prediction Error (FPE) criterion. The causality between predetermined and dependent variables can be examined by conducting Wald test, that is, by calculating the F-statistic based on the null hypothesis that a set of coefficients on the lagged values of independent variables are equal zero. If the null hypothesis is accepted, then it can be concluded that the independent variables do not cause dependent variable.

Data Analysis

In this paper, the Malaysian real gross domestic product, real exports, real imports of consumption goods, gross fixed capital formation, labour force (proxied by population[3] data) and exchange rate series are under study. The data for the variables such as exports and imports were obtained from Monthly Bulletin of Bank Negara Malaysia. Besides, the annual data covers the period from 1959 to 2000 for GDP, labour force and exchange rate were collected from International Financial Statistics, published by International Monetary Fund (IMF). All of the dependent and explanatory variables are deflated by the consumer price index (CPI), whereby the year 1995 has been treated as a base year (1995 = 100). Furthermore, all of the series are transformed into log form. Log transformation can reduce the problem such as heteroscedasticity because it compresses the scale in which the variables are measured, thereby reducing a tenfold difference between two values to a twofold difference (Gujarati 1995). For example, 80 is 10 times the number 8, however, log 80 (1.903) is only about twice as large as log 8 (0.903).

RESULTS AND INTERPRETATIONS

Dickey-Fuller (DF) and Phillips-Perron (PP) unit root tests are employed to test for the stationarity of the macroeconomic series at level and then first difference of each series. The results of the DF and PP tests at level are reported in Table 2, by taking into consideration of trend variable and without trend variable in the regression. Based on Table 2 (Panel I), the t-statistics for all series from both DF and PP tests are statistically insignificant to reject the null hypothesis of non-stationary at 0.05 significance level. This indicates that these series are non-stationary at their level form. Therefore, these variables are containing a unit root process or they share a common stochastic movement.

When the DF test is conducted at first difference of each variable, the null hypothesis of non-stationary is easily rejected at 0.05 significance level as shown in

[2] All of the variables selected are transformed to the log form.
[3] In this study, population data rather than labour force data was used due to the unavailability of labour force data over a sufficiently long period of time.

Table 2 (Panel II). This is consistent with some previous studies that have been demonstrated the most of the macroeconomics and financial series expected to contain unit root and thus are integrated of order one, I(1). A similar conclusion also comes from PP test. Therefore, we can conclude that the series are integrated of order one, and a higher order of differencing is not required to execute. The number of lag is set equal to one in order to avoid the problem of autocorrelation that is to ensure the error terms are uncorrelated and enhance the robustness of the results.

Table 2: Results of the Unit Root Tests[a]

Panel A: Level (uniform lag length = 1)

Variable	ADF		PP	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Data Period :1970 – 2000				
GDP	0.552	-2.913	0.164	-2.095
EXPORT	1.291	-3.381	1.207	-2.707
IMPCONS	0.308	-3.064	0.381	-2.604
GFCF	-1.119	-3.303	-1.253	-1.890
LABOUR	-0.046	-1.967	-0.275	-2.021
ER	-1.048	-0.774	-1.129	-0.914

Panel B: First Difference (uniform lag length = 1)

Variable	ADF		PP	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Data Period: 1970 – 2000				
GDP	-4.441*	-4.388*	-5.604*	-5.613*
EXPORT	-5.840*	-6.302*	-6.199*	-6.573*
IMPCONS	-5.240*	-5.300*	-5.430*	-5.447*
GFCF	-3.900*	-3.915*	-4.075*	-4.093*
LABOUR	-4.986*	-4.916*	-7.082*	-6.987*
ER	-4.391*	-4.810*	-6.464*	-6.795*

Notes: [a]The null hypothesis is that the series is non-stationary, or contains a unit root. The rejection of null hypothesis for both ADF and PP tests are based on the MacKinnon critical values.
* indicates the rejection of the null hypothesis of non-stationary at 5% significance level.

