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Econometric Analysis of the Export-led Growth Hypothesis: Evidence for BIMP-EAGA Countries[1]

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ABSTRACT

This paper employs several econometric methods to test the validity of the "export-led growth" hypothesis in three BIMP-EAGA countries, i.e., the Philippines, Indonesia, and Malaysia. Firstly, the study uses Johansen cointegration test and Granger causality test to examine the relationship between export and GDP in each of these countries. Secondly, panel unit root test and panel cointegration test are used to examine the relationship between the variables in these three BIMP-EAGA countries as a whole. The econometric tests of the individual countries indicate that there has been no significant relationship between the size of national income and the amount of export in each of these countries. The panel data analysis produces a similar result.

INTRODUCTION

There has been a conspicuous imbalance in the distribution of wealth between the "have" and "have-not" nations. Therefore, two of the most critical questions for development economists have been: What are the effective ways for the develop-

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ing countries to overcome the vicious cycle of poverty? What could be the engine of growth in these countries?

Traditionally, it has been assumed that the main reason for poverty in developing countries is lack of investment. Based on this assumption, foreign aid has been regarded as an important determinant of economic development. Developed countries have been allocating vast amounts of funds as foreign aid to the developing nations in order to overcome the shortage of foreign investments. However, foreign aid has not been able to solve existing economic problems in developing countries. As a result, aid donors began losing their enthusiasm for the provision of foreign aid. As Van den Berg (2001) puts it: "The main reason for the decline in real inflow of foreign aid is the simple fact that such aid has not always worked very well in bringing economic growth to the developing countries."

The diminishing inflows of foreign aid have prompted many aid recipient countries to explore other ways to overcome aid dependency and develop new strategies to stimulate their economies. One of the most promising and feasible development strategies for a developing nation is to find its own economic niche in the global market place. To reflect the changing views, aid donors and aid recipient countries have adopted a slogan: Trade Not Aid. This slogan supports the idea that the best way to stimulate economic growth in a developing country would be to encourage the country to become actively engaged in international trade. This idea has become a dominant discourse in economic development literature. It is known as the "export-led growth" (ELG) hypothesis.

International trade and export are presently regarded as engines of economic growth. The validity of this point of view has been fortified by China's miraculous economic performance. During decades of economic self-isolation, China suffered from severe economic stagnation and poverty. However, after abolishing its closed door policy, the country has been experiencing a spectacular economic growth. China's success contributed to a growing consensus among development economists, policymakers and political leaders about the importance of promoting international trade.

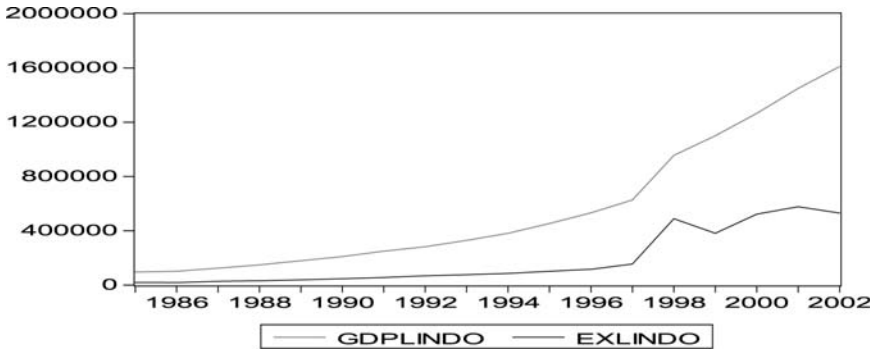
Despite the fact that in recent years many developing countries have been adopting similar export-driven development strategies, a systematic empirical research analyzing the relationship between export and economic development is still lacking. This paper focuses on Southeast Asia and specifically chooses three BIMP-EAGA (or Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area) countries—the Philippines, Indonesia and Malaysia—as a case study to analyse the relationship between exports and economic growth. Due to a lack of systematic economic data, this study excludes one BIMP-EAGA country, Brunei Darussalam, from the analysis. The main reason why this paper focuses on these three BIMP-EAGA countries is that these countries have been promoting

economic development through their export activities. Another is that a systematic research on export-growth linkage in the region is limited.

