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Reinvestigating the Export-Led Growth Evidence in Malaysia: Bound Test Approach

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

International trade is an important contributor to Malaysia's economic growth and development. Malaysia's trade policy is to pursue efforts towards creating a more liberalizing and fair global trading environment. While Malaysia continues to accord high priority to the rule-based multilateral trading system under the World Trade Organisation (WTO), Malaysia is also pursuing regional and bilateral trading arrangements to complement the multilateral approach to trade liberalisation. Recently, Malaysia has successfuly established free trade agreement (FTA) with her close trading partner such as Japan, Pakistan, New Zealand, India, Chile and Australia. Knowing the importances of export contribution towards the gross domestic product (GDP) of the country, this paper aims to reinvestigates the evidence of Export-Led-Growth Hypothesis by using recent time series techniques known as Bound test. The data used in this paper is annually data ranged from 1980 to 2011. By modifying the standard Cobb-Douglas production function, we found out that export plays a significant role in contributing growth to the Malaysia's economy. Besides, labor and capital are also vital for the development of the nation. We recommend few policies based on the result gained from this paper.

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1. INTRODUCTION

The Export Led Growth Hyphothesis (ELGH) postulates that export expansion is one of the main determinants of growth. It holds that the overall growth of countries can be generated not only by increasing the amounts of labor and capital within the economy, but also by expanding exports. Exports is believed to perform as an "engine of growth" especially for developing countries like Malaysia. Export led growth hypothesis is among the interesting studies conducted by many researchers previously especially in developing countries where it yields different results.

In Malaysia, [1] examine the relationships between exports and economic growth in Malaysia using quaterly data from 1965:Q1until 1996:Q4. They studied relationship for three different periods which are full sample period, the import substitution period (1965:Q1 until 1980:Q4) and export promotion period (1981:Q1 until 1996:Q4). By using cointegration and Granger causality test, they found that ELGH was valid for both full sample and import substitution period. In another studies, [2,3] have similar opinion with orthodox school that supports export led growth hypotheses in Malaysia. [4] apply a more comprehensive sample period (1960-2001) and bound testing approach in examining the relationship between growth and exports. It is found that cointegration relationship exist between exports and economic growth in long run which is accordance to [5]. The results of ARDL indicates exports and labour force have positive impact on economic growth while imports, exchange rate and the proxy of the financial crisis, have negative influence on growth.

[6] finds that exports have a positive and significant impact on economic growth by using data from 1973-1993 of India, Pakistan, Philiphines, Malaysia and Thailand. The results indicates it is important to pursue liberal and free market policy in Malaysia, Philiphines and Thailand. Meanwhile, India and Pakistan need to avoid employing restrictive and regulatory policies measures.

In the other study, [7] reinvestigate export led growth by using cointegration and multivariate granger causality in Pakistan. The results obtained indicate that there is unidirectional causality running from exports to output growth. There is no significant causality running from import and export growth. Meanwhile [8] uses 1970 – 2008 data, found unidirectional causality between economic growth, exports and imports. In detail, the granger causality results shows GDP does not granger cause export and capital formation while it granger cause real Imports.

In Fiji and Papua New Guinea, [9], apply Bound Test for cointegration to examine evidence for long run relationship between GDP, export and imports. By using granger causality test, exports and imports does granger cause GDP in Fiji while in Papua New Guinea, exports and GDP granger cause Imports. Results of Fiji implies that there is evidence of export led growth in the long run, while for Papua New Guinea, there is evidence for export led growth in the short run.

While in Germany, [10,11,12] find that the validity of export led growth hypothesis is found especially in manufacturing sector that where innovation creates Germany Competitive economy in the world although there is increase in wage cost.

[13] apply Breitung rank test in their analysis between GDP growth and export on Singapore, South Korea and Hong Kong. It is found that Singapore's results on cointegration are not supported by Johansen Test, but evidence does exist when Rank Test is used. While for South Korea, there is long run relationship between variables and it fits in both linear and nonlinear form. Whereas for Hong Kong, cointegration relationship does not found either in linear or nonlinearly.

