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Assessment on Economic Growth of Development Indicators in ASEAN: A Dynamic Panel Data Analysis

Fidlizan Muhammad Azila Abdul Razak Mohd Yahya Mohd Hussin
Department of Economics, Faculty of Management and Economics, Sultan Idris Education University, 35900 Tanjong Malim, Perak, Malaysia
*E-mail of the corresponding author: fidlizan@fpe.upsi.edu.my

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Abstract

This article analyses the relationship between economic growth and certain important indicators in economic development. These include the mortality rate, life expectancy, and unemployment rate in five different ASEAN countries from the years 1980 to 2010 using panel data analysis. The result of this estimation suggests that there exists a long-term relationship between economic growth and these development indicators, which is compatible with the theory highlighted in the economy. This shows that economic growth does have an impact on the development of a country in various aspects.

Keywords: Economic growth, economic development, ASEAN

1. Introduction

Growth and development are two terms commonly discussed in studies relating to economic development. Growth is a chain effect valued from economic growth. There are a variety of indicators that have been created to analyse the extent of which economic growth is able to be enjoyed by the country's population or otherwise. With these indicators, the group and hierarchy of a country in the world can be known. Among these is the classification of countries according to income (*i.e.* low to high income countries) and the human development index (which also ranges from low to high). Seeing as there exists a relation between development indicators and growth, this article thus analyses the long-term relationship between economic growth and development indicators in the five ASEAN countries: Malaysia, Singapore, Indonesia, the Philippines, and Thailand. In order to achieve this aim, dynamic panel data analysis was applied. Further discussion in this article is laid out as follows: Section 2 explains development indicators and is followed by a literature review in Section 3. Section 4 explains the methodology and data used in the study while Sections 5 and 6 deal with the results of the study's analysis and the conclusion respectively.

2. Development Indicators

In discussions relating to development indicators in economic development literature (Ray, 1998: 47), statements from Robert Lucas (1988) are commonly used. The essence of his statements refers to detailed analysis on the value of economic growth achieved in a country with reference to more realistic definition of development. A high Gross Domestic Product in a country may not necessarily be in line with its development. This situation may be a result of factors such as political instability (Goldsmith, 1987; Alberto *et al.* 1996), democracy (Heo and Tan, 2001), gender (Klasen, 1999), and various others.

This situation makes measuring development incredibly subjective. Despite that, a quantitative evaluation towards the impact of the economy on development is necessary. This makes it easier for policy makers in a country to determine the level of development enjoyed by the population. There are various indicators that have been introduced in order to measure the effects of economic growth. For example, the Human Development Index (HDI) is a measure that was proposed in 1990 for measuring the quality of human life in a country. However, this index has also come under criticism for its irrelevancy in explaining the level of development of a country (Hendrick *et. al*, 2011; Sagara and Najam, 1998; McGillivray, 1991). This criticism is based on the factor formula for calculation of the index, data collection, and variables in the HDI among other things.

Besides the HDI, the *Physical Quality of Life Index* (PQLI) and *Purchasing Power Parity* (PPP) are also frequently referred to. Their condition is similar to the HDI as the PQLI and PPP also receive almost similar

criticisms. The PQLI for instance, despite having been found appropriate in its early stages for explaining development (Larson and Wilford, 1979; Morris, 1978), has had later conflicts regarding its empirical results (Ram, 1980; Ravallion, 2010). Furthermore, the PQLI is less used in explaining the development of a country due to data constraints (Brodsky, 1981).

Even though the indices named do not give a holistic or accurate view on the level of development of a country, the indicators used to form these indices are often used in many studies. These indicators are generally agreed upon by researchers in various fields to be representative, or proxy to the value of the economic growth of the economy on the population of a country (Steven, 2005; Bhalla and Fluitman, 1985; Rametsteiner *et al*., 2011). Following through from that, many indicators have been created for measuring the extent to which the effects of economic growth of a country have been channelled towards the population through various aspects, whether economic in nature or otherwise.

Seeing as there are many indicators that are available for use, this study thus limits this discussion towards the essential relationships used in the discussion of economic development. The relationship in question is the one of economic development being the result of economic growth. In other words, economic growth is a way of explaining the development that happens in a country. The aim of this study, therefore, is to prove the existence of this relationship between two terms through a long-term relationship. Three indicators were chosen. These were the mortality rate, life expectancy, and unemployment rate.

3. Literature Study

Research relating to economic development is a popular field of research. Many studies have been performed to measure how far economic growth affects economic development in an economy that encompasses various aspects. In this section, the focus of discussion is limited to the only three factors that have been analysed.

