

Achieving Regional Convergence through the Role of Foreign Direct Investment and Portfolio Investment: Evidence from ASEAN+3

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Received: 2018, March 6

Accepted: 2018, August 20

Abstract

The purpose of this study is to analyze the effect of foreign direct investment and portfolio investment on the convergence occurrence of economic growth of countries in the ASEAN + 3 region and to determine the time or speed required to achieve convergence. The type of data used in this research is secondary data panel which is combination between time series data and cross-section data with annual time period 2001-2015 and number of ASEAN member country that is Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam and plus three countries namely China, Korea and Japan. So the total observation is 195. The analytical method used is the Arellano Bond dynamic panel. The results of the study show that the first lag variable of economic growth, Foreign Direct Investment (FDI) and portfolio investment have a significant influence on economic growth in ASEAN + 3, but not on ASEAN without China, Japan, and Republic Korea. Foreign Direct Investment (FDI) has a greater influence on changes in economic growth than portfolio investment. Half-life conditional convergence shows a value of 10.63 years which means the time required achieving steady-state conditions of the convergence process or the time required to achieve half of the convergence at convergence rates reaches 0.065% / year. Meanwhile, the influence of portfolio investment provides a greater speed of adjustment to the convergence process than foreign direct investment, but in a half-life of convergence, foreign direct investment is faster than the influence of portfolio investment.

Keywords: Foreign Direct Investment, Portfolio Investment, Economic Growth, Convergence, Dynamic Panel.

JEL Classification: F23, F21, O40, O47, C51.

1. Introduction

The increasingly dynamic global economic development characterized

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by the faster of goods and services, capital, human and even information and technology mobility, give important implications in increasing economic growth throughout the country. Inter-country capital flows in the form of foreign direct investment and investment portfolios become the main source of a country's economic drive in filling the gap between saving and investment. While on the other hand, the dynamics of capital mobility, especially the investment portfolio also cause a risk of vulnerability to the occurrence of a financial crisis. When capital inflows are sufficiently massive and cannot be absorbed by the economy as a whole, it will have implications for the weakening of export competitiveness (Batiz and Batiz, 1985). Short-term foreign capital inflows such as portfolio investment are vulnerable to negative sentiments that trigger a massive and sudden reversal of capital and potentially raise pressure on macro stability and the complexity of monetary policy.

The study of De Vita and Kyaw (2009) mentions developing countries with a minimum level of development compared to middle and upper-income countries, foreign direct investment (FDI) and portfolio investment are crucial in boosting economic growth. Alvarado et al. (2017) see the effect of foreign direct investment (FDI) on economic growth in 19 Latin American countries using panel data showing that the impact of FDI on economic growth is statistically insignificant in aggregate form. This result varies through the incorporation of the development level achieved by countries in this region. FDI has a positive value and a significant effect on products in high-income countries, whereas among middle and upper-income countries the effects are uneven and insignificant. Then, the effect on low-income countries shows a negative influence and significant. Our results show that FDI is not an adequate mechanism to accelerate economic growth in Latin America except for high-income countries.

While Jawaid and Raza (2012) study examined the relationship between foreign direct investment and economic growth using seven years in 129 countries from 2003 to 2009. The results show a significant positive relationship between foreign direct investment and economic growth in all countries, as well as in high, middle and low-income countries. The analysis also shows that foreign direct investment contributes greatly to the growth of low-income countries compared to

middle-income and high-income countries. The result of unconditional convergence shows that convergence exists in all countries, low, middle and high income. The result of conditional convergence based on foreign direct investment shows that low and middle-income countries are increasingly mutual converging rapidly.

The convergence of economic growth as Solow's (1956), Baumol (1986) and Barro and Sala-i-Martin (1995) hypotheses are important factors in development wherein the long run not only achieve the same economic growth but also the same per capita income. So it is with conditional convergence that countries in a region will converge on a steady-state. Less developed countries are growing faster than developed countries, due to the phenomenon catch-up process. Barro (2000) mentions the absolute convergence of each country has the same characteristics except the capacity of capital owned. In terms of capital mobility, low capitalization compared with the labor force decreases the capital intensity for less developed countries. Because openness in the mobility of capital of developed countries provides benefits in the formation of capital that will provide stimulation of domestic savings and encourage convergence, this is when developing countries are ready in industrial development (Wahiba, 2015).