Meanwhile a study done by [14] by using Bangladesh quaterly data of from the period of 1976 until 2003, have found a positive long run equilibrium relationships exist between exports and industrial production but there is no evidence of short run causality relationship exist between these two variables.

In China, [15] find that the engine of growth in China is based on import-led growth but not export led growth. The finding is supported by [16] where the study shows no long run and short run causality between export expansion and economic growth in China. Where as it is found that economic growth does Granger-cause imports in the short run.

Based on previous findings that have been discussed, different methodology, selection of variables and period of time undertaken with different countries have yielded different results of research. Due to this situation, there is a need to reinvestigate export led growth hypothesis (ELGH) in Malaysia and we will adopt Bound testing approach not only for estimating the short run and long run relationship between exports and economic growth but also to explore the relationship between Labor, Capital, exchange rate and import on economic growth for Malaysia from the period of 1980 to 2011 comprising of 32 years.

2. THE STANDARD PRODUCTION FUNCTION MODEL

Based on standard Cobb Douglas production function which consists of labor (L) and capital (K), we introduce new variables such as export (X), import (M), and exchange rate (EXR) as one of the determining variables for output growth (GDP) for Malaysia. In this paper, gross domestic product is represented by the production function as below:-

$$GDP_{it} = f\,(L, K, X, M, EXR) \tag{1}$$

where at period *t* and country *I*, GDP refers to gross domestic product, L is labor, K is capital, X is export, M is import and EXR is exchange rate between Malaysia and US end of period.

Labor, capital and export are expected to have a positive relationship with growth while import and exchange rate have negative relationship with growth.

To test the stationarity of each variable, we use the log form of the variables. Log transformation can reduce the problem of heteroscedasticity because it compresses the scale in which the variables are measured, thereby reducing a tenfold difference between two values to twofold difference. The new model will be as follow:-

$$LnGDP = \alpha_0 + \beta 1 LnL_{it} + \beta 2 LnK_{it} + \beta 3 LnX_{it} + \beta 4 LnM_{it} + \beta 5 LnEXR_{it} + v_{it} + u_{it} \tag{2}$$

Finally, we transform the model into Bound testing approach.

The use of the bounds technique is based on three validations. First, [17] advocates 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 recognised, 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 appropriate variables may not necessarily be the same. Therefore, the ARDL technique has the advantage of not requiring a specific identification of the order of the underlying data. Third, this technique is suitable for small or finite sample size [17].

2.1 Final Model of Growth for Malaysia

Let the long run relationship between the four variables in log linear form is given as follows:

$$LnGDP_t = \alpha + \beta_1 LnL_{t-1} + \beta_2 LnK_{t-1} + \beta_3 LnX_{t-1} + \beta_4 LnM_{t-1} + \beta_3 LnEXR_{t-1}\ \varepsilon \quad (3)$$

Equation 4 below basically incorpates the short run dynamics into the adjustment process.

$$\Delta LnGDP_t = \alpha + \sum_{i=1}^{v} \sigma_i \Delta LnGDP_{t-i} + \sum_{i=0}^{s} \beta_i \Delta LnL_{t-i} + \sum_{i=0}^{r} \epsilon_i \Delta LnK_{t-i} + \sum_{i=0}^{q} \epsilon_i \Delta LnX_{t-i} + \sum_{i=0}^{t} \epsilon_i \Delta LnM_{t-i} + \sum_{i=0}^{w} \epsilon_i \Delta LnEXR_{t-i} + d\varepsilon_{t1} + u_t \quad (4)$$

Finally, we transform the model into Bound testing approach in equation (5) below:

$$\Delta LnGDP_t = \alpha + \sum_{i=1}^{v} \sigma_i \Delta LnGDP_{t-i} + \sum_{i=0}^{s} \beta_i \Delta LnL_{t-i} + \sum_{i=0}^{r} \epsilon_i \Delta LnK_{t-i} + \sum_{i=0}^{q} \epsilon_i \Delta LnX_{t-i} + \sum_{i=0}^{t} \epsilon_i \Delta LnM_{t-i} + \sum_{i=0}^{w} \epsilon_i \Delta LnEXR_{t-i} + \beta_0 LnGDP_{t-1} + \beta_1 LnL_{t-1} + \beta_2 LnK_{t-1} + \beta_3 LnX_{t-1} + \beta_4 LnM_{t-1} + \beta_5 LnEXR_{t-1} + u_t \quad (5)$$