Okun's Law remains one of the most popular laws used in studying the relationship between unemployment and economic growth (Tatom; 1976). This law states that a 1% growth in the economy results in a 2% decrease in the unemployment rate of a country. This law has been tested in a few countries. Among the countries in which the law was tested were Turkey (Aktar and Ozturk, 2009), Malaysia (Ting and Ling, 2011), the G7 Countries (Molana and Malley, 2008), the OECD Countries (Lee, 2000), Japan (Hamada, 1984), and many others. From these studies, it was found that the unemployment rate was incredibly sensitive towards the level of economic growth achieved by a country, though the findings of Aktar and Ozturk (2009) state that this result can only be achieved if there exists an increase in skill levels amongst the workers.

Studies that use a proxy of economic growth through development indicators to analyse this relationship were also carried out. For example, a study carried out by Biagi and Lucifora (2008) used education and demographic indicators on the rate of unemployment. In the study, they found that an increase in the level of education of a range of ages, in European countries, caused a decrease in the rate of unemployment. These studies have shown that there exists a significant relationship between economic growth and a reduction in the rate of unemployment.

The relationship between economic growth and mortality rate has also been studied. Comprehensive studies on this relationship have been carried out by Preston (1975, 1985). In two of his studies, it was found that an increase in income had a significant effect towards the reduction of the mortality rate in less developed countries. These findings were supported by a study conducted by Pritchett and Summers (1996) which found that a decrease in the mortality rate during the 1960s was a result of an increase in income. Brockerhoff and Brenna (1998) who studied countries in the low-income group found a similar occurrence. The limited access capabilities of rural communities resulting from income restrictions were found to have a significant impact on mortality rate compared to the urban populace.

A study by Bloom and Mahal (1997) on the other hand interestingly observed the opposite. They discussed the effects of disease which lead to death, such as AIDS, on economic growth. The study involved a compilation of

data from 51 countries. Results show that this relationship was insignificant. However, they did not reject the notion that it had an intrinsic effect upon social life, job opportunities, and so on.

Brenner (2005) in commenting on the relationship between economic growth and the mortality rate in the USA from the years 1901-2000 also supported the notion that the reduced mortality rate happened because of increased economic activity. Based on these studies, it can be concluded that economic growth is incredibly important in analyzing the mortality rate of a certain country.

For the final indicator, that of life expectancy, numerous studies have also been carried out. A few studies such as Granados (2012), Cervellati and Sunde (2011), Kulkarni *et al*. (2011), Croix and Licandro (1999), Sen (1981), and many more were found to support this relationship.

Seeing as there exists a relationship between these indicators and economic growth, this study will specifically research the relationship with regards to five ASEAN countries. With that, it is hoped that this study will be able to explain the relationship that exists between these indicators.

4. Methodology and Research Data

In the context of the findings of the research literature with relation to economic growth being important to development in a variety of aspects, this study thus focuses its analysis on five ASEAN countries. The countries that were studied were Malaysia, Singapore, Indonesia, the Philippines, and Thailand involving data from the years 1996 to 2010. The selection of these five countries was based upon the availability of data for the period of research. The latest dynamic panel data analysis techniques were used in this study, namely that of the Mean Group (MG) and the Pooled Mean Group (PMG). Both of these methods were introduced by Pesaran and Smith (1995) and Pesaran *et al.* (1999). The effects of economic growth (ΔlnGDP) towards mortality rate (lnMR), life expectancy (lnLER), and the unemployment rate (UEMP) were analysed to represent development indicators. To understand the long-term effects of economic growth towards development indicators, the relationship can be written in the form of the following panel error-correction equation;

$$\Delta X_{i,t} = \alpha_i + \theta_i\left(X_{i,t-1} - \beta_i \Delta GDP\right) + \sum_{j=i}^{p-1} \gamma_{i,j}\, \Delta GDP_{i,t} + \sum_{j=1}^{q-1} \varphi_{ij} \Delta X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (1)$$

where β_i is the long-term parameter, θ_i is the balance parameter (correction), $X_{i,t}$ are the development indicators (MR, LER, UEMP) and $\Delta GDP_{i,t}$ is the GDP growth for each country, i, for a given year, t in the study period.

In analyzing the existence of a long-term relationship between the variables in the equation (1) above, a general procedure similar to the one used in the VAR method for time series data may be applied. The first procedure that was performed was the unit root test, followed by the co-integration and error correction test. Seeing as the study used panel data, a unit root test was applied. There were a variety of unit root test that were able to be used. In this study, tests by Levin, Lin and Chu, LLC (Levin *et al*., 2002), Ipshin (Im *et al.*, 1997) and Hadri (2000) were used. The LLC and Ipshin tests had null hypotheses which meant that research variables contained unit root problems, while the Hadri test was stationary at the level stage. Unit root tests were therefore important to make sure that research variables had a similar degree of integration. The degree of integration can be used as an evidence that demonstrated the possibility of a long-term relationship. In this study, the Hadri (2000) unit root test was started. According to Das (2011), this test was the strongest compared to the other tests with stationary null hypotheses.