Since the variables are integrated of order one, then we can proceed to conduct the multivariate cointegration test. In Table 3, the results of trace test obviously demonstrated that the null hypothesis of p=0 against its alternatives p>1, is easily rejected at 0.05 significance level. The computed value is 41.76 is greater than the critical value of

Table 3
Results of Johansen and Juselius Multivariate Procedure,
VAR with 1 lag

Variables: GDP, EMPORT, IMPCONS, GFCF, LABOUR and ER
Sample Period: 1959-2000 (42 observations)

I. Eigenvalue 0.639 0.443 0.246 0.188 0.177 0.027

Hypothesis Ho:rank=p	Maximum Eigenvalue	95%	Trace	95%
p == 0	41.76*	39.40	94.99*	94.20
p <= 1	24.00	33.50	53.23	68.50
p <= 2	11.56	27.10	29.24	47.20
p <= 3	8.56	21.00	17.68	29.70
p <= 4	7.97	14.10	9.11	15.40
p <= 5	1.14	3.80	1.14	3.80

II. Estimated Cointegrating Vector

GDP	EXPORT	IMPCONS	GFCF	POPUL	ER
1.00	-1.053	0.652	-0.115	-0.147	0.567

III. Test for Appropriate Lag Length (1)

	GDP	EXPORT	IMPCONS	GFCF	POPUL	ER
i) Serial Correlation						
F(1, 19)	1.724	3.183	1.949	0.001	0.610	0.035
	[0.198]	[0.084]	[0.172]	[0.972]	[0.441]	[0.854]
ii) Normality: $\chi^2(2)$						
	6.793	0.336	5.770	1.659	11.253	75.367
	[0.034]*	[0.846]	[0.056]	[0.436]	[0.004]*	[0.000]*

iii) Vector AR 2-2 F(36,103) = 1.154 [0.285]
iv) Vector normality χ^2 (12) = 125.700 [0.000] **

IV. Exogeneity Tests (IMPCONS, GFCF and POPUL are Weakly Exogenous)

$H_0 : \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$	$\chi^2(5) = 33.203$ [0.000] **
$H_0 : \alpha_1 = 0$	$\chi^2(1) = 7.254$ [0.007] **
$H_0 : \alpha_2 = 0$	$\chi^2(1) = 15.463$ [0.000] **
$H_0 : \alpha_3 = 0$	$\chi^2(1) = 3.641$ [0.056]
$H_0 : \alpha_4 = 0$	$\chi^2(1) = 0.866$ [0.352]
$H_0 : \alpha_5 = 0$	$\chi^2(1) = 0.051$ [0.821]
$H_0 : \alpha_6 = 0$	$\chi^2(1) = 5.481$ [0.019] *

Notes ** and * indicate significant at 1% and 5% level respectively.
Figures in square parentheses [] refer to marginal significance level.

94.20. However, if we test the null hypothesis of p≤1, we cannot reject the hypothesis at the same level of significance. Therefore, based on the trace test results, we concluded that there exists a single cointegrating vector in the model. Maximum eigenvalue test suggests a similar result. The null hypothesis of p=0 is successful rejected at 0.05 marginal significance. However, the null hypothesis of p=1 cannot be rejected at the same level of significance, since the computed value (24) is statistically insignificant to reject the null hypothesis (the critical value is 39.40). Hence, maximum eigenvalue test also suggests that there exist a single cointegrating vector in the model. Based on the both tests, we may conclude that economic growth and its macroeconomic determinants exhibit a long-run relationship. This means that these series are cannot move "too far away" from each other.

The estimated cointegrating vector has plausible coefficient and correct sign for the variables, except for exchange rate that is:

$$GDP = 1.053EXPORT - 0.652IMPCONS + 0.115GFCF + 0.147POPU - 0.567ER \quad (7)$$

Equation (7) indicates that the variables such as exports, gross fixed capital formation and labour force are positively correlated to economic growth, with the estimated elasticities of 1.053, 0.115 and 0.146, respectively (Panel II). Consistent with a priori, import of consumption goods has a negative impact on economic growth. The result is expected because imported consumption goods are unproductive in promoting the economic growth and do not contribute to the capital generation.

Quite surprisingly, we found that exchange rate is inconsistent with a priori that is, the depreciation of the exchange rate will slow down the growth of economic. In fact, the Malaysian government has succeeded to devaluate its currency in order to improve the competitiveness of exported goods in the international markets and then stimulate the economic performance in early 1990s. However, the same policy may not work after the 1997 Asian financial crisis as most of the currencies in East Asian countries has already been depreciated. In this critical period, the depreciation of one country in the region of

East Asia may induce contagion effects to other countries, as they will also depreciate their currencies to improve the international competitiveness. Consequently, depreciation will make a country worse off. This is why the Malaysian government has been implementing fixed exchange rate to avoid variability in the foreign exchange market, which may further jeopardise the domestic growth performance.

