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EXPORT-LED GROWTH HYPOTHESIS IN MALAYSIA: AN INVESTIGATION USING BOUNDS TEST

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ABSTRACT

The objective of this paper is to test the validity of the export-led growth hypothesis in the Malaysian economy using a more comprehensive sample period and a recent technique, that is, the bounds testing approach. Based on this model, both exports and labour force have stimulated positive adjustment to economic growth, whereas variables such as imports, exchange rate and the East Asian financial crisis are found to influence growth negatively. Moreover, a cointegrated relationship between exports and economic growth was detected in both the long and short runs. Further analysis showed that exports Granger-cause economic growth in the period of study. Thus, this study provides further evidence to support the export-led growth hypothesis in the Malaysian economy.

Key words: Export-led growth, bounds test, causality.

INTRODUCTION

In 1817, David Ricardo proposed that trade enables a country to specialize in the production of a commodity in which it has a comparative advantage. The specialization of production can increase the efficiency of resource utilization by increasing the rate of capital formation and improving the growth rate of total factor productivity (Khalafalla and Webb, 2001).

Since the mid-1980s, the Malaysian economy has been growing rapidly and it has been suggested that such growth is driven by exports (Reinhardt, 2000). However, empirical evidence provides no clear conclusion in this regard (Shah and Yusoff, 1990; Doraisami, 1996; Dodaro, 1993; Ghatak and Price, 1997; Al-Yousif, 1999; Khalafalla and Webb, 2001). Shah and Yusoff (1990) conducted one of the earliest studies on annual data of the Malaysian economy up to 1987 by using the Ordinary Least Squares (OLS) method. Their result supports the export-led growth hypothesis but is refuted by Dodaro (1993) who tested the validity of the hypothesis for 87 countries including Malaysia and noted that the export-led growth hypothesis was not robust in Malaysia. He provided strong evidence of a growth-led export hypothesis and concluded that the relationship between exports and growth

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appears to be negative (rather than positive). In another study using the cointegration procedure and causality framework, Ghatak and Price (1997) reconfirmed the negative relationship found by Shah and Yusoff (1990). Ghatak and Price (1997) argued that the relationship existed between some traditional exports (non-fuel primary exports) and gross domestic product (GDP) as well as non-export GDP. They concluded that aggregate exports (Granger) cause real GDP and non-export GDP, whereas manufactured exports (disaggregated measure) appeared to contribute significantly to the existing exports and GDP as compared to traditional (non-fuel primary) exports.

Exports, international trade, efficiency of resource allocation and economic prosperity are interrelated. The relationship between exports and economic growth in Malaysia was investigated by Khalafalla and Webb (2001) using quarterly data from 1965:Q1 to 1996:Q4. They studied the relationship in three different periods: full sample period, the import-substitution period (1965:Q1 to 1980:Q4) and the export-promotion period (1981:Q1 to 1996:Q4). Using cointegration and Granger causality tests, they found that the export-led growth hypothesis was valid for both the full sample and the import-substitution periods. This finding is in line with two previous studies by Shah and Yusoff (1990) and Ghatak and Price (1997). Nonetheless, for the export-promotion period, the relationship changed to growth-driven exports and imports-driven growth. As a result, they suggested that the export-led growth hypothesis was dominated by structural change in the economy.

In reviewing the previous studies, obviously, the empirical validity of the export-led growth hypothesis is mixed and ambiguous for the case of Malaysia. These sets of inconsistent findings could be due to different sample periods and the different sets of econometric methodologies used such as single equation (OLS), vector autogression (VAR) model, cointegration procedures and Granger causality frameworks. There are limitations to these techniques. The OLS is not adequate in studying causality or a cointegration relationship, whereas the other three methodologies require the underlying time series to have the same order of integration. Econometric theory indicates that a set of variables is cointegrated if there is a linear combination among them without stochastic trend. In this case, a long-run relationship exists between these variables. However, this inference is only valid if the requirement of the same order of integration has been met. Suppose an explanatory variable, which is stationary at level (known as I(0) variable) is regressed with another variable, which is nonstationary at level but is first-difference stationary (known as I(1) variable), then this will yield a spurious regression and thereby give a misleading and unreliable conclusion. Thus, it is argued that the use of the above methodologies has significant influence on the export-led growth literature as the trade variables (that is, exports and imports) are likely to be nonstationary at level. Therefore, one needs to consider different modeling strategies in resolving the order of integration of the series in testing the hypothesis of export-led growth. Thus, the Malaysian case study of the export-led growth hypothesis needs to be revisited.