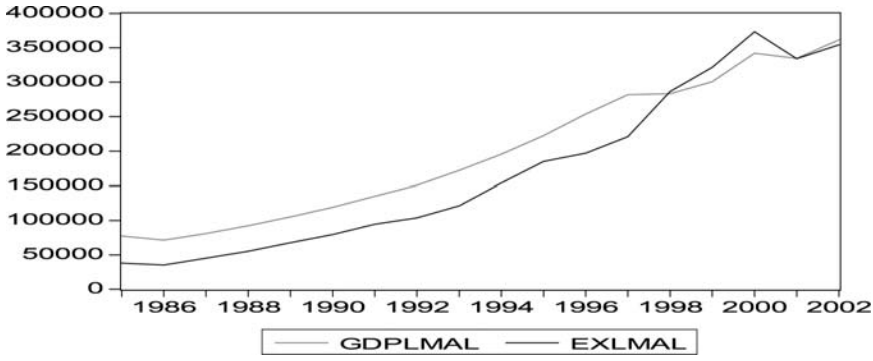
Figure 1 highlights several interesting features in the relationships between exports and gross domestic product (GDP) in the three BIMP-EAGA countries over the past two decades. First, in Indonesia, its 1996 GDP amounted to 532 trillion rupiah. During the Asian financial crisis, Indonesian GDP increased to 627 trillion rupiah in 1997 and further expanded to 955 trillion in 1998 (Asian Development Bank 2005).[3]

Figure 1. Exports and Gross Domestic Product (1985–2002)

(a) Indonesia (Billion Rupiah)

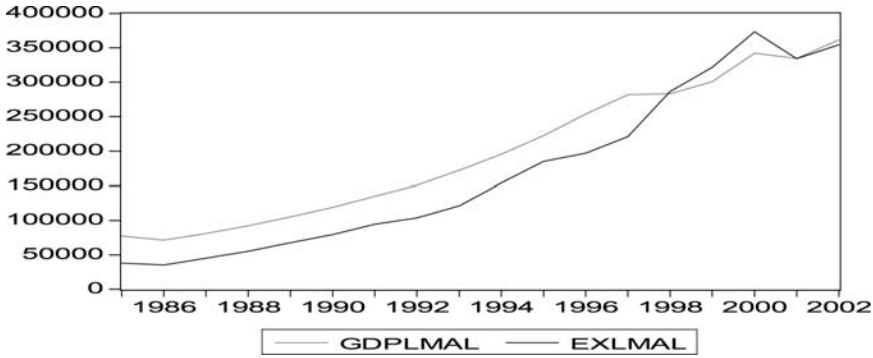


(b) Malaysia (Million Ringgit)



[3] The value of Indonesian rupiah depreciated against the US dollar during the Asian financial crisis. Therefore, while Indonesia's GDP expanded if denominated in rupiah, it declined if denominated in US dollars.

(c) Philippines (Billion Pesos)



Source: Asian Development Bank (2005)

Second, in Malaysia, its exports amounted to 197 billion ringgit in 1996. At the height of the Asian financial crisis, the country's exports increased to 220 billion ringgit in 1997 and reached 286 billion ringgit in 1998 (Asian Development Bank 2005).[4]

Finally, in the Philippines, exports and GDP from 1985 to 2002 seemed to be less volatile than in Indonesia and Malaysia. The country's GDP amounted to approximately 1 trillion pesos in 1990. It expanded to approximately 2 trillion pesos in 1996 and swelled to 3 trillion pesos in 1999.

Regarding research methodology, majority of previous research studies on the ELG hypothesis have used either crosscountry data or time-series data. This paper employs a different econometric method—that is, panel data analysis—to examine the relationship between exports and economic growth.

The main reason why the panel data method has been chosen for this study is that this methodology is more powerful than the univariate ones. Panel unit root test has also been getting increasingly popular among applied econometricians. As Maddala and Wu (1999) argue:

- ✦ It is by now a generally accepted argument that the commonly used unit root tests like the Dickey-Fuller (DF), augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests lack power in distinguishing the unit root null from stationary alternative, and that using panel unit root tests is one way of increasing the power of unit roots test based on a single time series.

[4] Malaysian ringgit depreciated against the US Dollar during the crisis. Therefore, Malaysian exports denominated in US dollars were declining.