where Δ is the first-difference operator, u_t is a white-noise disturbance term and all variables are expressed in natural logarithms with the symbol of Ln. The above final model also can be viewed as an ARDL of order, (v s r q t w). The model indicates that economic growth in terms of real GDP per capita tends to be influenced and explained by its past values besides the other explanatory variables such as labor, capital, export, import, exchange rate.

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 [18]. After regression of Equation (3), the Wald test (*F*-statistic) was computed to differentiate the long-run relationship between the concerned variables. The Wald test can be carried out by imposing restrictions on the estimated long-run coefficients of economic growth, export, import and capital and exchange rate.

The null and alternative hypotheses are as follows:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = 0 \text{ (no long-run relationship)}$$

Against the alternative hypothesis

$$H_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq 0 \text{ (a long-run relationship exists)}$$

The computed *F*-statistic value will be evaluated with the critical values tabulated by [17]. 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.

The main aim of this model is to verify the export led growth evidence for Malaysia by detecting the positive relationship between export and growth. Furthermore, the model will also test if labor and capital are positively associated with growth in the Malaysia while the import and the exchange rates are negatively correlated with the GDP.

2.2 Sources of Data

The data used in this research paper (GDP, X, M, K, L and EXR) to be used for Malaysia's case is collected from various sources such as International Financial Statistical Database from International Monetary Fund (IMF), World Development Indicators and Global Development Finance 2011 from World Bank and UNCTADSTAT database from United Nations Conference on Trade and Development (UNCTAD) that can be accessed freely from the internet. The sample data used is annual data starting from 1980 up to 2011 comprising of 32 years. Data used for GDP is real GDP as a proxy of economic growth, total labor force for Labor (L), nominal export of goods and services for export (X). nominal import of goods and services for import (M), gross fixed capital formation for capital (K) and national currency per US dollar (end of period) for exchange rate (EXR).

3. RESULTS AND ANALYSIS

3.1 Unit Root Test

The analysis begins with testing the unit root of every variable for Malaysia. Unit root test such as Dickey-Fuller/augmented Dickey-Fuller (ADF) and the Phillip Perron (PP) test are done to determine the order of integration of the variables. The stationarity of the data is run by using Eview7 because it is more users friendly. Table 1 represents the result from the unit root tested for all variables in the model. Based on DF and ADF, we found out that all variables are stationary at I(0) or at level for both no trend and with trend except for Malaysia' labor force (L) where it is stationary at I(1) at level and trend with 10% significant level. At first differences, all variables are found to be stationary at I(1) and mostly significant at 1% level except for the import (M) which significant at only 5% level.. Unit root test is once again tested by more powerful test known as Philipp Perron test (PP). The result shows that labor (L) is still stationary at level with trend while other variables show similar result from DF/ADF unit root test. With the dependent variable, GDP is confirmed to be I(1) at first difference while the independent variables shows a mix evidence of I(0) and I(1), therefore, the data meet the requirement to proceed by using Autoregressive Distributed Lags (ARDL) module as suggested by [17,9].

