



## **An Empirical Analysis of the ASEAN-4's Causality between Exports and Output Growth**

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### **ABSTRACT**

This paper specifically focuses on analyzing the causality between real gross domestic product (GDP) and real export of goods and services of the ASEAN-4 countries (Indonesia, Malaysia, Thailand and the Philippines) by using comprehensive econometric techniques such as the unit root test, cointegration test, and error correction model. This study reveals that for short-run dynamics, while bi-directional Granger-causality exists in Malaysia, the Philippines, and Thailand; the unidirectional Granger-causality runs from GDP growth to EXP growth for Indonesia. While the long-run relationship shows a bidirectional Granger-causality between GDP and EXP growth for Malaysia and Thailand, GDP growth Granger-caused EXP growth for Indonesia and an inverse relationship exists between these two variables for the Philippines.

**Keywords:** ASEAN-4, Causality, Exports-output Growth

**JEL Classifications:** O1, O2, O4, O5

### **1. INTRODUCTION**

The question that often has been asked by development economists is whether economic growth is driven by the growth of exports (export-led growth [ELG]), or export growth is just an inevitable consequence of surplus commodity expansion due to excessive supply in the country's domestic market (growth-led export [GLE]), or the growth of export and output has mutual impacts on each other (feedback relationship) or else? In empirical studies, with respect to ASEAN-4 countries, the studies of Jung and Marshall (1985), Piazzolo (1996) and Islam (1998) examine the causal relationship between these two key variables for Indonesia and their results support the ELG. Xu's (1996) study also confirms that the output growth of Indonesia, Malaysia and the Philippines has run from the growth of export. Empirical results of Dodaro (1993), Ghatak et al. (1997), Ekanayake (1999) and Keong et al. (2005) also find Malaysian economy is driven by the growth of export. Furthermore, while the ELG is supported by Dutt and Ghosh's (1996) study for the Philippines, Rahman and Mustafa's (1997) research also support the ELG hypothesis for both the Philippines and Thailand.

In contrast to these results underpinning the ELG, some other studies support the GLE hypothesis such as Ahmad and Harnhirum (1996) for all the ASEAN-4 countries, Jung and Marshall (1985) for Thailand, Rahman and Mustafa (1997) for Indonesia and Al-Yousif (1999) for Malaysia. Meanwhile, results of some others suggested that a feedback relationship exists between these two variables, for instance Ekanayake (1999) for Indonesia, the Philippines and Thailand; Rahman and Mustafa (1997) and Baharumshah and Rashid (1999) for Malaysia; Bahmani-Oskooee and Alse (1993) for the Philippines and Thailand; Xu (1996) for Thailand; and recently Amrinto (2006) for the Philippines and Furuoka (2007) for Malaysia. Lastly, some results confirmed that there is no such causality between export growth and output growth in the studies of Islam (1998) for Malaysia, the Philippines and Thailand, of Bahmani-Oskooee and Alse (1993) for Malaysia, of Dodaro (1993) for the Philippines and Thailand, of Jung and Marshall (1985) for the Philippines and of Dutt and Ghosh (1996) for Thailand.

This paper specifically focuses on analyzing the causality between real gross domestic product (GDP) and real export (REXP) of goods and services by using comprehensive econometric

techniques such as unit root test, cointegration test, and error correction model (ECM). In brief, the remainder of this paper is structured as follows. Section 2 briefly reviews the literature on the export-led-growth hypothesis. While methodology and data are discussed in Section 3, Section 4 presents the empirical results of this study, and finally Section 5 concludes this paper.