For similar reasons, many applied econometricians prefer using panel cointegration test rather than univariate cointegration test. Thus, Pedroni (2004) maintains that the problem of the univariate cointegration test is "the inherently low power of many of these tests when applied to time series available for the length of the postwar period." As Pedroni (2004) points out: "Practitioners could stand to benefit significantly if there existed a straightforward manner in which to perform cointegration tests for pooled time series panels."

This paper consists of five sections. Section 2 offers a brief review of literature on the relationship between economic growth and international trade. Section 3 discusses the research methodology adopted in this study, and Section 4 reports research findings. Section 5 concludes.

ECONOMIC DEVELOPMENT AND INTERNATIONAL TRADE

The starting point of the debate over the complex and intricate relationship between a country's economic performance and its exports can be traced back to the founding fathers of modern economic thought. This means that the role of international trade in the economic development has been an important topic for more than 200 years.

Classical economists Adam Smith and David Ricardo were the first to raise awareness about the role of international trade in a country's economic development. They argued that a country could benefit considerably if it specialized in a certain commodity or product and then exported this commodity or product to foreign countries that lacked this certain commodity.

In his seminal book *The Wealth of Nations* (1776), Adam Smith proposed that a country should specialize in and export those commodities in which it had an absolute advantage. At the same time, Adam Smith reasoned, the country should import the commodities in which its trading partners had an absolute advantage. The concept of *absolute advantage* could be explained by using input coefficients, which is the amount of labor required to produce one unit of output. Country A has an absolute advantage if:

$$a_{LX} < b_{LX} \qquad (1)$$

where a_{LX} is the input coefficient of product X in country A, and b_{LX} is the input coefficient of product X in country B (Yarbrough and Yarbrough 2002).

David Ricardo further elaborated on the concept of absolute advantage. In his book *The Principles of Political Economy* (1817), Ricardo introduced a more generalized concept of *comparative advantage*. He asserted that a nation could gain from trade by exporting the goods or services in which it had the best com-

parative advantage in productivity while importing those in which it had the least comparative advantage. Country A has a comparative advantage if:

$$a_{LX} / a_{LY} < b_{LX} / b_{LY} \quad (2)$$

where a_{LY} is the input coefficient of product Y in country A, and b_{LY} is the input coefficient of product Y in country B (Yarbrough and Yarbrough 2002).

With the development of economic thought, several shortcomings of the classical theory of international trade became evident. First of all, the theory does not incorporate a perspective on the consequences of deteriorating terms of trade, which became a central trade issue between the developed and developing nations. As Cypher and Dietz (1998) observe: "Especially for poor, less-developed nations, we show that the generalised argument in favour of free trade policy derived from (classical) trade theory cannot be sustained once one takes the long-term historical trend of the terms of trade into consideration."

Second, it is not always possible for a country to determine its economic niche or comparative advantage in advance. As a result, many developing countries have been experiencing serious difficulties in establishing a firm position in the global market. This reality was noticed by Hausmann and Rodrick (2002) who commented that for a developing nation, economic development could become a trial and error process of discovering its own strengths in the global competition.

Empirical research studies support the notion that there exists a positive relationship between international trade and economic development, and findings of a number of inquiries provide some evidence to support the ELG hypothesis. As Van den Berg (2001) notes: "The empirical evidence on the source of economic growth overwhelmingly suggests that there is a positive relationship between international trade and economic growth."

Several high-profile studies have been conducted on the impact of international trade on economic development. One such study was undertaken by the World Bank for the period 1973–1985. In the study, developing nations were classified into four groups: (1) strongly outward-oriented countries, (2) moderately outward-oriented countries, (3) moderately inward-oriented countries, and (4) strongly inward-oriented countries. The study concluded that strongly outward-oriented countries had enjoyed the highest economic growth among the four groups. By contrast, strongly inward-oriented countries had experienced most severe economic recessions (World Bank 1987).

Another study was done by prominent economists Jeffrey Sachs and Andrew Warner (1995) who analyzed the relationship between globalization and economic performance. The findings of their research favor the promotion of international trade as a means of economic development. The researchers argue

that regardless whether a country is a developing or a developed nation, there is a strong association between the openness of its economy and its growth rate. As Sachs and Warner (1995) write:

- ✦ Within the group of developing countries, the open economies grew at 4.49 percent per year, and the closed economies grew at 0.69 percent per year. Within the group of developed countries, the open economies grew at 2.29 percent per year, and the closed economies grew at 0.74 percent per year.