Lag one was selected because it has ensured the robustness of the model, that is, the model shows no serial correlation problem in both individual variables and overall system. However, there exists normality problem in three individual variables namely, GDP, population (POPU) and exchange rate (ER). This problem is particularly caused by the 1997 Asian financial crisis that induced very high variability in both GDP and exchange rate. In order to ensure the originality of the data, that is, let the data reflects itself, we decided not to modify these outliers, which appear in mid-1980s and mid-1990s. Moreover, utilising Monte Carlo techniques, Gonzalo (1994) has compared cointegrating parameter estimates from three techniques namely, OLS, NLS and MLE in an error correction model. He found that maximum likelihood estimation in a fully specified error correction model has superior properties than the other techniques although when the disturbance terms are non-Gaussian. Therefore, the results reported are valid and reliable.

In Panel IV, it is interesting to note that both GDP and exports are not weakly exogenous. There are three implications of this finding. First, The use of a single ordinary least square (OLS) in estimating the short-run causality relationship is invalid and may lead to a biased conclusion. Second, the rejection of null hypothesis of weakly exogenous for exports elicits some doubts on the ability of export promotion policy to spur domestic economic growth (Darrat, *et al*. 2000). Finally, the endogeneity of output and export implies that output does behave endogenously to export, but at the same time, output has a high potential to influence export. This means that the relationship is more complex and there may be a two-way causation and this interaction is amplified via other variables such as imports, capital and exchange rate. Since there only exist a single cointegrating vector in the system and not all independent variables are weakly exogenous (Panel IV),

single generalized unrestricted model (GUM) employing two-stage least square (TSLS) technique is adopted. The lag length for each of the independent variables could be identical; but even then, within the lag length some of the (insignificant) lags may be omitted, and the lags can vary in the model. The structure of the lags will determine the presence and type of causality that is present in the system.

The short-run causality results are shown in Table 4. We found that most of the explanatory variables (in first differences) in the short-run model are statistically significant either in the lag value(s) or in the contemporaneous level. In Panel I, we found that three variables (imports of consumption goods, gross fixed capital formation and population) significantly influence economic growth in the short-run at contemporaneous level, with the estimated elasticity of 0.226, 0.278 and -12.592, respectively. It is noteworthy that in the short-run, an increase in the labour supply will decrease the economic growth rate at the elasticity of 12.592. This means that Malaysia is a labour abundant nation and has achieved its maximum use of labour. Any increase in labour supply with a little change in fixed capital, in general, will lead to a lower economic growth. Other variables also show significant overall influence GDP at 1% significance level by the Wald test - by restricting the coefficient of the lagged variables (Panel II), although their separate effects may be insignificant by the t- statistic.

The estimated error-correction term has a correct sign and is statistically significant at 0.01 marginal level. However, the speed of adjustment to long-run changes is quite low (0.083). Although the parameters have significantly reduced from 25 to 16, the goodness of fit of the specification and the standard error of regression remain superior (0.764 and 0.034, respectively) [Panel V]. Besides, the model had pass the all diagnostic checkings which implies that there is no serial correlation, heteroscedasticity, normality problems and specification error (Panel III). To sum up, we conclude that the hypothesis of export-led growth is valid in the Malaysian economy in both short- and long-term with a positive effect.

Table 4
Results of Short-Run Reduced Form, Generalized Unrestricted Model – Two Stage Least Squares (TSLS) Technique

I. D(GDP) = -0.083ECT(-1)** + 0.689D(GDP(-3))** - 0.285D(EXPORT(-1))** -0.214D(EXPORT(-2))** - 0.439D(EXPORT(-3))** +0.226D(IMPCONS)* + 0.191D(IMPCONS(-1)) + 0.278D(GFCF)** -0.129D(GFCF(-1))* + 0.065D(GFCF(-3)) - 12.592D(POP)** -0.093D(POP(-2)) + 0.194D(POP(-3)) - 0.183D(ER) - 0.186D(ER(-3)) +0.420

Adjusted R-squared	**0.764**	**F-statistic**	**8.712****
S.E. of regression	**0.034**	**Prob(F-statistic)**	**0.000**