A clear-cut validation of the export-led growth hypothesis is crucial in drawing policy implications.[1] This study re-examines the short- and long-run relationship between

[1]For instance, the industrialization strategies of the Sixth Malaysia Plan incorporated the principal recommendations of the Industrial Master Plan which emphasized export-led growth through industrial diversification, provision of a liberal investment climate and the promotion of intra-industry linkages (Malaysia, Seventh Malaysia Plan, 1996–2000). These efforts would be ineffective if the empirical results did not support the export-led growth hypothesis.

Malaysian exports and economic growth based on (1) a more comprehensive sample period than that used in existing studies to yield a more convincing conclusion; and (2) the autoregressive distributed lag (ARDL) model, or bounds testing approach, proposed by Pesaran et al. (2001) for the reasons stated below. The use of the bounds technique is based on three rationales. First, Pesaran et al. (2001) advocated the use of the ARDL model for the estimation of level relationships because the model suggests that once the order of the ARDL has been identified, the relationship can be estimated by OLS. Second, the bounds test allows a mixture of I(1) and I(0) variables as regressors, that is, the order of integration of relevant variables may not necessarily be the same. Therefore, the ARDL technique has the advantage of not requiring a precise identification of the order of the underlying data. Third, this technique is appropriate for small or finite sample size (Pesaran et al., 2001).[2]

ECONOMETRIC METHODOLOGY

This section summarizes the autoregressive distributed lag (ARDL) model, or bounds testing approach (Pesaran et al., 2001), which we adopted to examine the existence of short- and long-run relationships between exports and economic growth. Following Pesaran et al. (2001) we constructed the vector autoregression (VAR) of order p, denoted VAR(p), for the following export-led growth function:

$$z_t = \mu + \sum_{i=1}^{p} \beta_i z_{t-i} + \varepsilon_t \tag{1}$$

where z_t is the vector of both x_t and y_t, where y_t is the dependent variable defined as real GDP and $x_t = [X_t, M_t, L_t, ER_t]'$ is the vector matrix which represents a set of explanatory variables. There are four explanatory variables in this model, namely: real exports (*X*), real imports (*M*), labour (*L*) and exchange rate (*ER*). $\mu = [\mu_y, \mu_x]'$, t is a time or trend variable, β_i is a matrix of VAR parameters for lag i. According to Pesaran et al. (2001), y_t must be I(1) variable, but the regressor x_t can be either I(0) or I(1). We further developed a vector error correction model (VECM) as follows:

$$\Delta z_t = \mu + \alpha t + \lambda z_{t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta y_{t-i} + \sum_{i=0}^{p-1} \gamma_i \Delta x_{t-i} + \varepsilon_t \tag{2}$$

where Δ is the first-difference operator. We then partitioned the long-run multiplier matrix λ as:

$$\lambda = \begin{bmatrix} \lambda_{yy} & \lambda_{yx} \\ \lambda_{xy} & \lambda_{xx} \end{bmatrix}$$

[2]The constraint on the sample size for Malaysian economic variables is noted in, for example, Tang (2001) and Tang (2002), where the ARDL procedure is adopted. The former uses 24 annual observations (1973–1997) in examining the relationship between Malaysian bank lending and inflation, whereas the latter employs 25 annual data (1973–1997) in studying the relationship between Malaysian money demand and expenditure components.

The diagonal elements of the matrix are unrestricted, so the selected series can be either I(0) or I(1). If $\lambda_{yy} = 0$, then y is I(1). In contrast, if $\lambda_{yy} < 0$, then y is I(0).