Table 1. Unit root test

Country	DF/ADF unit root test			
Malaysia	**Level**		**First difference**	
	No trend	**With trend**	**No trend**	**With trend**
LnGDP	-0.904293 (0)	-1.548439 (0)	-6.367700 (0)***	-6.376687 (0)***
LnX	-0.929713 (0)	-0.710066 (0)	-4.669637 (0)***	-4.828945 (0)***
LnM	-0.978687 (0)	-0.950011 (0)	-4.068373 (0)***	-4.047703 (0)**
LnEXR	-1.696547 (0)	-1.736781 (0)	-5.939946 (0)***	-6.020444 (0)***
LnL	0.560866 (0)	-3.450126 (0)*	-4.714615 (0)***	-4.693916 (0)***
LnK	-1.355367 (0)	-1.850775 (0)	-5.124857 (0)***	-5.051956 (0)***
	PP unit root test			
LnGDP	-0.961932 (2)	-1.636923 (3)	-6.342420 (2)***	-6.355625 (2)***
LnX	-0.898216 (2)	-0.710066 (0)	-4.653093 (3)***	-4.830729 (6)***
LnM	-0.978687 (0)	-1.191492 (1)	-4.089000 (2)***	-4.065266 (2)**
LnEXR	-1.667539 (2)	-1.736781 (0)	-5.964379 (3)***	-6.097059 (4)***
LnL	0.503246 (2)	-3.524638 (4)*	-4.714615 (0)***	-4.650235 (1)***
LnK	-1.355367 (0)	-1.945988 (1)	-5.121956 (2)***	-5.048539 (2)***

Note: (*),(**),(***) indicate significant at 1%,5% and 10% significant level respectively. DF and ADF is run by using Schwarz Info Criterion while PP is run by using Newey West Bandwidth

3.2 Testing the Existence of Long Run Relationship

Before we proceed with ARDL testing, we first test for the existence of long run relationship between the dependent variable and independent variables by using Microfit 4.1. Table 2 below illustrates the result of F-statistics for Malaysia by setting the lag order equal to 2. The critical value for both restricted intercept with no trend and restricted intercept with trend suggested by [9] is also shown in the Table 2. We used Narayan critical value table because our data comprised 32 years of observation and it is between the ranges of 30 to 80 as suggested by this author. Based on the result below, the computed F-statistics is found to be significant at 1% level for Malaysia and larger than the critical value at I(1) for both restriction categories which are 5.691 (restricted intercept with no trend) and 6.211 (restricted intercept and trend). This condition has proven the existence of long run relationship between the variables which indicating of a steady-state long run relationship among economic growth, exports, imports, labor capital, and real exchange rates. Therefore, the ECM version of the ARDL model is an efficient way in determining the long run relationship among the variables.

Table 2. Detecting the long run relationship

Malaysia					
F-Statistic	**Significant level**	**Bound testing (restricted intercept and no trend)**		**Bound testing (restricted intercept and trend)**	
7.5178***		I (O)	I (1)	I (0)	I (1)
	1%	3.976	5.691	4.270	6.211
	5%	2.794	4.148	2.970	4.499
	10%	2.334	3.515	2.457	3.797
Lags=2, k=6 and n=30 (32-2). This bound test statistic based on Narayan 2004					

3.3 Diagnostic Checking

After detecting the long run relationship for Malaysia, we estimate both short run and long run model from equation (3) and the maximum order of lag chosen are 2 as suggested by [17] and [9]. From this, the lag length that minimizes Schwarz Bayesian criterion is selected. The ARDL (2, 0, 0, 0, 1, 1) model is used for Malaysia. Before we analyzed the result, it is important to check the robustness of the model by adopting several diagnostic tests such as Breusch-Godfrey serial correlation LM test, ARCH test, Jacque-Bera normality test and Ramsey RESET specification test. All the test reveal in Table 3 shows 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 homoscedastic given that the probability value of the t-test are all above than 10% significant value.

Table 3. Diagnostic test

Diagnostic checking
Serial Correlation[a]
0.0023598 (0.961)
Functional Form[b]
0.10640 (0.744)
Normality[c]
1.7273 (0.422)
Heteroscedasticity
1.8620 (0.172)[d]

Note: Dependent variable is D(LGDP) or LGDP. (*), (**), (***) indicate significant at 1%,5% and 10% significant level respectively. [a] Langrange multiplier test of residual; [b]Ramsey's RESET test using the square of the fitted values; [c]Based on a test of skwness and kurtosis of residuals; [d]Based on the regression of squared residuals on squared fitted values