The convergence of economic growth is no exception to the integration between countries in the Association of Southeast Asian Nations (ASEAN) region where the role of capital mobility is a key component in promoting economic growth in each country. The ASEAN region, which has more than 1,600 economic zones in various types of industries and non-industries, makes the investment role especially FDI very important. As well as the rapid development of the financial sector, also attracted the entry of investment portfolios in the region. This is in line with the development direction of the ASEAN Community in 2020 which focuses on creating the mobility of goods and services, investment, and capital in promoting economic development, poverty reduction, and socio-economic disparity.

The purpose of this study is to analyze the effect of direct investment and portfolio investment on the convergence of economic growth of countries in the ASEAN + 3 region and to determine the time or speed required to achieve convergence.

2. Empirical Literature

Investment plays an important role in economic development in each country. There have been many studies analyzing the role of capital investment both Foreign Direct Investment (FDI) and Portfolio Investment on economic growth. But still few see the influence of both types of investment on the convergence of economic growth between countries in a region.

Several studies that specifically analyze the effect of FDI on growth are Neto and Veiga (2013) on the role of foreign direct investment in growth through technological diffusion and innovation. Using panel data covering 139 countries from the 1970-2009 period with standard growth regression methods and productivity growth to determine the direct and indirect effects on the role of catch-up technology. The results of the analysis found that both mechanisms have a positive effect on productivity growth and GDP growth that directly shows the influence of FDI through technological and investment diffusion.

Meurer (2016) examines the relationship between flows, GDP, and investment. The study results showed a strong relationship between Foreign Portfolio Investment (FPI) and the real effective exchange rate through the influence pathway in the real sector, namely changes in production costs. Similarly, expectations of economic agents influence the strong relationship between FPI and GDP.

Musibah et al. (2015) investigated the moderate role of political stability of Foreign Direct Investment (FDI) inflows into Yemen over the past two decades. Using the Augmented Dickey-Fuller (ADF) Test to check stationary data. After the ADF test, standard and hierarchical regression approaches were used for the analysis. Standard regression results show that GDP growth rates have a significant effect on FDI inflows to Yemen while the exchange rate, inflation rate, balance of payments, and gross national income have no effect on FDI inflows in the country. However, when the moderate variable, political stability is used along with other variables such as exchange rate, inflation rate, the balance of payments and gross national income, hierarchical regression results indicate that these variables are important determinants of the country's important FDI inflows. So the results show that political stability is crucial for Yemen's growth in the future of the economy.

Matallah and Ghazi (2015) examined the effect of globalization and

FDI on economic growth in 14 MENA countries during the period 1995-2011 using data panel analysis. The results of the study show that globalization and political stabilization provide a conducive climate for economic growth through easier investment policies and regulation of economic and political-institutional systems.

Sun's study (2011) is based on the basic theory and method of co-integration studies to see the relationship of foreign direct investment (FDI) with China's economic growth. Granger Causality Test results show that China's economic growth will increase due to an increase in FDI and have a long-term relationship between them seen from ECM estimates. Lamsiraroj and Ublusoglu (2015) try to examine the effects and advantages of foreign direct investment (FDI) on economic growth and this study explores the relationship of global FDI growth through an 'information' econometric analysis based on substantial guidance obtained from detailed investigations of 880 estimates reported in 108 published studies. This study attempted to use econometric analysis using global samples from 140 countries in the period 1970 to 2009. The analysis results confirm some previous empirical studies that FDI positively affects economic growth. In addition, the analysis also found that this relationship also applies globally to developing countries. The empirical studies of Curwin and Mahotga (2014) review the impact of the growth of Foreign Direct Investment (FDI). This study estimates the correct growth model for country-specific and periods of heterogeneity and endogeneity in FDI. The results show that FDI penetration reduces economic growth in the short and long term.