Abundant literature is available on the linkage between exports and economic growth. Giles and Williams (2000a, 2000b) examined more than 150 papers on the topic and concluded that despite the extensive research, the evidence of the vigour of the ELG hypothesis is mixed and inconclusive. This inconsistence in empirical results may arise from the differences in time periods, data or methodology. To highlight this issue, Giles and Williams (2000a, 2000b) examined 36 empirical works on the ELG hypothesis in South Korea. Eleven of these research studies estimated a form of aggregate production function model while 25 papers focused on the causality using a Vector Autoregressive (VAR) framework. Among the former, eight inquiries reported a significant relationship between exports and economic growth in South Korea while the rest of the studies detected a nonsignificant relationship.

This means that the studies that employed the VAR framework reached contradicting results while all five studies that used the quarterly data reached the same conclusion (i.e., they detected a bi-directional causality between exports and growth). Furthermore, several studies focusing on the same time span (i.e., from the 1950s to the 1980s) but employing different research methods found noncausality relationship between the two variables (Giles and Williams 2000a, 2000b).

Especially interesting for this paper are research studies on the relationship between exports and economic growth in the Philippines, Malaysia and Indonesia. Time series analyses that tested the ELG hypothesis for these countries showed mixed results. For the Philippines, Amrinto (2006) used parametric and semiparametric error correction model (ECM) to test the ELG hypothesis for the period 1981-2004. Results from the parametric ECM indicated that there had been a unidirectional causality between the Philippines' exports and output in the short-run while findings from the semi-parametric ECM established a bilateral causality between the two variables.

To test the ELG hypothesis in the Malaysian context for the period 1960-2001, Keong, Yusop and Liew (2005) used the bounds test method. They detected the co-integrating relationship between the country's exports and its economic

growth. The researchers also pointed out the short-run causality from exports to economic growth.

In the Indonesian context, an empirical analysis to identify the determinants of economic growth during the period 1965–1992 was done by Piazolo (1996). He included six variables (i.e., exports, government expenditure, population, capital formation, inflation, foreign investment) into the econometric model. The results of the study supported the ELG hypothesis for Indonesia.

Having established the importance and complexity of the relationship between international trade and economic growth, this paper proceeds to examine whether exports have been producing a significant impact on the economic development in the selected three BIMP-EAGA countries. The following section discusses the econometric methods employed in the current research.

RESEARCH METHODOLOGY

A panel data analysis is used in this paper to examine relationship between the amounts of national income and the volumes of export in three BIMP-EAGA countries, namely, the Philippines, Malaysia and Indonesia, for the period 1985–2002.[5] It is hypothesised that the size of a country's GDP is influenced by the amount of its export (*EX*).

Three separate methods are used in this study to analyse the model, namely, 1) pooled Ordinary Least Squares (OLS); 2) one-way fixed effects; and 3) two-way fixed effects. The fixed-effects approach is better suited for the cases where there exist unobservable country-effects and unobservable time-effects.

First of all, to examine the determinants of the size of national income without taking into account country- and time-effects, a pooled OLS regression model could be written as:

$$GDP_{it} = \alpha + \beta_1 EX_{it} + \varepsilon_{it}, \qquad (3)$$

where GDP_{it} is the size of gross domestic product in country i in year t; EX_{it} is the amount of export in country i in year t; α is the intercept; β_1 is the slope parameter; ε_{it} is the error term. To incorporate country-effects, one-way fixed effects model could be written as:

$$GDP_{it} = \alpha_i + \beta_1 EX_{it} + \varepsilon_{it}, \qquad (4)$$

where α_i is country i specific fixed effects. Finally, to incorporate both country- and time-effects, a two-way fixed effects model could be:

[5] The data is obtained from the Asian Development Bank (2005).

$$GDP_{it} = \alpha_0 + \alpha_i + \theta_t + \beta_1 EX_{it} + \varepsilon_{it}, \qquad (5)$$

where α_0 is the intercept; α_i is the country-effects; θ_t is the time-effects.