3.4 Long Run Elasticities

The estimated coefficients of the long run relationship between economic growth (GDP) and the independent variables is significant at 1% level except for import (M) which is significant at 10% level only. The result showed that the export (X), capital (K) and labor (LL) have a positive relationship with the GDP with estimated elasticities of 0.34, 0.13 and 1.09 respectively. This shows that a 1% increase in export (X), capital (K) and Labor (L) will result in 0.34 %,). 13% and 1.09% increase in the country's GDP. The detection of positive relation between X and GDP confirm the idea of export led growth for Malaysia. As anticipated, imports (M) have a negative impact on GDP where an increase in import might lead to a decrease in international reserve of the country, thereby slowing down the economic growth or GDP. Over the sample period studied, a 1% increase in M will decrease the GDP by 0.13%. Next, beside M, exchange rate (EXR) is also found to have a negative relationship with the GDP and this finding was inconsistent with the previous studies that a positive relationship should be observed between exchange rate (domestic price of US currency, RM/USD) and economic growth or GDP. In order words, the depreciation of the exchange rate will slow down the economic growth. This finding might relate to the series of economic crisis that occur in Asia from the past 30 years such as Asian Financial Crisis in 1997-1998 and Global Recession in 2008-2009. Previously, the devaluation policy perhaps can improve the competitiveness of the export (X) in international market in order to stimulate the economic performance. Somehow, this method also could potentially make a country worse off in more recent scenario.

3.5 Short Run Elasticities

The dynamic short run causality among the variables tested are obtained by restricting the coefficient of the variables with its lags equal to zero by using the Wald test. If the null hypothesis of no causality is rejected, then we can conclude that a selected variables used in this model (Granger) can lead towards economic growth. From the test revealed in Table 4, all explanatory variables are statistically significant at 1%, 5% and 10% significant level except for exchange rate (EXR) and labor (L). Therefore, it can be concluded that export (X), import (M) and capital (K) can granger cause the economic growth. Besides, the significant ECT suggests that more than more than 0.84 of the disequilibrium caused by the previous shock will be corrected in the current year and converges back to the long run equilibrium for the country. As a summary, based on the findings of the short run causality test, we concluded that the hypothesis of export-led growth is still valid in the Malaysian economy as there appeared to be a positive relationship and short run causality running from the exports to growth. This study is consistent with the previous studies done by [5].

Table 4. Analysis of short run and long run model

Short run coefficient		**Long run coefficient**	
Malaysia/ ARDL(2,0,0,0,1,1)			
Dependent variable: D(LGDP)	**Coefficient (standard error)**	**Dependent variable: LGDP**	**Coefficient (standard error)**
D(Constant)	-0.64306 (1.0181)	Constant	-0.76262 (1.2110)
ECT_{t-1}	-0.84322 (0.047232)***	LX	0.34807 (0.066015)***
$D(LGDP)_{t-1}$	-0.12745 (0.051142)**	LM	-0.13237 (0.076736)*
D(LX)	0.29350 (0.057129)***	LK	0.13126 (0.036180)***
D(LM)	-0.11162 (0.064279)*	LEXR	-0.34060 (0.10899)***
D(LK)	0.11068 (0.029362)***	LL	1.0930 (0.10899)***
D(LEXR)	-0.026350 (0.026293)		
D(LL)	0.049463 (0.12704)		

4. CONCLUSION

This research paper indeed tries to reinvestigate the validity of export led growth hypothesis for Malaysia. By adopting a more recent econometric technique known as Bound test, we proposed our model to investigate the lead of trade and development theory to justify the hypothesis of export led growth for Malaysia. This paper extends the study made by the previous paper [5] by including more relevant determinant variables such as labor (L), capital (K), exchange rate (EXR), import (M) and export (X). In summary, the result shows that X, L, and K have positive impacts on economic growth while M and EXR has negative impact on growth. Moreover, we also found that the hypothesis of export led growth in the Malaysian economy is supported in both short run and long run. As for policy recommendation, since export (X) seem to be one of the major determinants for Malaysian economy, the government should implement effective macroeconomic policies in stabilizing its trade balance, liberalizing the country's trade and attracting export-oriented foreign direct investment into the country. Besides, the government should ensure there is enough supply of labor and capital in the market given that it would lead to a higher level of economic growth. Last but not least, the government should monitor carefully its exchange rate policy in order to maintain the health of the economy as any movement in the exchange rate may produce undesirable impact towards the economy growth.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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