While some studies analyzing the effect of the investment portfolio on economic growth are Chaudhry et al. (2014) stated that FDI had a negative effect on Net Portfolio Investment in Pakistan during the period of 1981-2012. Waqas et al's study (2015) mentions a significant relationship between macroeconomic variables and investment portfolio volatility. Mentioned that the low volatility associated with high-interest rates, exchange rate depreciation, low inflation, FDI for the case of China, India, Pakistan, and Sri Lanka during the period 2000 to 2012. The same results with Baghebo and Apere's study (2014) long-term portfolio investment to the real gross domestic product in Nigeria. The result of Duasa and Kassim's (2009) study is that the Malaysian economy is influenced by Portfolio Investment by maintaining investor

trust. Bada's study (2016) mentions an increase in portfolio investment followed by massive capital outflows leading to a global recession. So that required regulation and infrastructure strengthening to increase investor trust.

Carbonell and Warner (2018) examined the effect of influence on economic growth in Spain during the period of 1984-2010. The study shows that Foreign Direct Investment (FDI) does not affect economic growth in Spain. This is due to the fact that FDI is a competitor for domestic investment where at the time FDI is financed by banks it will cause crowding out for domestic investment.

Wakyereza's study (2017) shows that FDI has a negative effect on both short and long term economic growth in Uganda. This is as in the Solow-Swan model regarding total factor productivity and absorption capacity is still low. The tourism sector is one of the sectors that attract FDI.

3. Methodology

3.1 Model Specification

The dynamic panel model in this study is Arellano Bond - Generalized Method of Moment (AB-GMM) to analyze the determinants of economic growth and calculate the convergence of beta economic growth that's influenced by Foreign Direct Investment (FDI) and Portfolio Investment. The beta convergence used is the conditional convergence of ASEAN + 3 countries. The following model specifications used for conditional convergence in this study were calculated using the following model specifications.

$$\Delta gdp_{i,t} = \beta \Delta gdp_{i,t-1} + \gamma \Delta fdi_{i,t} + \kappa \Delta portf_{i,t} + v_{i,t}$$

Where, $gdp_{i,t}$ is the economic growth of ASEAN + 3 countries, $fdi_{i,t}$ is Foreign Direct Investment (FDI), $portf_{i,t}$ is portfolio investment, while $gdp_{i,t-1}$ is the economic growth of the previous year.

The calculation of beta convergence yields two indicators, namely is the speed of economic growth convergence and the half-life test. The speed of economic growth convergence test to measure how fast the convergence of economic growth will be steady-state or to a balanced

line where economic growth between countries will have in common with each other.

$$\lambda = -\frac{\ln(\beta)}{T}$$

T is the time period.

Half-life (t^*) test indicating the time required to achieve steady-state conditions from the process of convergence of economic growth or the time required to achieve half of the economic growth convergence.

$$t = \frac{-\ln 0.5}{\ln(\beta)/T} = \frac{\ln 2}{\lambda}$$

If the null hypothesis is rejected ($\beta < 0$) it is concluded that countries with high economic growth will experience a decline and convergence in the same economic growth. If the value of beta approaches zero, then the process of convergence of economic growth will tend to be slow.

3.2 Data

The type of data used in this research is secondary data panel which is combination between time series data and cross-section data with annual period time 2001-2015 and number of member country of ASEAN that is Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam and plus three countries namely China, Korea and Japan. So the total observation is 195. The variable used is Gross Domestic Product (GDP) annual percentage growth rate at market prices based on constant 2010 U.S. dollars, Net Foreign Direct Investment (FDI) in current US \$, and Net Portfolio Investment (portf) in current US \$.

3.3 Method of Analysis

Panel data is a combination of time series data and cross-section data usage. The data panel to see the behavior of a number of individuals with different characteristics over a period. The dynamic panel regression model is a regression model by adding the time lag of the dependent variable as an independent variable. Dynamic panel data models, in general, are as follows.

$$y_{i,t} = \delta y_{i,t-1} + x'_{i,t} \beta + u_{i,t}$$

$$i = 1, 2, \dots, N ; t = 1, 2, \dots, t$$

$u_{i,t}$ is a one-way error component and assumed $\lambda_i \in IIDN(0, \sigma_\lambda^2)$.