To determine whether or not this long-term relationship actually exists or otherwise, a panel co-integration test was carried out. This was the Westerlund (2007) co-integration method with four co-integration tests applied. These were the G_a, G_t, P_a and P_t. The two (G_a, G_t) tests refer to the alternative hypothesis for at least one co-integration unit, while the two tests (P_a, P_t), on the other hand, refer to the alternative hypothesis with the co-integrated panels as a whole. In case the null hypothesis co-integration test is rejected, it will show that there

exists a long-term relationship between the variables. With relation to that, a panel error correction test may be carried out to determine whether it is a long term or short-term parameter.

Seeing as the error correction panel test was dynamic, the Pooled Mean Group, PMG (Pesaran *et al*., 1999) and the Mean Group, MG (Pesaran and Smith, 1995) was carried out. Through the PMG method, the short-term coefficients between units were found to be heterogeneous, though the long-term coefficient was similar for all units. Because of that, the long-term coefficients were similar for all units, while the intercept, speed of adjustment, and short-term coefficient were different between units. Asteriou (2009) describes a detailed formula for the PMG in his research. The short-term MG on the other hand was found to be contrary to the PMG in which the long-term parameter, short term and intercept were different for each unit. Because there were two methods, a Hausman (1978) test was carried out to determine which model was the best. The tested hypothesis in this test was to determine whether or not the long-term coefficient was appropriate for all units in the model. In case this hypothesis was rejected, the MG method would have been found to be more appropriate compared to the PMG method (Eng and Muzaffar, 2006).

5. Research Findings

The stationarity test for the research variables are shown in Table 1. Based on the unit root test by Hadri (2000), it was found that all the research variables had similar degrees of integration. This indicated the possibility of there being a long-term relationship between development indicators and economic growth.

Following the similar levels of integration shown in Table 1, the Westerlund (2007) co-integration test was carried out. The findings from the analysis are shown in Table 2. Based on Table 2, it was found that all tests rejected the null hypothesis. This showed that there exists a long-term relationship between the development variables and economic growth. To determine which model was appropriate for explaining the long-term relationship between development indicators and economic growth, the Hausman (1978) test was used. The results are shown in Table 3.

Based on Table 3, it was revealed that relationship between the unemployment rate (UEMP) and economic growth was only appropriately analysed using the PMG model. A failure to reject the null hypothesis showed that the long-term relationship between the units or countries were the same. On the other hand, two more indicators, that were the mortality rate (lnMR) and the life expectancy rate (lnLER) were more suited to being analysed using the MG model. The Chi-Square values which rejected the null hypothesis at a rate of 1% and 5% proved the choice of this model.

Analyses of the effects of the long-term relationship between the three indicators, or development indicators, with economic growth were carried out separately. The findings from these analyses are displayed in Tables 4, 5, 6 and 7.

Based on Table 4, it was found that the long-term parameters between economic growth and life expectancy showed a positive relationship. This demonstrated that economic growth was significant in increasing life expectancy. However, this effect was only found significant in the Philippines. From the perspective of the speed of adjustment, it was found that the parameters were negative and significant in all countries except Singapore. This showed that economic growth was important in explaining life expectancy. It also proved that the lnLER variable was able to withstand the short-term stability burden to achieve long-term stability. The biggest ECM value was shown by Indonesia with 28.5%, followed by Thailand with 8.8%.

The results of analysis between mortality rate (lnMR) and economic growth is shown in Table 5. Based on Table 5, it was found that all the countries showed a significant long-term relationship between the two variables. In other words, it was found that economic growth was significant in reducing the mortality rate. Economic growth was also found significant in specifically explaining the relationship in Indonesia, the Philippines, and also Thailand. This is justified by the fact that the significant ECM values for the three countries were related. In the short-term relationship, on the other hand, it was found that economic growth variables were insignificant. This is supported by Lorentzen *et al.* (2005) who states that its effect is not immediate but actually takes time. This is because the actions taken by an individual or the government will give long-term benefits.

The relationship between the unemployment rate and economic growth for the five ASEAN countries is shown in Table 6. According to Table 6, it was revealed that economic growth was significant in reducing the unemployment rate. Significant ECM values also proved this relationship. The findings show that the unemployment rate withheld the short-term stability correction burden to achieve a stability of about 23.3%. Besides that, economic growth was also significant in giving a short-term effect towards the unemployment rate. This indirectly showed that positive economic growth was important in increasing job opportunities.

Table 7, on the other hand, displays the details from Table 6 analysed by country. Based on Table 7, it was found that economic growth was a significant indicator in affecting the unemployment rate in three countries, namely Singapore, the Philippines, and Thailand. Besides that, these variables were significant in the short-term to Malaysia and Thailand.