II. Wald Test (Joint Test - F-statistic):

D(GDP)	D(EXPORT)	D(IMPCONS)	D(GFCF)	D(POPUL)	D(ER)
8.576**	6.412**	5.053*	10.795**	7.730**	3.008
[0.008]	[0.003]	[0.016]	[0.000]	[0.001]	[0.071]

III. Diagnostic Checking

i) Autocorrelation (Breusch-Godfrey Serial Correlation LM Test):

F(1) = 4.119 [0.056] F(2) = 2.090 [0.151]
F(3) = 1.564 [0.233] F(4) = 2.860 [0.056]

ii) ARCH Test:

F(1) = 0.000 [0.992] F(2) = 0.259 [0.773]
F(3) = 0.162 [0.921] F(4) = 0.638 [0.639]

iii) Jacque-Bera Normality Test: $\chi^2(2) = 2.540$ [0.281]

iv) Ramsey RESET Specification Test:

F-statistic = 0.301 [0.824] Number of fitted term = 3

IV. Instruments: ECT(-1) D(GDP(-1)) D(GDP(-2)) D(GDP(-3)) D(EXPORT(-1)) D(EXPORT(-2)) D(EXPORT(-3)) D(EXPORT(-4)) D(IMPCONS) D(IMPCONS(-1)) D(GFCF) D(GFCF(-1)) D(GFCF(-2)) D(GFCF(-3)) D(POP) D(POP(-2)) D(POP(-3)) D(POP(-4)) D(ER(-1)) D(ER(-2)) D(ER(-3)) C

V. Information on the Full Unreduced Model: (25 parameters)

Adjusted R-squared	0.590	F-statistic	3.210*
S.E. of regression	0.044	Prob(F-statistic)	0.020

Note: See Table 3

CONCLUSION AND POLICY IMPLICATIONS

The aim of this paper is to comprehensively examine the relationship between exports and output growth in the Malaysian economy using longer time series data stemming from 1959 to 2000. Following the lead of the trade and development theory

and aggregate production function, we have developed a conceptual model that explicitly incorporates the different channels via different variables in affecting the relationship between export and economic growth. Advanced econometric methodologies have been applied in order to investigate the short- and long-run causality relationship between export and growth, as well as some selected variables.

Several conclusions could be drawn from the analysis. First, the use of OLS techniques in estimating the relationship between export and economic growth is biased due to the endogeneity of some explanatory variables. Second, there exists a stable long-run relationship among economic growth, exports, imports, gross fixed capital formation, labour and exchange rate (consistent with Doraisami 1996 and Al-Yousif 1999). Third, by including the variables such as imports of consumption goods, capital formation and labour force, we found that the hypothesis of export-led growth is valid in the Malaysian economy in both short- and long-run. Finally, the error correction model indicates that the growth rate of capital formation and imports have a positive impacts on economic growth, while labour has a negative causality in the short-term. Nevertheless, in the short-run, all variables significantly Granger cause real GDP at standard significance levels.

From a policy perspective, the results reported in the study recommended that the Malaysian economy could enjoy the economic prosperity by implementing major institutional and economic structural changes. Policy-makers can reduce the restriction on profits and capital remittances, encourage domestic private investment and liberalise its trade and investment policies step-by-step in attracting more foreign direct investment (FDI) into the Malaysian economy. For instance, liberalised investment policies in encouraging the huge inflows of FDI in mid-1980 and early 1990s is viewed as a main catalyst in stimulating the Malaysian economic performance. Furthermore, FDI inflows can create the spillover effects and technological improvement, as well as human capital development in the domestic economic (Borensztein, *et al*. 1995). This, in turn, will contribute to the higher productivity of capital and labour, and sustain the stability of exchange rate movements. Nonetheless, as there is an inverse short-run causality between labour and growth, policy-makers should be careful in making their foreign labour

policies, that is, they should attract more skilled and professional foreign labours rather than less skilled workers in a huge bundle.

As a small open economy, Malaysia heavily relies on foreign trade, as the trade ratio is relatively higher than GDP (Table 1). This means that domestic economic performance is sensitive to the changes in the international markets. Therefore, liberalisation of trade and investment policies without comprehensive preparations may hurt domestic economic and industries, as there is great pressure from abroad when the country implementing its liberalisation policy. Thus, policy-makers should liberalise its policies carefully in terms of trade and foreign direct investment in attracting multinational corporations (MNCs) to setup their factory in certain resource-abundant and high technology industries locally in order to improve the overall economic prosperity.