## 2. LITERATURE REVIEW ON ELG HYPOTHESIS

Balassa (1980) first states that in general, the production of export goods is concentrated in those economic sectors of the economy, which are already most efficient; export expansion thus helps channel investment in these sectors, which in turn increases the overall productivity of the economy. Second, a large export sector also allows a country to gain from economies of scale and positive externalities that may lead to increased growth (Tyler, 1981). This argument proposes that domestic markets are too small for optimal scale to be achieved, while increasing returns may occur with access to foreign markets (Giles and Williams, 2000b). Third, foreign competition increases the pressure on industries exporting goods to keep costs relatively low and to promote technological changes, which in turn improves productivity (Michaely, 1977; Kavoussi, 1984), and may cause the workers' general skill level to rise in the export sector. Fourth, 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 accumulation (Kavoussi, 1984).

Fifth, an argument can be based on the two-gap model (Chenery and Strout, 1966), which states that if the foreign exchange constraint is binding, then the growth of exports reduces the foreign exchange constraint, thereby facilitating imports of capital goods and faster growth (Voivodas, 1973; Williamson, 1978; Fajana, 1979). Sixth, Feder (1983) measures the contribution of exports to economic growth through resource allocations. He validates his argument by dividing the economy into export and non-export sectors with the assumption that marginal productivity is higher in the export sector. Exports are then introduced into the production of the non-export sector as an additional factor, and a significant coefficient result indicates that exports have generated positive externalities for the non-export sector. Seventh, the export sector's expansion increases employment and real wages leading to domestic spending as another source of output growth (Athukorala and Menon, 1996). Finally, an outward-oriented strategy of development may provide greater opportunities and rewards for entrepreneurial activity, which is the key to extended growth, as it is the entrepreneur who will seek out risk and opportunity (Lal and Rajapatirana, 1987).

Representative of this hypothesis, one should mention the success of the four little Dragons (Hong Kong, Singapore, South Korea and Taiwan) achieving remarkable economic growth driven by exports; as despite their relatively small size in terms of population, they are all ranked in the top 20 export economies in the world in 2011, with South Korea ranked at the 6<sup>th</sup> position; Hong Kong at 12<sup>th</sup>, Singapore at 13<sup>th</sup> and Taiwan at 18<sup>th</sup> (Giles and Williams,

2000a). In addition, Ozturk and Acaravci (2010) confirmed ELG for Turkey.

In contrast to the ELG is the (GLE) hypothesis, which assumes the growth of output leading to exports expansion. It suggests that when output growth, induced by some specializing and comparative advantage industries, increases faster than domestic demand, then the need to export their products to foreign markets is inevitable. Lancaster (1980) and Krugman (1984) state that economic growth leads to enhancement of skills and technology, which in turn increase the comparative advantages for the country that facilitates exports. Jung and Marshall (1985) argue that, in the case of unbalanced growth, producers will be forced to seek out foreign markets for their commodities when domestic demand is less than excessive production. In this case, the causality flows from output growth to export growth and this cannot be interpreted as evidence of ELG. Their study, based on the Granger causality tests for thirty-seven developing countries over 1950-81, finds evidence for the ELG hypothesis in only five countries included in the sample, which were Indonesia, Greece, Egypt, Costa Rica and Ecuador. Similarly, Ahmad and Kwan (1991) find no support for the ELG hypothesis in their empirical study (over 1981-87) for 47 African developing countries.

The third possible hypothesis is a bi-directional (or feedback) causal relationship between exports and output growth. Chow (1987) applies causality tests on annual time series data of real manufactured exports and real manufactured output over 1960-84 for eight newly industrializing countries to find evidence of bi-directional causality (BDC) in the case of Brazil, Hong Kong, Israel, South Korea, Singapore and Taiwan, and no causality in the case of Argentina. Ekanayake (1999) examines the causal relationship between exports and GDP for eight Asian developing countries, using annual data from 1960 to 1997, and finds that a BDC relationship between these two variables exists in 7 out of 8 countries considered, which were India, Indonesia, South Korea, Pakistan, the Philippines, Sri Lanka and Thailand. The only country that experienced ELG is Malaysia. Also, Shan and Sun (1999) test the ELG hypothesis, using quarterly time series data for the US economy, and the results indicate a BDC relationship between output growth and export growth. Uddin et al. (2013) found a BDC between exports and economic growth in Bangladesh.