The VECM procedures described above are important in the testing of at most one cointegrating vector between dependent variable y_t and a set of regressors x_t. To derive our preferred model, we followed the assumptions made by Pesaran et al. (2001) in Case III, that is, unrestricted intercepts and no trends. After imposing the restrictions $\lambda_{xy} = 0$, $\mu \neq 0$ and $\alpha = 0$, the export-led growth function can be stated as the following unrestricted error correction model (UECM):

$$\Delta GDP_t = \beta_0 + \beta_1 GDP_{t-1} + \beta_2 X_{t-1} + \beta_3 M_{t-1} + \beta_4 L_{t-1} + \beta_5 ER_{t-1} + \sum_{i=1}^{p} \beta_6 \Delta GDP_{t-i} + \sum_{i=0}^{q} \beta_7 \Delta X_{t-i} + \sum_{i=0}^{r} \beta_8 \Delta M_{t-i} + \sum_{i=0}^{s} \beta_9 \Delta L_{t-i} + \sum_{i=0}^{v} \beta_{10} \Delta ER_{t-i} + u_t \quad (3)$$

where Δ is the first-difference operator, u_t is a white-noise disturbance term and all variables are expressed in natural logarithms. Equation (3) also can be viewed as an ARDL of order (p, q, r, s, v). Equation (3) indicates that economic growth in terms of real GDP tends to be influenced and explained by its past values, so it involves other disturbances or shocks. Therefore, (3) was modified in order to capture and absorb certain economic shocks. Dummy variables (*DUM*) with a value of zero before the East Asian financial crisis period, and a value of one after the crisis, have been included in the equation to measure the impact of the crisis:

$$\Delta GDP_t = \beta_0 + \beta_1 GDP_{t-1} + \beta_2 X_{t-1} + \beta_3 M_{t-1} + \beta_4 L_{t-1} + \beta_5 ER_{t-1} + \delta DUM_t + \sum_{i=1}^{p} \beta_6 \Delta GDP_{t-i} + \sum_{i=0}^{q} \beta_7 \Delta X_{t-i} + \sum_{i=0}^{r} \beta_8 \Delta M_{t-i} + \sum_{i=0}^{s} \beta_9 \Delta L_{t-i} + \sum_{i=0}^{v} \beta_{10} \Delta ER_{t-i} + u_t \quad (4)$$

The structural lags are determined by using minimum Akaike's information criteria (AIC). From the estimation of UECMs, the long-run elasticities are the coefficient of the one lagged explanatory variable (multiplied by a negative sign) divided by the coefficient of the one lagged dependent variable (Bardsen, 1989). For example, in (4), the long-run export and import elasticities are (β_2/β_1) and (β_3/β_1), respectively. The short-run effects are captured by the coefficients of the first-differenced variables in (4).

After regression of Equation (4), the Wald test (*F*-statistic) was calculated to discern the long-run relationship between the concerned variables. The Wald test can be conducted by imposing restrictions on the estimated long-run coefficients of real GDP, real exports, real imports, labour and exchange rate. The null and alternative hypotheses are as follows:

$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ (no long-run relationship)

$H_A : \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$ (a long-run relationship exists)

The computed *F*-statistic value will be compared with the critical values tabulated in Table CI(iii) of Pesaran et al. (2001). According to these authors, the lower bound critical values assumed that the explanatory variables x_t are integrated of order zero, or I(0), while the upper bound critical values assumed that x_t are integrated of order one, or I(1). Therefore, if the computed *F*-statistic is smaller than the lower bound value, then the null hypothesis is not rejected and we conclude that there is no long-run relationship between economic growth and its determinants. Conversely, if the computed *F*-statistic is greater than the upper bound value, then economic growth and its determinants share a long-run level relationship. On the other hand, if the computed *F*-statistic falls between the lower and upper bound values, then the results are inconclusive.