If there are country-effects in the regression model, the pooled OLS, or equation (1), cannot effectively estimate the linkage between the independent variable and the dependent variable. Similarly, if there exist time-effects, the one-way fixed-effects model, or equation (2), cannot effectively estimate the regression model. Thus, the significance of country-effects and time-effects needs to be analyzed. An F- test could be used for this purpose (Greene 2003).

Further, Hausman specification test can be employed to determine whether the fixed-effects approach is better suited for the analysis than the random-effects approach. The random effect-model could be written as:

$$GDP_{it} = \alpha + u_i + \beta_1 EX_{it} + \varepsilon_{it}, \qquad (6)$$

where u_i is the country-specific random element.

As the variables used in the above-mentioned estimation are in levels, the country- and time-specific effects can be interpreted as long-run. If the GDP_{it} and EX_{it} are co-integrated, an error correction model (ECM) could be estimated as

$$\Delta GDP_{it} = \alpha_i + \beta \Delta EX_{it} + \lambda(GDP_{it-1} - \hat{\alpha}_i - \hat{\beta} EX_{it-1}) + e_{it}, \qquad (7)$$

where $\hat{\alpha}_i$ and $\hat{\beta}$ represent the long-run coefficients; β represents the short-run coefficient; λ is the error correction coefficient, and the error correction term (EC_{it-1}) represents deviations from the long-run equilibrium.

If the independent and dependent variables are co-integrated, both variables are assumed to be integrated of order one, denoted as I(1). This paper uses two panel unit root tests (IPS test and MW test) to determine whether both variables are integrated of order one.

An IPS test is based on the mean value of individual ADF statistic or *t*-bar (Im, Pesaran and Shin 2003). There are two steps to estimate the IPS test statistic. First, obtain the individual ADF statistic. Second, obtain the *t*-bar or mean value of individual ADF statistic.

$$t\text{-bar}_{\text{NT}} = \frac{1}{N} \sum_{i=1}^{N} t_{iT_i} \qquad (8)$$

The corresponding standardised *t*-bar statistic is given by

$$Z_{tbar} = \frac{\sqrt{N}\left\{tbar - N^{-1}E(t_{T_i})\right\}}{\sqrt{N^{-1}\sum_{i=1}^{N} Var(t_{T_i})}} \quad (9)$$

where $E(t_T)$ is the mean of t_T, and $Var(t_T)$ is the variance of t_T. Im et al. (2003) provide the Monte Carlo estimate of $E(t_T)$ and $Var(t_T)$.

This paper also employs the Maddala and Wu (MW) test, which is based on combined significance levels (p-values) from individual unit root tests. According to Maddala and Wu (1999), if the test statistics are continuous, the significance level π_i (i =1,2, …….N) are independent and uniform (0,1) variables, then the ($-2\Sigma \log \pi_i$) has a χ^2 distribution with two degree of freedom. Maddala and Wu (1999) used combined p-values, or λ, which is expressed as

$$\lambda = -2\sum_{i=1}^{N} \log \pi_i \,, \quad (10)$$

where λ has a χ^2 distribution with 2N degree of freedom.

If the independent and the dependent variables are co-integrated, the residual e_{it} will be integrated of order zero, denoted as I(0). This paper uses the Pedroni method to test whether the residual is integrated of order zero. Pedroni (1999, 2004) employed two types of panel co-integration tests. The first one is the *panel statistic* that is equivalent to the unit roots statistic against a homogeneous alternative. The second one is the *group mean statistic* that is analogous to the panel unit root tests against a heterogeneous alternative.

Pedroni (2004) argued that the panel statistic can be constructed by taking the ratio of the sum of the numerators and the sum of the denominators of the analogous conventional time series statistic. On the other hand, the group mean statistic can be constructed by first computing the ratio corresponding to the conventional time series statistics and then by computing the standardized sum of the entire ratio over the *N* dimension of the panel.