In dynamic models, y_i is a function of λ_i then $y_{i,t-1}$ is also a function of λ_i . Because λ_i is a function of $u_{i,t}$ then there will be a correlation between regressor variables $y_{i,t-1}$ and $u_{i,t}$, this will cause least square estimators to be biased and inconsistent, even if not correlated serially. This means that the use of static panel estimation methods such as OLS in dynamic panel equations models will be biased and inconsistent (Baltagi, 2005). Similarly, to eliminate the individual effects, the transformation is done in the form of first difference. To overcome the bias and inconsistency of least square estimators, according to Anderson and Hsiao (1982) can be used Instrumental Variable (IV) estimation method, ie by instrumenting variables that correlate with error. The Anderson and Hsiao methods then developed by Arellano and Bond (Arellano and Bond Generalized Methods of Moments Estimator) and resulted in unbiased, consistent and efficient estimates. Excess GMM is first, GMM is common estimator and provides a more useful framework for comparison and assessment. Secondly, GMM provides a simple alternative to other estimators, especially with maximum likelihood. Generalized Method of moment (GMM) is an extension of the moment method. GMM equates the condition moment of the population and the condition moment of the sample.

4. Result of Analysis

ASEAN is one of the areas of economic integration in Asia that has the potential of economic resources in creating economic growth in Asia. In macroeconomics, ASEAN succeeds to bring GDP growth at 5.3 percent since 2006, while inflation was at a moderate level of 4.3 percent. After the 2008 global financial crisis, countries in the ASEAN region, growing steadily compared with the developed countries that experienced a crisis.

The growth of this region can't be separated from foreign direct

investment (FDI) which has grown four times in the last decade from the US \$ 266 billion in 2000 to the US \$ 1.1 trillion in 2011. In the same year, total trade reached the US \$ 2.4 trillion and grew an average of 16.8 percent. The positive trend of investment in ASEAN attracted the attention of UNCTAD by determining the investment rank of Indonesia, Thailand, Viet Nam, and Malaysia in the top 20 economic goals 2012-2014. In addition, the Global Competitiveness Index 2012-2013, set Singapore as the country with the second-highest competitiveness, while the Philippines ranked tenth, Thailand to 38 and Brunei in the 28th position. The Philippines and Indonesia are also predicted to rank 16th and 17th largest countries in the world by 2025 based on per capita income, regulation, education, and demographic changes. Malaysia, Thailand, Viet Nam, and Singapore are among the 50 countries that are predicted to rule the world

([http:// http://investasean.asean.org](http://investasean.asean.org)).

The highest development of FDI inflows in the ASEAN region is Singapore. Singapore is one of the ASEAN countries which has a fairly rapid economic development. This is indicated by the rapid growth of the city and has become an industrial area that has high competitiveness with other developed countries. While the good looks are for developing countries such as Cambodia, Viet Nam and Lao PDR which also have relatively moderate FDI growth. This is an opportunity for developing countries to improve their economic performance through foreign investment. While other countries in ASEAN showed a pattern that has a difference not too large including three other major countries namely China, Japan, and Korea.

As for the largest FDI outflow capital is Singapore, followed by Malaysia and the Philippines. While some other countries have small differences and a percentage of less than 5%. Short-term foreign capital inflows such as portfolio investment are vulnerable to negative sentiments that trigger large and sudden reversal capital and potentially put pressure on macro stability. So is the case with FDI, although it is long term compared to the portfolio investment, then maintaining the trust and macroeconomic stability becomes very important in the sustainability of the investment.