Based on the findings of the analysis from the discussion above, it has been proven that economic growth is an important proxy for development in ASEAN countries. Because of that, in order to develop the country in various aspects, ASEAN countries have to ensure that there exists continuous economic growth. Through this growth, development may be initiated to ensure the well-being of the population.

6. Conclusion

This article is intended to analyse the effects and relationship between economic growth and development. Research relating to economic development states that economic growth is the instigator or source of development. Through analysis of the three indicators (*i.e.* mortality rate, life expectancy, and the unemployment rate), it was found that there exists a significant relationship between economic growth and the indicators in five of the ASEAN countries that were studied. This proves that economic development, which encompasses all three of these indicators, is needed for the economic growth of a country to be sustainable and continuous.

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Table 1: Stationarity Test

variable	lnGDP	lnLER	lnMR	UEMP
level	4.6084*	4.7217*	5.1983*	2.9449*
Difference	1.6901**	4.6044*	4.4095*	2.4177*

*,** and *** Significant at 1,5 and 10%

Table 2: Panel Cointegration Test

Tests	G_a	G_t	P_a	P_t
lnLER	-3.533*	-43.446*	-19.755*	-56.575*
lnMR	-4.075*	-54.942*	-2.125*	-14.568*
UEMP	-5.277*	-24.235*	-6.980*	-19.926*

*,** and *** Significant at 1,5 and 10%

Table 3: Hausman Test

Model	Chi Square (χ^2)	P-value	Selection
lnLER	4.569	0.0013	MG
lnMR	5.47	0.0194	MG
UEMP	1.02	0.3136	PMG

Table 4: MG Estimates of life Expectancy Rate Equation for 5 countries

Variable	Malaysia	Indonesia	Singapore	Philippine	Thailand
	Long Run Coefficients				
lnGDP	0.2903 (0.0281)	0.0003 (0.0925)	0.3281 (3.4111)	0.0838** (0.0355)	0.0640 (0.0500)
	Short run Coefficients				
ECM	-0.0423*** (0.0248)	-0.2856*** (0.0163)	0.0065 (0.0975)	-0.0196* (0.0045)	-0.0878* (0.0308)
$\Delta lnGDP$	-0.0028 (0.0023)	-0.0001 (0.0042)	-0.0115 (0.0130)	-0.0034 (0.0023)	-0.0085 (0.0105)
Constant	0.1735*** (0.0907)	0.1242** (0.0512)	-0.0025 (0.3269)	0.0732* (0.0164)	0.4212* (0.1151)

*,**,*** significant at 1%,5% and 10%

Table 5: MG Estimates of Mortality Rate Equation for 5 countries

Variable	Malaysia	Indonesia	Singapore	Philippine	Thailand
	Long Run Coefficients				
lnGDP	-1.4759* (0.4535)	-1.1922* (0.1327)	-1.1473* (0.3791)	-2.4049* (0.4285)	-1.0021* (0.0309)
	Short run Coefficients				
ECM	-0.0155 (0.0210)	-0.0259** (0.0105)	-0.0821 (0.0715)	-0.0237* (0.0059)	-0.1754* (0.0246)
$\Delta lnGDP$	0.0579 (0.0486)	-0.0041 (0.0203)	0.0723 (0.1350)	-0.0376 (0.0309)	-0.0119 (0.0517)
Constant	0.1704 (0.2892)	0.2680** (0.1117)	0.9920 (1.1979)	-0.4504* (0.1004)	1.7881* (0.2764)

*,**,*** significant at 1%,5% and 10%

Table 6: PMG Estimates of Unemployment Rate Equation for 5 countries

	Long Run Coefficients
lnGDP	-2.5881* (0.8207)
	Short run Coefficients
ECM	-0.2331* (0.0890)
$\Delta lnGDP$	-5.8350* (1.6136)
Constant	5.9664*(1.7110)

*,**,*** significant at 1%,5% and 10%

Table 7: Individual Results of Panel ECM of Unemployment Rate Equation for 5 countries

Variable	Malaysia	Indonesia	Singapore	Philippine	Thailand
	Short run Coefficients				
ECM	-0.0853 (0.0841)	-0.0793 (0.0634)	-0.2288*** (0.1286)	-0.2471** (0.1159)	-0.5251* (0.1449)
$\Delta lnGDP$	-10.3313* (2.2452)	-3.8532 (4.0569)	-5.3932 (5.6435)	-1.2217 (6.3589)	-8.3759** (3.6159)
Constant	2.3974 (2.2900)	2.3052 (1.5836)	7.0195 (3.8443)	6.5826*** (3.3318)	11.5271* (3.3396)

*,**,*** significant at 1%,5% and 10%

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