This paper uses the two panel co-integration tests as suggested by Pedroni (1994, 2004), namely the *panel ADF statistic* and the *group mean ADF statistic*. The two versions of the ADF statistic could be defined as

Panel $$Z_t = (\bar{s}^2{}_{NT} \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{e}^2{}_{i,t-1})^{-1/2} \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{e}_{i,t-1}\Delta\hat{e}_{i,t} \quad (11)$$

Group Mean $$N^{-1/2}Z_t = N^{-1/2}\sum_{i=1}^{N}(\sum_{t=1}^{T} \hat{s}_i \hat{e}^2{}_{i,t-1})^{-1/2} \sum_{t=1}^{T} \hat{e}_{i,t-1}\Delta\hat{e}_{i,t} \,, \quad (12)$$

where e_{it} represents the residuals from the ADF estimation, and s represents the variance of the residuals from the ADF estimation.[6] The asymptotic distribution of panel- and group mean statistic can thus be expressed as:

$$\frac{\kappa_{N,T} - \mu\sqrt{N}}{\sqrt{\nu}} \Rightarrow N(0,1) \qquad (13)$$

where $\kappa_{N,T}$ is the appropriately standardized form for each of the statistics. On the other hand, μ is the mean of $\kappa_{N,T}$, and ν is the variance of $\kappa_{N,T}$. Pedroni (1999) provides a Monte Carlo estimate of μ and ν.

EMPIRICAL RESULTS

a) Individual country

First of all, this paper adopts the co-integration and causality method to analyze each of the selected BIMP-EAGA countries individually. The ADF unit root tests are employed to test the stationarity of the time series data sets. Empirical results from the ADF test are reported in Table 1.

Despite some minor differences in the findings as seen in Table 1, the obtained results indicate that both variables—GDP and EX—have unit roots in levels. The EX becomes stationary in the first difference while GDP still has unit root in levels. Therefore, EX is integrated of order one as denoted by I(1).

Further, this paper uses the Johansen co-integration test to test the long-run movement of the variables. Results of the co-integration test based on the maximum eigen value of the stochastic matrix are reported in Table 2.

Despite some minor differences,[7] the findings do not indicate that there exists a long-run relationship between the two variables (EX and GDP), which means that these variables are not co-integrated. In other words, in the long-run, they do not move with each other.

Finally, the Granger-causality method is employed to examine casual relationships between exports and economic growth in the three BIMP-EAGA countries. The result of the F-statistics and p-values are reported in Table 3.

According to results presented in Table 3, the null hypothesis that EX does not Granger-cause GDP could not be rejected for all of the three selected countries. This means that the results do not give evidence that exports Granger-caused the GDP of Indonesia, Malaysia, and the Philippines.

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[6] This paper uses the unweighted versions of statistics. Pedroni (2004) argues that in the Monte Carlo simulation, he finds that unweighted statistics tend to outperform the weighted statistics.

[7] In the case of Indonesia, the findings indicate two co-integrating equations, or $k = r$, where k is the number of variables, and r is the number of cointegrating equations. This could mean that there is no co-integrating relationship between the variables.

Table 1. The ADF unit root test

	Levels			First Differences		
	Indonesia	Malaysia	Philippines	Indonesia	Malaysia	Philippines
GDP	3.931	1.871	3.465	-1.938	-2.269	-3.576*
EX	-0.504	0.442	1.649	-5.459***	-3.841**	-2.831*

Notes: *** indicates significance at 1% level
** indicates significance at 5% level
* indicates significance at 10% level

Table 2. Johansen co-integration test

Indonesia				
Eigenvalue	Max-Eigen Statistic	5 percent critical value	1 percent critical value	Number of co-integrating equations
0.737	21.423	14.07	18.63	None**
0.245	4.502	3.76	6.65	At most 1*
Malaysia				
Eigenvalue	Max-Eigen Statistic	5 percent critical value	1 percent critical value	Number of co-integrating equations
0.534	12.218	14.07	18.63	None
0.002	0.463	3.76	6.65	At most 1
The Philippines				
Eigenvalue	Max-Eigen Statistic	5 percent critical value	1 percent critical value	Number of co-integrating equations
0.377	7.593	14.07	18.63	None
0.198	3.538	3.76	6.65	At most 1

Notes: * indicates significance at 5% level
** indicates significance at 1% level

However, in the case of Malaysia, its GDP indeed Granger-causes EX. This means that an increase in the GDP Granger-caused an increase in the country's exports. On the other hand, in Indonesia and the Philippines, the null hypothesis that GDP does not Granger-cause EX could not be rejected.