Data Analysis

Real GDP, real exports, real imports, labour force and exchange rate series are the variables involved. The data for the variables such as GDP, exports, imports and labour force were obtained from the World Development Indicator 2003 database. The data for exchange rate were collected from the International Financial Statistics, published by the International Monetary Fund (IMF). They are annual data from 1960 to 2001, which included several important events such as the period before the Asian financial crisis erupted (1960 to mid-1997), the crisis period (mid-1997 to mid-1998), the implementation of a pegged exchange rate and the capital control period (September 1, 1998 to 2000) and the recovery period (2001 to the present). All of the dependent and explanatory variables, except for labour, were deflated by the consumer price index (CPI), whereby the year 1995 was treated as the base year (1995 = 100). Furthermore, all of the series were transformed into log form. Log transformation can reduce the problem of heteroskedasticity 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).

RESULTS AND DISCUSSION

The standard Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests were used to check the order of integration of these variables. The results obtained are reported in Table 1. Based on the ADF test statistic, it was found that all series, except for labour force (*L*), are non-stationary. Such a mixed result is also suggested by the PP test statistics as both real export (*X*) and labour force (*L*) are stationary at level, that is, they are I(0) variables but not for other series, which demonstrated a non-stationary path. Nevertheless, both tests yielded a similar conclusion after first differencing, that is, all series are stationary at I(1). Obviously, the mixture of both I(0) and I(1) variables would not be possible under the Johansen procedure. This provides a good rationale for using the bounds test approach, or ARDL model, proposed by Pesaran et al. (2001).

Table 1. Results of the Unit Root Tests

Variable	ADF		PP	
	Constant No Trend	Constant Trend	Constant No Trend	Constant Trend
Panel A: Level				
Data Period :1960–2001				
GDP	–0.7160	–2.4541	–0.7518	–2.2026
X	0.8241	–2.5615	0.3852	–4.2219***
M	0.2390	–2.5156	0.4445	–2.3254
L	0.0934	–3.3085*	0.0297	–4.9897***
ER	–0.9943	–0.9543	–1.0791	–1.0644
Panel B: First Difference				
Data Period: 1960–2001				
GDP	–4.3282***	–4.3229***	–5.2218***	–5.1941***
X	–6.8355***	–7.1801***	–12.1190***	–12.4470***
M	–4.3935***	–4.4502***	–5.2147***	–5.2128***
L	–6.8891***	–6.8039***	–10.7610***	–10.6230***
ER	–4.3896***	–4.7866***	–6.4649***	–6.7677***

Key: *X* = Export; *M* = Import; *L* = Labour; *ER* = Exchange Rate.
The null hypothesis is that the series is non-stationary, or contains a unit root. The rejection of the null hypothesis for both ADF and PP tests is based on the MacKinnon critical values. The lag lengths in both ADF and PP tests are selected based on the AIC criteria, which range from lag one to lag four.
* and *** indicate the rejection of the null hypothesis of non-stationary at 10% and 1% significance level, respectively.

The estimation of Equation (4) using the ARDL model is reported in Table 2. Using Hendry's general-to-specific method, the goodness of fit of the specification, that is, *R*-squared and adjusted *R*-squared, remains superior (0.9862 and 0.9619, respectively). The robustness of the model has been confirmed by several diagnostic tests such as Breusch-Godfrey serial correlation LM test, ARCH test, Jacque-Bera normality test and Ramsey RESET specification test. All the tests revealed that the model has the desired econometric properties, namely, it has a correct functional form and the model's residuals are serially uncorrelated, normally distributed and homoskedastic. Therefore, the results reported are serially uncorrelated, normally distributed and homoskedastic. Therefore, the results reported are valid for reliable interpretation.

In Table 3, the results of the bounds cointegration test show that the null hypothesis of $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ against its alternative $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$ is easily rejected at the 1% significance level. The computed *F*-statistic of 44.6504 is greater than the upper critical bound value of 5.06, thus indicating the existence of a steady-state long-run relationship among economic growth, exports, imports, labour and exchange rate.