Finally, there would be no causal relationship between exports and economic growth when the growth paths of these two variables are independent of each other; or say in other words, are determined by the other unrelated variables in the economic system. Sheehey (1990; 1993) states that the link between sectoral growth and the growth of GDP is common to all sectors; it is not due to relative productivity differences or externality effects. He argues that the empirical causality test had no relevance for the ELG/GLE controversy by applying the same test to each of the major sub-categories of GDP such as government expenditure, private consumption, agriculture, manufactures, construction and electricity, gas and water services; Sheehey then substitutes exports with other components of GDP in the

production function, and the results show all significance. To prove his point, in a later test, Sheehy (1993) uses non-export sector substituted for the export sector in the production function and the results remain unchanged. Also, Dollar (1992) suggests that it is possible the causation runs in the other direction such as from poor growth performance to inward-orientation. An external factor such as debt crisis may cause slackness for both economic and export growth. Finally, the link between export growth and economic growth is still inconclusive of whether more trading leads to growing faster or faster output growth drives more trading as raised by the World Bank (1987) that the link between trade strategy and macroeconomic performance is not entirely clear and raise the question of whether outward orientation leads to better economic performance or superior economic performance paves the way for outward orientation. Also, Harrison (1995, p. 26) concludes that “existing literature is still unresolved on the issue of causality.”

In brief, there are four possible types of causality between the growth of exports and the growth of output:

- ELG: Unidirectional causality runs from exports to economic growth ( $EXP \rightarrow GDP$ ).
- GLE: Unidirectional causality runs from economic growth to the growth of export ( $GDP \rightarrow EXP$ ).
- BDC: Unidirectional causality runs from export growth to economic growth and vice versa ( $EXP \leftrightarrow GDP$ ); and
- No causality (NC): Independent relationship between the growth of export and the growth of output.

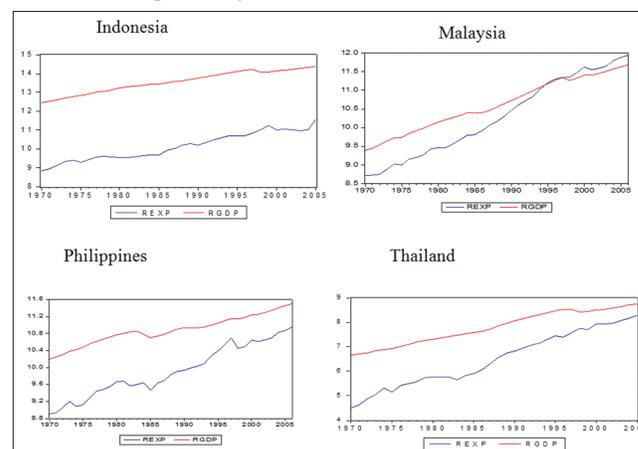
### 3. METHODOLOGY AND DATA

As mentioned earlier, the purpose of this paper is to investigate the ASEAN-4's causality between exports and economic growth to verify whether or not the growth of export provides a significant contribution to the growth of output. The reason that the growth of exports is selected in this analysis is in statistic macroeconomic theory; national output is the sum of consumption, government purchases, investment and exports minus imports. If I take this approach, the role of exports is directly apparent.

It is noted that imports are excluded in this test, as Fosu (1990b) indicates that one might wish to include imports in the equation or even replace exports, however, besides the fact that imports are likely to be heavily dependent on income, imported goods are unlikely to yield the production economies attributed to exports. This study therefore employs the bivariate model by using the techniques of unit root test, cointegration test, pair-wise Granger-causality test, and ECM to verify the causal relationship between real output growth and REXPs of goods and services as mentioned in the introductory part.

According to Ekanayake (1999, p. 45): “These econometric techniques have gained popularity in recent empirical research for a number of reasons including: (a) The simplicity and relevance in analyzing time-series data, (b) the ability to deal with non-stationary variables, and (c) to provide additional channels through which Granger-causality could be detected when two variables are cointegrated.”