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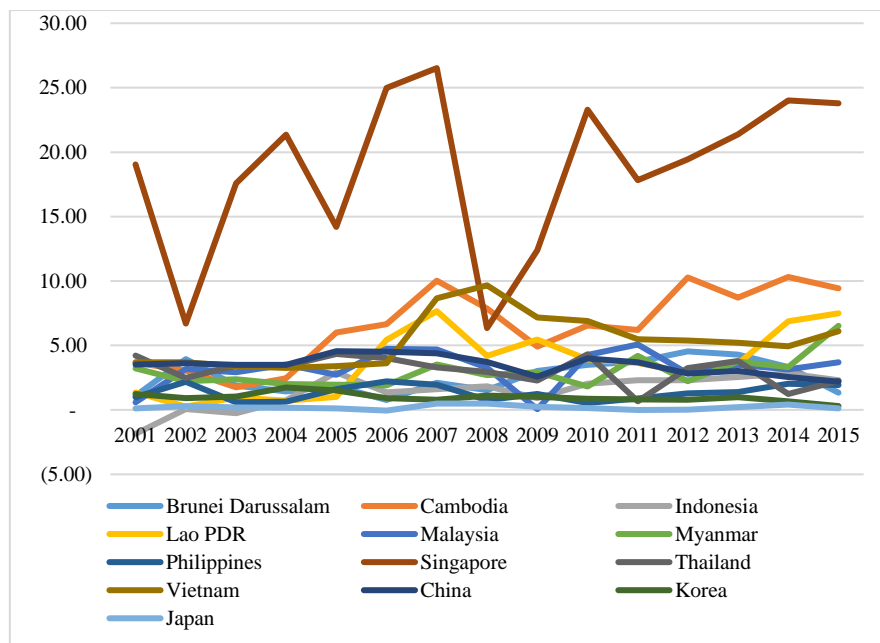


Figure 1: Net Inflow Foreign Direct Investment (% of GDP)

Source: <http://worldbank.org>

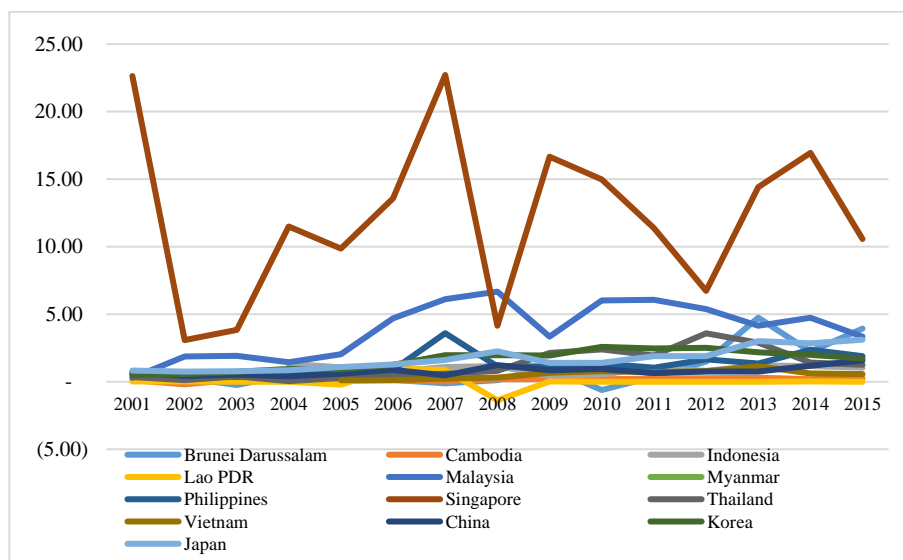


Figure 2: Net Outflow Foreign Direct Investment (% of GDP)

Source: <http://worldbank.org>

Intra-ASEAN investment increased by 2015 to 22,232.2 US \$ Million from 22,134.5 US \$ Million, with the largest total investment coming from Singapore which is 61,284.8 US \$ Million with a smaller

intra-ASEAN share of 5.6% from extra-ASEAN that is 94.4 %. The increase in intra-ASEAN investment was boosted by an increase in manufacturing and financial investment.