Table 2. Estimated Model for the Malaysian Growth Function Based on Equation (4)

I. Estimated Model			
Variable	Coefficient	*t*-Statistic	Probability
GDP_{t-1}	–0.7801	–10.9685***	0.0001
X_{t-1}	0.9094	13.8948***	0.0001
M_{t-1}	–0.3876	–10.4945***	0.0001
L_{t-1}	0.2440	2.2314**	0.0439
ER_{t-1}	–0.5814	–12.9155***	0.0001
DUM_t	–0.0159	–3.6273***	0.0031
β_0	1.6513	6.7903***	0.0001
ΔGDP_{t-1}	0.3332	4 4327***	0.0007
ΔX_t	0.2285	8.9829***	0.0001
ΔX_{t-1}	–0.6908	–11.7716***	0.0001
ΔX_{t-2}	–0.6745	–10.4417***	0.0001
ΔX_{t-3}	–0.5904	–10.7947***	0.0001
ΔX_{t-4}	–0.4652	–8.8032***	0.0001
ΔM_t	0.2172	6.7601***	0.0001
ΔM_{t-1}	0.3148	10.4944***	0.0001
ΔM_{t-2}	0.2501	9.9278***	0.0001
ΔM_{t-3}	0.1719	6.4242***	0.0001
ΔL_t	1.1133	1.6766	0.1175
ΔL_{t-1}	–0.8428	–1.0523	0.3118
ΔL_{t-2}	–3.6695	–4.6606***	0.0004
ΔL_{t-3}	–2.0569	–3.2489***	0.0063
ΔER_{t-1}	0.3263	7.2144***	0.0001
ΔER_{t-2}	0.2816	7.5948***	0.0001
ΔER_{t-3}	0.0987	3.9100***	0.0018
II. Model Criteria / Goodness of Fit			
R^2 = 0.9862	Adjusted R^2 = 0.9619	*F*-statistic = 40.5268 [0.0001]***	
III. Diagnostic Checking			
AR(2) = 2.448 [0.1319]	AR(4) = 2.6597 [0.1026]		
ARCH(3) = 0.6454 [0.5918]	ARCH(4) = 0.5535 [0.6980]		
JB = 0.5972 [0.7418]	RESET = 1.3707 [0.2644]		

** and *** indicate significant at 0.05 and 0.01 level, respectively.

Probability values are quoted in square brackets. AR(*i*) and ARCH(*i*) for i = 2, 4 denote LM-type Breusch-Godfrey Serial Correlation LM and ARCH test, respectively, to test for the presence of serial correlation and ARCH effect at lag *i*. JB and RESET stand for Jarque-Bera Normality Test and Ramsey Regression Specification Error Test, respectively.

Table 3. Bounds Test for Cointegration Analysis Based on Equation (4)

Critical Value	Lower Bound Value	Upper Bound Value
1%	3.74	5.06
5%	2.86	4.01
10%	2.45	3.52

Computed *F*-statistic: 44.6504 (significant at 0.01 marginal level).
Critical values are cited from Pesaran et al. (2001), Table CI(iii), Case III: Unrestricted intercept and no trend.

The estimated coefficients of the long-run relationship between economic growth and exports, import, labour force and exchange rate are expected to be significant, that is:

$$GDP_t = 1.6513 + 1.1657X_t - 0.4969M_t + 0.3128L_t - 0.7453ER_t - 0.0159DUM_t \quad (5)$$

Equation (5) indicates that variables such as exports and labour force are positively correlated to economic growth, with the estimated elasticities of 1.1657 and 0.3128, respectively (Table 4, Panel I). This shows that a 1% increase in exports (labour force) will result in about 1.2% (0.3%) increase in economic growth. As anticipated, imports have a negative impact on economic growth; an increase in imports may reduce the country's international reserves, thereby slowing down economic growth.[3] Our result shows that over the sample period studied, a 1% increase in imports will bring about a 0.5% decrease in Malaysia's economic growth.