REFERENCES

Al-Yousif, Yousif K. 1999. On the role of exports in the economic growth of Malaysia: A multivariate analysis. *International Economic Journal* **13**: 67 – 75.

Arnade. C and U. Vasavada. Causality between productivity and exports in agriculture: Evidence from Asia and Latin America. *Journal of Agricultural Economics* **46**: 174-186.

Balassa B. 1985. Exports, policy choices, and economic growth in developing countries after the 1973 oil shock. *Journal of Development Economics* **18**: 23-35.

Borensztein, E., J. D. Gregorio and J.W. Lee. 1998. How does foreign direct investment affect economic growth. *Journal of International Economics* **45**: 115-135.

Darrat, A.F., M.K. Hsu and M, Zhong 2000. Testing export exogeneity in Taiwan: Further evidence. *Applied Economics Letters* **7**: 563-567.

Dickey, D.A. and Fuller, D.A. 1979. Distributions of the estimators for autoregressive time series with a unit root. *Journal of American Statistical Association* **74**: 427-431.

Dodaro, S. 1993. Exports and growth: A reconsideration of causality. *Journal of Developing Area*s **27**: 227-244.

Doraisami, A. 1996. Export growth and economic growth: A reexamination of some time series evidence of Malaysian experience. *Journal of Developing Areas* **30**: 233-230.

Dutt, S. D. and D. Ghosh. 1994. An empirical investigation of the export growth – economic growth relationship. *Applied Economics Letters* **1**: 44-48.

Engle, R.F. and C.W.J. Granger. 1987. Cointegration and error correction: Representation, estimation and testing. *Econometrica* **55**: 251-276.

Fosu, A. K. 1990. Exports and economics growth: The African case. *World Development* **18**: 831 – 835.

Fosu, A. K. 1996. Primary exports and economic growth in developing countries. *World Economy* **19**: 465 – 475.

Greene, W. H. 2000. *Econometric Analysis*, 4th ed., New York: Prentice Hall Press.

Granger, C. W. J. 1988. Some recent developments in a concept of causality. *Journal of Econometric*s **39**: 199-211.

Gujarati, D. N. 1995. *Basic Econometrics*, 3rd ed., New York: McGraw-Hill Press.

Henriques, I. and P. Sadorsky. 1996. Export-led growth or growth-driven export? *Canadian Journal of Economics* **3**: 440-555.

Johansen, S. 1988. Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control* **12**: 231-254.

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**: 169-211.

Kavoussi, R. M. 1984. Export expansion and economic growth: Further empirical evidence. *Journal of Development Economics* **14**: 241-250.

Krugman, P.R. 1984. Import protection as export promotion. In *Monopolistic Competition in International Trade,* ed. H. Kierzkowski, Oxford: Oxford University Press.

Lancaster, K. 1980. Intra-industry trade under perfect monopolistic competition. *Journal of International Economics* **10**: 151–175.

Malaysia, Bank Negara. *Monthly Statistical Bulletin*, various issues.

Malaysia, Ministry of Finance, *Economic Report, 1999/2000*, various issues.

Malaysia, Ministry of Finance, *Seventh Malaysia Plan, 1996-2000.*

Reinhardt, N. 2000. Back to basics in Malaysia and Thailand: The role of resource-based exports in their export-led growth. *World Development* **28**: 55-77.

Riezman, R.G., P. M. Summers and C. H. Whiteman. 1996. The engine of growth or its handmaiden? A time series assessment of export-led growth. *Empirical Economics* **21**: 77-113.

Serletis, A. 1992. Export growth and Canadian economic development. *Journal of Development Economics* **38**: 133-145.

Shan, J. and F. Sun.1998a. Export-led growth hypothesis for Australia: An empirical re-investigation. *Applied Economics Letters* **5**: 423-428.

Shan, J. and F. Sun. 1998b. On the export-led growth hypothesis: The econometric evidence from China. *Applied Economics* **30**: 1055-1065.

Thornton, J. 1997. Export and economic growth: Evidence from 19th century Europe. *Economics Letters* **55**: 235-240.

Thornton, J. 1996. Cointegration, causality and export-led growth in Mexico, 1895-1992. *Economics Letters* **50**: 413-416.