**Figure 1:** ASEAN-4's log real gross domestic product and log real exports of goods and services, 1970-2006



Source: Eviews 6.1 output

Testing for causality or cointegration between the two variables, real GDP (RGDP) and REXP of goods and services (expressed in logarithmic form) is performed in two steps. First, the time-series properties of each variable are examined by the unit root tests, which test whether REXP of goods and services<sup>1</sup> ( $LREXP = \text{Log REXP}$ ) and RGDP ( $LRGDP = \text{Log RGDP}$ ) are stationary, or integrated of order zero,  $I(0)$ . Then, the next step is to explore whether the cointegration exists between  $LREXP$  and  $LRGDP$  by using the Engle-Granger two-step cointegration procedure and Johansen-Julius cointegration technique.

Before testing for Granger causality, it is important to establish the properties of the time series involved. In other words, I will investigate the order of integration and the existence of common trends between the two time series,  $LREXP$  and  $LRGDP$ . A visual inspection of the two time series presented in Figure 1 suggests that the data series are trended.

Therefore, the model selected for this study is trend and intercept. However, it is hard to say whether the trend components are deterministic or stochastic, and whether the  $LREXP$  and  $LRGDP$  series have any common trend. This suggests that the right way to model economic variables is to test for their order of integration by using unit root tests and if they are both  $I(1)$ , then applying the cointegration technique to find out if a long-run equilibrium does exist between them.

All the data used in this paper, RGDP and REXP of goods and services at constant prices (base year 2000), are collected from the World Bank database. The ASEAN-4's time series are collected from 1970 to 2006. Also, it is noted that the analysis uses annually data because quarterly data are not available.

The software used for running all these tests is Eviews 6.1. Lastly, it is noted that the definition of the variables in this analysis is as follows:

- $LRGDP$  = The natural log of RGDP
- $LREXP$  = The natural log of REXP

1 From now on, real exports of goods and services are briefly said as real exports.

**Table 1: ASEAN-4's unit root test results for logs of REXP and RGDP**

Variable	Level/ difference	ADF test		Phillips-Perron test	
		Trend and intercept		Trend and intercept	
		Test statistic	P value	Test statistic	P value
Indonesia LREXP	Level	-2.386 (0)	0.3800	-2.567 (3)	0.2963
	1 <sup>st</sup> difference	-6.203 (0)	0.0001	-6.208 (2)	0.0001
LRGDP	Level	-1.491 (1)	0.8137	-1.144 (1)	0.9068
	1 <sup>st</sup> difference	-4.485 (0)	0.0055	-4.457 (2)	0.0067
Malaysia LREXP	Level	-1.280 (2)	0.8761	-1.993 (2)	0.5852
	1 <sup>st</sup> difference	-5.523 (0)	0.0004	-5.518 (1)	0.0004
LRGDP	Level	-1.635 (0)	0.7588	-1.794 (2)	0.6868
	1 <sup>st</sup> difference	-5.026 (0)	0.0014	-5.038 (1)	0.0013
Philippines LREXP	Level	-2.654 (0)	0.5232	-2.681 (2)	0.2498
	1 <sup>st</sup> difference	-6.089 (0)	0.0001	-6.137 (2)	0.0001
LRGDP	Level	-1.836 (0)	0.6660	-2.142 (2)	0.5057
	1 <sup>st</sup> difference	-3.216 (0)	0.0274	-3.241 (2)	0.0259
Thailand LREXP	Level	-1.252 (0)	0.8837	-1.475 (2)	0.8197
	1 <sup>st</sup> difference	-5.656 (0)	0.0003	-5.688 (2)	0.0002
LRGDP	Level	-1.437 (2)	0.8312	-1.161 (3)	0.9036
	1 <sup>st</sup> difference	-3.403 (0)	0.0673*	-3.396 (2)	0.0683*