Interestingly, we found that the coefficient of exchange rate (*ER*) is inconsistent with previous studies that a positive relationship should be observed between exchange rate (domestic price of US currency, RM/US$) and economic growth. Theoretically, if the Malaysian ringgit depreciates (i.e. the RM/US$ increases in value), then this will raise the competitiveness of the domestic commodities, and hence encourage exports. By the same token, appreciation of the ringgit is expected to deter exports. The findings of this study, however, show a negative relationship (−0.7453) between these two variables, which means that the depreciation of the exchange rate will slow down economic growth. This could be related to the East Asian financial crisis, which began in mid-1997. In the early 1990s, the Malaysian government had succeeded in devaluating its currency in order to improve the competitiveness of exported goods in international markets, and to stimulate economic performance. The same policy, however, may not have worked after the 1997 East Asian financial crisis as most of the currencies in East Asian countries had already been depreciated. During this critical period, the depreciation of one country's currency in the region might have induced contagion effects in other countries. Consequently, depreciation could potentially make a country worse off. This can be observed at the estimated coefficient of the Dummy variable (*DUM*), which is negative and significant at 1% level. This means that the crisis slowed down economic growth.

[3]However, if a nation imports more capital goods than consumption goods, then the relationship between imports and economic growth may turn positive as the imported capital goods will lead to a higher production or productivity of a nation in the future.

Table 4. Long-run Elasticities and Short-run Causality of Economic Growth in Malaysia Based on Equation (4)

I. Long-run Estimated Coefficient	
Variable	Coefficient
X	1.1657***
M	–0.4969***
L	0.3128**
ER	–0.7453***
DUM	–0.0159***

II. Short-run Causality Test (Wald Test *F*-statistic):

ΔX	ΔM	ΔL	ΔER
59.7108***	40.2154***	18.6790***	21.7399***
[0.0001]	[0.0001]	[0.0001]	[0.0001]

Key: *X* = Export; *M* = Import; *L* = Labour; *ER* = Exchange Rate.
** and *** denote significant at 5% and 1% level, respectively. Figures in brackets refer to marginal significance values.

The dynamic short-run causality among the relevant variables is shown in Table 4, Panel II. The causality effect can be obtained by restricting the coefficient of the variables with its lags equal to zero (using Wald test). If the null hypothesis of no causality is rejected, then we conclude that a relevant variable Granger-caused economic growth. From this test, we found that all the explanatory variables are statistically significant to Granger-caused economic growth at a 1% significance level. To sum up the findings of the short-run causality test, we conclude that the hypothesis of export-led growth is valid in the Malaysian economy, as there appeared to be a positive relationship and short-run causality running from exports to growth.

CONCLUSION

Few empirical studies have been conducted in the past to investigate the validity of the export-led growth hypothesis in the case of Malaysia. Shah and Yusoff (1990) and Ghatak and Price (1997) are supportive of this hypothesis, whereas Dodaro (1993) showed the validity of a growth-led export hypothesis in the same country. Al-Yousif (1999) found that although in the short run there is evidence of export-led growth, in the long run the Malaysian economy is internally led. It is difficult to draw any conclusion on the relationship between Malaysian economic growth and exports from extant empirical results.

Recently, Khalafalla and Webb (2001) showed that the empirical results differ by sample period. In an attempt to arrive at a conclusive finding, this study adopted a different perspective—that is, to test the relationship between exports and output growth in the Malaysian economy using the newly proposed bounds testing approach. Following the lead of trade and development theory, and the aggregate production function, we developed a conceptual model that incorporated different channels via different variables that affect the relationship between exports and economic growth. A major finding of this study is that, in accordance with Ghatak and Price (1997), there exists a stable positive long-run relationship between growth and exports. Note that this study differs from Ghatak and Price (1997) and others by considering other important macroeconomic determinants. Second, the ARDL model indicates that exports and the labour force have a positive impact on economic growth, while imports, exchange rate and the proxy of the financial crisis, have a negative influence on growth. Finally, we found that the hypothesis of export-led growth in the Malaysian economy is supported in both the short and long runs.

From these findings, a few policies can be recommended. Firstly, as a small open economy, it is evident that Malaysia relies heavily on foreign trade. Hence, domestic economic performance is sensitive to the changes in international markets. Therefore, the government should implement effective macroeconomic policies in stabilising its trade balance and liberalising the country's trade, as well as attracting export-oriented foreign direct investment into the country. Secondly, government should ensure that the supply of well-equipped labour is adequate, as this would lead to a higher level of economic growth. Finally, a stable exchange rate policy is a must in maintaining good economic performance, as movements in the exchange rate may produce negative impacts on economic prosperity.

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