These empirical results show that, in the case of Malaysia, there is a unidirectional causality from the country's GDP to its exports, but not vice versa. The results also show that there is no unidirectional causality from exports to GDP. These results are in concordance with a previous research conducted by Ahmad and Harnhirun (1996) who report a unidirectional causality from GDP to exports in

Table 3. Granger-causality test

Indonesia		
Causality	F-statistics	P-value
EX ⟶ *GDP*	3.852	0.053
GDP ⟶ *EX*	3.075	0.086
Malaysia		
Causality	F-statistics	P-value
EX ⟶ *GDP*	0.211	0.812
GDP ⟶ *EX*	6.182	0.015
The Philippines		
Causality	F-statistics	P-value
EX ⟶ *GDP*	0.172	0.843
GDP ⟶ *EX*	2.707	0.110

Indonesia, Malaysia, and the Philippines. In other words, the Granger-causality test provided empirical support for a growth-driven export rather than the export-driven growth hypothesis.

In short, empirical evidence obtained in this study does not support the existence of a long-run relationship and causality between exports and GDP in the three BIMP-EAGA countries. Furthermore, no empirical evidence was obtained to support the proposition that exports Granger-caused economic growth in all these countries. Thus, the findings on this research provide no empirical evidences to support the ELG hypothesis in the context of Indonesia, Malaysia, and the Philippines.

b) Panel data

Results of the regression analyses of the pooled OLS model are presented in Table 4. The multiple coefficient of determination (R^2) at 0.77 increases considerably to 0.91 under controlled country-effects and leads to a slight improvement to 0.92 under conditioned country- and time-effects.

Table 4 also reports the results of the one-way fixed effects model. In this model, the estimated autocorrelation coefficient is 0.745, which is high. This diagnostic test indicates the autocorrelation process in the model. To compare the one-way fixed effects model with the random effects model, Lagrange Multiplier (LM) test and Hausman test indicate that a random-effects model would be a better choice for the analysis. Furthermore, to compare the pooled OLS model with the one-way fixed effects model, the null hypothesis that $\acute{a}_i$ (country-effects) equals zero is rejected at 0.01 level of significance. This implies the presence of country-effects in the model.

The same method could be applied to examine the significance of time-effects. Table 4 shows results of the two-way fixed effects model. In this model, the estimated autocorrelation coefficient is 0.392, which is low. This diagnostic test indicates that there is no autocorrelation process in the model. Lagrange Multiplier (LM) test and Hausman test show that the two-way random effects regression model is better suited than the fixed-effects model. To compare the one-way fixed effects model with the two-way fixed effects model, the null hypothesis that $\grave{e}_t$ (time-effects) equals zero could not be rejected.

These results imply that only the one-way random effects model is best suited for the analysis. In other words, the size of national income in the three

Table 4. Panel data analysis (Pooled OLS, one-way fixed effects and two-way fixed effects): Dependent variable: GDP

	Pooled OLS	One-Way Fixed Effects	One-Way Random Effects	Two-Way Fixed Effects
EX	2.039	1.956	1.957	2.178
	(13.336)**	(16.94)**	(17.03)**	(10.59)**
Overall Significance(F test)	178.37**	170.91**		20.19**
R^2	0.77	0.91	0.77	0.92
Adjusted R^2	0.76	0.90		0.87
Lagrange Multiplier Test (One-way (Random-effects/Fixed-effects vs. Classical Regression Model)				153.78**
Lagrange Multiplier Test (Two-way) (Random-effects/Fixed-effects vs. Classical Regression Model)				161.61**
Hausman Specification Test (One-way) (Fixed-effects vs. Random-effects)				0.03
Hausman Specification Test (Two-way) (Fixed-effects vs. Random-effects)				1.46
F Test for Model Specification (One-Way Fixed Effects vs. Pooled OLS)				38.50**
F Test for Model Specification (Two-Way Fixed Effects vs. Pooled OLS)				3.55**
F Test for Model Specification (Two-Way Fixed Effects vs. One-Way Fixed Effects)				0.34
Estimated Autocorrelation Coefficient (One-way fixed effect)				0.745
Estimated Autocorrelation Coefficient (Two-way fixed effect)				0.392

Numbers in parentheses in "fixed effects" are t-statistics

Number in parentheses in "random effects" is derived from coefficient divided by standard errors

* indicates significance at 0.05 level

** indicates significance at 0.01 level

BIMP-EAGA countries is influenced by country-specific random effects only. As the one-way random effects model shows, the independent and dependent variables *did* have a significant relationship, which implies that GDP in these BIMP-EAGA countries expanded as their EX increased.