The numbers in parentheses for the ADF represent the number of lags of the dependent variables included in the test. The numbers in parentheses for the PP indicate the number of Newey-West bandwidth (using Bartlett kernel) automatically selected by the system. \*Significant at the 0.10 level, otherwise significant at the 0.05 level. ADF: Augmented Dickey Fuller, LREXP: Log real exports, LRGDP: Log real gross domestic product

**Table 2: Cointegration tests based on Engle-Granger procedure**

Dependent (y <sub>t</sub> )	Independent (x <sub>t</sub> )	Engle-Granger statistics	CRDW statistics	Adjusted R <sup>2</sup>
Indonesia RGDP	REXP	-2.746 (9)	1.992	0.12
Malaysia RGDP	REXP	-3.122 (0)	1.575	0.20
Philippines RGDP	REXP	-2.325 (0)	1.816	0.11
Thailand RGDP	REXP	-2.202 (0)	1.931	0.10

The critical values of ADF statistic are -3.63, -2.95 and -2.61 at 1%, 5% and 10% significant level respectively by MacKinnon (1996). The numbers in parentheses represent the number of lags of the dependent variables included in the test. RGDP: Real gross domestic product, REXP: Real exports

**Table 3: Cointegration tests based on Johansen-Juselius procedure**

Data vector	Hypothesized number of CE (s)	$\lambda_{max}$	P value	$\lambda_{trace}$	P value
Indonesia (RGDP, REXP)	None*	37.147	0.0001	49.192	0.0000
	At most 1	12.045	0.0599	12.045	0.0599
Malaysia (RGDP, REXP)	None*	28.730	0.0035	38.709	0.0008
	At most 1	9.980	0.1281	9.980	0.1281
Philippines (RGDP, REXP)	None*	29.398	0.0013	40.130	0.0005
	At most 1	10.732	0.0976	10.732	0.0976
Thailand (RGDP, REXP)	None*	19.593	0.0467	26.530	0.0414
	At most 1	6.937	0.3511	6.937	0.3511

\*Denotes rejection of the hypothesis at the 0.05 significant level. RGDP: Real gross domestic product, REXP: Real exports

**Table 4: Results of ECM**

Dependent variable	Independent variable	F-statistics	R <sup>2</sup> (*)	EC-term T-statistics
Indonesia RGDP	REXP	0.375 (3, 29)	0.09	-0.290
	RGDP	5.285 (3, 29)	0.34	-1.290
Malaysia RGDP	REXP	14.142 (2, 31)	0.46	-2.619
	RGDP	15.437 (2, 31)	0.46	-2.302
Philippines RGDP	REXP	11.202 (2, 31)	0.43	-2.665
	RGDP	12.407 (2, 31)	0.39	-1.836
Thailand RGDP	REXP	9.681 (3, 29)	0.45	-2.122
	RGDP	5.109 (3, 29)	0.35	-3.710

All tests are based on 0.05 significant level. The numbers in parentheses represent the degree of freedom of F-statistics test. (\*) Indicates the relative strength of causality between the variables. ECM: Error-correction model, RGDP: Real gross domestic product, REXP: Real exports

However, for simplicity, I sometimes use GDP and EXP for the natural logs of RGDP and REXP in some tables presented throughout this paper.

## 4. EMPIRICAL RESULTS

### 4.1. Results of Unit Root Test

Table 1 presents the results of the unit root test. Evidently, each time series is non-stationary at the 0.05 significant level. However, they all become stationary after their first difference.