Table 1: Net Inflow Foreign Direct Investment, Intra and Extra ASEAN

Country	Net Inflow FDI (US\$ Million), 2015			Share to Total Net Inflow (%), 2015		
	Intra-ASEAN	Extra-ASEAN	Total Net Inflow	Intra-ASEAN	Extra-ASEAN	Total Net Inflow
Brunei Darussalam	86.7	84.7	171.3	50.6	49.4	100.0
Cambodia	425.4	1,275.6	1,701.0	25.0	75.0	100.0
Indonesia	9,499.0	7,417.8	16,916.8	56.2	43.8	100.0
Lao PDR	221.8	857.3	1,079.2	20.6	79.4	100.0
Malaysia	2,719.0	8,570.6	11,289.6	24.1	75.9	100.0
Myanmar	2,230.6	593.8	2,824.5	79.0	21.0	100.0
Philippines	66.2	5,658.0	5,724.2	1.2	98.8	100.0
Singapore	3,416.3	57,868.5	61,284.8	5.6	94.4	100.0
Thailand	1,413.7	6,613.8	8,027.5	17.6	82.4	100.0
Viet Nam	2,153.5	9,646.5	11,800.0	18.2	81.8	100.0
Total	2,232.2	8,586.6	20,818.8	18.4	81.6	100.0

Source: ASEAN Foreign Direct Investment Statistics Database; <http://aseanstats.org>

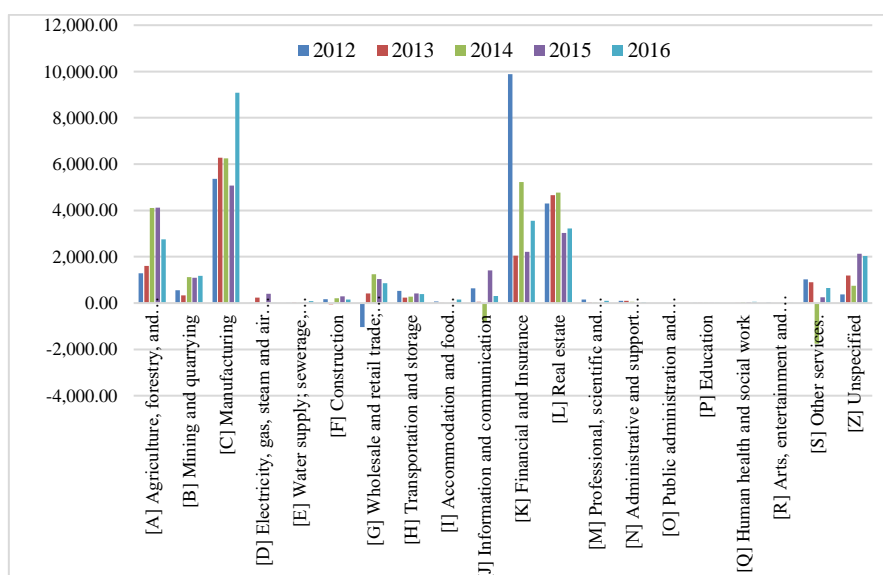


Figure 3: Flow of Foreign Direct Investment to ASEAN by Sector (Million US\$)

Source: ASEAN Foreign Direct Investment Statistics Database; <http://aseanstats.org>

FDI flows of ASEAN countries are concentrated in the manufacturing and financial sectors which have an upward trend compared to other economic sectors. Like for example a Japanese

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company that has invested heavily in the manufacturing sector from \$ 7.9 billion in 2015 to \$ 23.8 billion by 2016, as well as many Korean investments in Viet Nam. While China is concentrated in financial, electricity, manufacturing and real estate investment (ASEAN, 2017).

Intra-ASEAN investment is mostly concentrated in agriculture and mining. Companies in ASEAN became the largest real estate investors that described the high demand for real estate in the ASEAN region. In the manufacturing sector, ASEAN became the second-largest investor after Japan.

Capital inflows have increased, but for those sourced from certain countries have decreased. FDI of the European Union (EU) rose 46 percent to \$ 30.5 billion, while China rose 44 percent to \$ 9.2 billion, Republic of Korea rose 3 percent to \$ 6.0 billion, Australia rose 77 percent to \$ 3.4 billion. FDI from the EU comes from several countries namely Netherlands, Ireland, Luxembourg, Denmark, Spain, and France.