The results of the panel unit root tests and panel co-integration test are presented in Table 5. Before conducting the test for panel co-integration, there is a need to ensure that both variables are integrated of order one, as denoted by I(1).

Despite minor differences, both the IPS test and MW test could not reject the null hypothesis of unit root in levels, with or without linear trends included. On the other hand, both panel unit root tests rejected the null hypothesis of unit root in first differences with linear trends included. These results provide evidence of the presence of stationary process for both GDP and EX at first differences. This means that both variables could be considered as integrated of order one, I(1).

Further, both panel co-integration tests, namely, the panel statistic and the group mean statistic, failed to reject the null hypothesis that there is no co-integration. These results indicate the absence of a co-integrating relationship between GDP and EX. Therefore, this paper could not proceed to estimate the error correction model because there is no evidence for a co-integrating relationship between the two variables.

In short, the one-way random effects model shows that GDP and EX have significant relationship in the three BIMP-EAGA countries selected for this re-

Table 5: Panel unit root test and panel co-integration test

	Panel Unit Root Tests			
	Levels		First Differences	
	Individual effects	Individual effects and linear trends	Individual effects	Individual effects and linear trends
IPS test				
GDP	6.24	2.68	0.04	-1.30*
EX	4.28	0.21	-2.53***	-2.42***
MW test				
GDP	0.17	4.62	5.85	11.33*
EX	0.08	3.51	18.834***	18.34***
	Panel Co-integration Test			
	Panel ADF Statistic		Group Mean ADF Statistic	
Pedroni test	1.27		0.65	

* indicates significance at 0.10 level
** indicates significance at 0.05 level
*** indicates significance at 0.01 level

search. This implies that in Malaysia, Indonesia, and the Philippines, the size of the country's national income *did* expand as the export volumes grew. However, there is no cointegrating relationship between the variables. This means that the empirical findings of this study do not provide sufficient empirical support to prove the existence of an export-led growth in these three BIMP-EAGA countries.

CONCLUSION

International trade is habitually assigned an important role in propelling developing nations toward the status of developed economies. BIMP-EAGA countries represent dynamic developing economies that have been experiencing rapid economic development. Taking these facts into consideration, this paper conducted an empirical analysis of the relationship between exports and development in three BIMP-EAGA countries, namely, Indonesia, Malaysia, and the Philippines.

This study's empirical findings lead to a conclusion that there is no sufficient empirical evidence to support a significant positive relationship between the size of national income and the amount of exports in the three selected developing nations. The main reason why exports did not significantly influence the economic growth of Malaysia, Indonesia, and the Philippines could be that other economic factors had been more important in determining economic growth in the region. For example, economic growth in the three BIMP-EAGA countries could be driven by such economic factors as consumption or government expenditure.

Some of the economic policy implications that stem from these research findings are that the governments in the region should not focus too narrowly on their international economic policies (eg., trade policy) when formulating the development plans. Against a commonly accepted reality of export-driven growth, economic development in the three BIMP-EAGA economies has, evidently, been influenced by various and quite complex factors. For example, these nations could have been experiencing a consumption-driven growth or a government expenditure-driven growth. Thus, the findings in this paper encourage a closer look at other factors that may influence the size of income in BIMP-EAGA countries and other developing nations.

Future inquiries on the relationship between exports and economic growth could incorporate additional variables not included in this study in order to obtain a deeper insight into the complex issues of economic development process in Malaysia, Indonesia, and the Philippines as well as other developing countries. Future research studies could go beyond the two-variable model (i.e., exports and growth) and incorporate other independent variables, such as labor, capital, and investment. Also, future inquiries on the topic may want to identify the determinants of economic growth in the region by using the fully specified growth equation.

Globalization and trends in regional economic integration processes (eg., BIMP-EAGA, ASEAN, APEC) will undoubtedly have a significant impact on developing economies in the region. This fact should also be taken into consideration. Therefore, it is possible that in the future, the ELG hypothesis could become increasingly relevant in the BIMP-EAGA region.

Another important issue to consider for future studies is that international trade may be able to stimulate economic development through technological spillovers as new and sophisticated technologies are transferred from one country to another through international trade. Examining this linkage could be a challenging and very interesting area of future research.

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