### 4.2. Results of Cointegration Test

Having confirmed each time series on LRGDP and LREXP of the ASEAN-4 is stationary after first differencing; the next step is to apply the Engle-Granger two-step cointegration procedure and

**Table 5: Summary of empirical analysis of ASEAN-4's Granger-causality, ECM**

Countries	Ho: Unit root/order of integration	Cointegration		Causality	
		ADF	Johansen-Juselius	Short-run	Long-run
Indonesia	Ho: Cannot reject I(1)	Cointegration	Cointegration	EXP←GDP	No causality
Malaysia	Ho: Cannot reject I(1)	Cointegration	Cointegration	EXP↔GDP	EXP↔GDP
Philippines	Ho: Cannot reject I(1)	No-cointegration	Cointegration	EXP↔GDP	EXP→GDP
Thailand	Ho: Cannot reject I(1)	No-cointegration	Cointegration	EXP↔GDP	EXP↔GDP

GDP: Gross domestic product, ECM: Error-correction model

the Johansen-Juselius cointegration test to check whether the two variables are cointegrated for each country concerned. At first, the augmented Dickey Fuller procedure is applied. The cointegration results based on this technique are reported in Table 2 (Engle-Granger) and Table 3 (Johansen-Juselius procedure) below.

### 4.3. Results of ECM

The results reveal that bidirectional Granger-causality exists in the short run for Malaysia, Philippines, and Thailand while there is unidirectional Granger-causality from RGDP growth to REXP growth for Indonesia. The long-run relationship, represented by the EC-term T-statistics in the last column shows a bidirectional Granger-causality between RGDP growth and REXP growth for Malaysia and Thailand, while RGDP growth Granger-caused REXP growth for Indonesia and an inverse relationship exists between these two variables for the Philippines. Tables 4 and 5 below present the ASEAN-4's results of the ECM.

## 5. CONCLUSION

It is of vital importance to define whether a country is in the process of ELG or GLE, or even a two-way causal relationship between trade and economic growth in order to guide policymakers in setting up appropriate strategies for that country's sustained high economic growth in the long run. If the ELG hypothesis is accepted, then the country should adopt the outward-looking export-oriented industrialization strategy by promoting suitable policies to enhance trade. For example, a flexible foreign exchange rate policy, minimal direct import-control measures, low and effective protection rates, government subsidies for export industries, strong incentives for export-oriented industries, and efficient export and import procedures etc. On the other hand, if the GLE hypothesis is acknowledged, then the inward-looking development strategy may be essential to enhance the growth of output, and exports are just a vent for the country's expansion of commodity surplus. Policies for such situation as domestic market protection through import restrictions, high tariffs, overvalued currency, low interest financing, special incentives for infant industries etc. In the third case, a BDC relationship between these two variables exists, the suitable policies should be a balanced mixture of both strategies.

The results of this research show that it is different with others mainly because of differences in the time series, model (bivariate/multivariate), methodology and variables. This study reveals that

for short-run dynamics, while bi-directional Granger-causality exists in Malaysia, the Philippines, and Thailand; the unidirectional Granger-causality runs from GDP growth to EXP growth for Indonesia. While the long-run relationship shows a bidirectional Granger-causality between GDP and EXP growth for Malaysia and Thailand, GDP growth Granger-caused EXP growth for Indonesia and an inverse relationship exists between these two variables for the Philippines (EXP → GDP). Generally, the policy implications for these empirical findings suggest the following.

- Indonesia: The increase of exports is only an effect of the country's expansion of output; therefore Indonesia should fasten further weight on higher economic growth policy by using the inward-looking industrialisation strategies to meet the growing domestic demand.
- Malaysia and Thailand: The long run relationship is mutually reinforcing of each other between exports and output growth; therefore Malaysia and Thailand should focus with the same magnitude on higher economic growth for both domestic demand and foreign markets by using a mixture of strategies of export promotion as well as import substitution industrialisation.
- Philippines: The expansion of exports is really a cause for this country's output growth; and the Philippines thus should keep concentrating on the export-promotion industrialization strategies, as well as improving the diplomatic and trade relations with countries all over the world and integrating more to the global trading network.

However, as noted by Tang et al. (2015), economies which are overly dependent on exports for growth are very vulnerable when there is a global slowdown such as the financial crisis in 2008-09 in the major developed countries which had a devastating impact on export-dependent economies.

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