Table 2: Top Ten Sources of Foreign Direct Investment Inflows in ASEAN

Country/region	Value		
	2013	2014	2015
ASEAN	19,562.2	22,134.5	22,232.2
European Union (EU)	24,511.3	24,989.9	20,127.6
Japan	24,750.2	15,705.4	17,559.4
USA	7,157.2	14,748.5	13,646.0
China	6,426.2	6,990.1	8,256.5
Republic of Korea	4,303.3	5,750.7	5,710.4
Australia	2,587.7	6,281.5	5,246.7
Hong Kong	5,251.2	9,813.2	4,542.9
Taiwan, Province of China	1,381.8	3,253.9	2,807.0
New Zealand	335.9	550.0	2,241.2
Total top ten sources	96,267.1	110,217.7	102,370.0

Source: ASEAN Foreign Direct Investment Statistics Database; <http://aseanstats.org>

Figure 4 shows the dynamic trend of portfolio investment in ASEAN + 3, indicating that Singapore has the largest portfolio investment compared to other countries and is followed by Japan. This is because Singapore and Japan as developed countries have a deepening of the established financial sector with high capital mobility. After the 2008

financial crisis, the biggest positive net portfolio investment was Brunei Darussalam, Singapore, and followed by Japan. The interesting point is the trend of investment development in developing countries such as Cambodia and Brunei Darussalam compared to other countries in ASEAN such as Indonesia, Philippines, and even China which have a tendency for greater capital outflows.

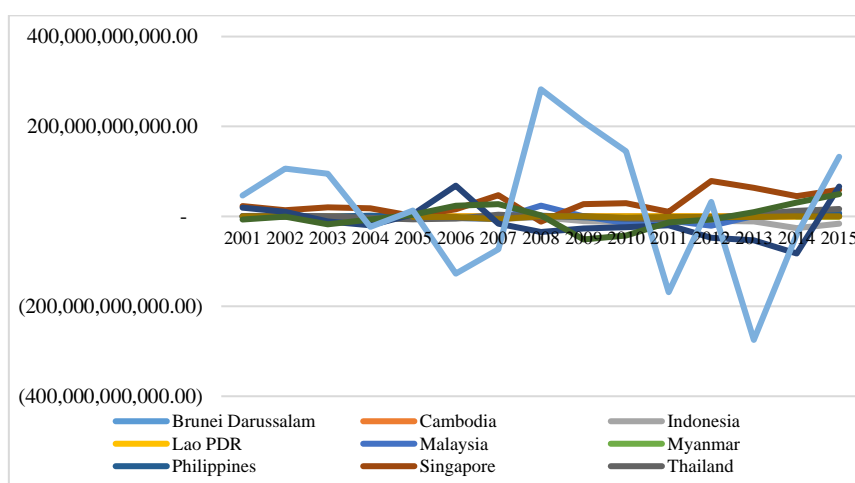


Figure 4: Net Portfolio Investment (BoP, Current US\$)

Source: <http://worldbank.org>

Estimation result of ASEAN + 3 countries by using GMM Arellano-Bond two-step estimator shows parameter significance with *p-value* value of 0.000 influence of first lag variable of economic growth with FDI and portfolio investment. The dynamic panel model with the Arellano-Bond GMM approach has met the statistical criteria of the best models consistent and the instrument variables used are valid which is indicated by the J-Statistic value of 10.982 which means not reject the null hypothesis. While for a residual diagnostic test of Arellano-Bond (AB) on m-stat shows *p-value* of 0.031 or not reject the null hypothesis at $\alpha=1\%$. Thus, the estimate can be said to be consistent and there is no autocorrelation in error first difference of the first-order.

Table 3: Estimated Beta Convergence Result of Economic Growth in ASEAN + 3

Dependent Variable : D(GDP)		
Independent Variable	Coefficient	t-Statistic (Probability Value)
D(GDP)(-1)	-0.376	-13.899 (0.000)

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D(fdi)	-1.96.10 ⁻¹¹	-6.248 (0.000)
D(portf)	-1.60.10 ⁻¹²	-2.405 (0.017)

J-Statistic = 10.982; Prob.-value = 0.277

Uji Arrelano-Bond : AR (1) m-stat = -2.154; Prob.-value = 0.031

Speed of Adjustment λ (%/year) = 0.065

Half-life (year) =10.63

Source: Secondary data is processed, 2017.

While the half-life value for the conditional beta convergence model shows a value of 10.63 years which means the time required to achieve steady-state conditions of the convergence process or the time required to achieve half of the convergence at convergence rates reaches 0.065% /year. Convergence shows the differential of economic growth is getting smaller with the convergence trajectory which is also increasingly closer together during the study period towards long-term balance.

Table 4: Estimated Beta Convergence Result of Economic Growth in ASEAN
Dependent Variable : D(GDP)

Independent Variable	Model 1		Model 2		Model 3	
	Coefficient	t-Statistic (Probability Value)	Coefficient	t-Statistic (Probability Value)	Coefficient	t-Statistic (Probability Value)
D(GDP)(-1)	-0.274	-5.090(0.000)	-0.298	-35.210(0.000)	-0.351	-478.933(0.000)
D(fdi)	-2.13.10 ⁻¹⁰	-1.356(0.178)	-1.97.10 ⁻¹⁰	-53.530(0.000)	-	-
D(portf)	1.36.10 ⁻¹¹	0.109(0.913)	-	-	-4.65.10 ⁻¹²	-2.479(0.015)
Speed of Adjustment λ (%/year)		0.086		0.081		0.070
Half-life (year)		8.03		8.59		9.93

Source: Secondary data is processed, 2017.

When compared to the results of the ASEAN countries' estimates without involving China, Japan, and Korea in the sample, the estimation results using the Arellano-Bond GMM two-step estimator shows different things when using all ASEAN + 3 countries. Estimation results show that the significance of the parameter with a *p-value* of 0.000 is only the first lag variable of economic growth, but not for the FDI and investment portfolio variables. This shows that the convergence of economic growth among ASEAN countries is still not optimal, compared with the presence of three countries, namely China, Japan, and Korea.

This is because the three countries are the largest countries that invest capital in the ASEAN region. However, if separately variable FDI and portfolio investment also significantly affect economic growth. The main factors in increasing intraregional investment are the growing strength of finance and increasing internationalization in building competitiveness and access to markets, natural resources, and asset strategies.

The speed of adjustment of ASEAN + 3 countries is faster than ASEAN. Half-life convergence in achieving steady-state in ASEAN is faster 8.03 years compared to in ASEAN + 3 countries which are 10.63 years. Meanwhile, the pace of adjustment towards convergence with the influence of portfolio investment was faster than that of foreign direct investment, but the half-life needed to achieve half of the convergence was much longer at 9.93 years while for foreign direct investment 8.59 years with a difference of 1.34 years. Likewise, capital flows that are long-term influence changes in economic of growth that are greater than short-term investments. Short-term foreign capital inflows, such as portfolio investment, are vulnerable to negative sentiments that trigger large and sudden reversal capital and potentially create pressure on macro stability.

5. Conclusion

- 1) Convergence shows the differential of economic growth is getting smaller with the convergence trajectory which is also increasingly closer together during the period of study towards long-term equilibrium.
- 2) The first lag variable of economic growth, Foreign Direct Investment (FDI) and investment portfolio have a significant influence on economic growth in ASEAN + 3, but not in ASEAN without China, Japan, and Republic Korea. The main factors in increasing intraregional investment are the growing strength of finance and increasing internationalization in building competitiveness and access to markets, natural resources, and asset strategies.
- 3) Half-life conditional convergence shows a value of 10.63 years, which means the time, required achieving steady-state conditions of the convergence process or the time required to achieve half of the convergence at convergence rates reaches 0.065% / year.

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