

## Does Investment Inflows Matter for Country's Economic Performance? Evidence from Static Panel Data

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**Abstract:** Macroeconomic objective for every country is to achieve ideal economic performance and it can be measured by analyzing growth of Gross Domestic Product (GDP). The aim of this empirical article is to explore the factors that determine GDP in ASEAN-5 countries over a period of 1998 to 2018 using static panel data analysis. Pooled Ordinary Least Square, Random Effect and Fixed Effect models were regress and result shows that Fixed Effect model is the most appropriate model to estimate factors determine GDP in ASEAN-5 countries. The results demonstrate that foreign direct investment (FDI) and labour productivity are the most significant variables; while trade openness, inflation rate, and population growth have no significant effect on GDP for ASEAN-5 countries. This article is significant because it contributes to the literature on factors influences GDP by encompassing the scope of previous studies.

**Key words:** *foreign direct investment, gross domestic product, labour productivity, population growth, panel data analysis, ASEAN-5*

### INTRODUCTION

ASEAN is an acronym for The Association of Southeast Asian Nations, a regional corporation of ten most inclusive emerging and developing Asian countries with each distinguished by a significant influence in global economy. It consists of Malaysia, Indonesia, Thailand, Philippines, Vietnam, Cambodia, Myanmar, Laos, Singapore and Brunei Darussalam. ASEAN has applicable policies to promote the flow of FDI into their respective countries, especially to sectors with multiple investments. Strong investments inflows on manufacturing, services and infrastructure industries were came from China, the Netherlands, Germany, Switzerland and Australia. In 2017, the ASEAN countries attracted 20 percent of the global FDI and contributed 25 percent of global GDP. If ASEAN is form as a single country, it would be the third largest market in the world behind India and China with 630 million of population [1]. FDI flows to ASEAN rose from USD 123 billion in 2016 to USD137 billion in 2017 with a rise in investments in five member states

namely Indonesia, Thailand, Philippines, Singapore and Malaysia.

This ASEAN-5 countries share several common features. First, these five member states are working together to form the ASEAN Exchanges that aims to promote ASEAN capital markets and to offer more opportunities to investors in the region. Second, these countries have relatively huge amount of young populations as compared to other developed countries and its labour market is evolving towards more mobility for skilled professionals in the region. On the other indicator, combined FDI inflows to the four CLMV countries (Cambodia, Laos, Myanmar and Vietnam) grasped a greatest level in 2017, increasing by 21 per cent to USD23 billion, accounting for 17 per cent of total FDI flows in ASEAN. Vietnam was the third largest recipient within ASEAN behind Indonesia and Singapore. This hike contributed by these region rapidly growing industry clusters include health care, research and development (R&D) activities, e-commerce, automotive and the electronics. For

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example, Apple from United States established its first Indonesian R&D facility, Denka from Japan operate a chemical R&D operation in Singapore, Dyson from United Kingdom developed a technology centre in Singapore, Nissan from Japan developed R&D facility in Thailand, Osram Opto Semiconductor from Germany an R&D operation in Malaysia and Samsung from Republic of Korea developed an R&D centre for mobile phones in Vietnam [1].

This article intends to provide significant insights and to answer the question, ‘What are the features that influence GDP in ASEAN countries?’. Given the different performance level of each countries, this empirical analysis will cover three different model in order to determine the best fitted model by using static panel data. The article contributes to the literature concerning the factors influence GDP by extending the scope of former studies, many of which focused on ASEAN. The results of this article can provide framework to policy makers of other developing countries that would like to increase its national income.

### LITERATURE REVIEWS

A huge amount of empirical studies was done to explore the determinants of GDP to countries. Studies on multiple countries frequently employed panel data analysis while time series analysis were often been used to study a single country. However, the choice of dependent and independent variables was varied depending on the countries observed. As for dependent variable, [2] [3] and [4] used the total GDP growth to represent changes in countries’ output [5] [6]. Other dependent variables often used include GDP and GDP per capita to represent market size.

Macroeconomic variables have been used consistently as independent variables. For instance, many empirical studies used, trade openness, inflation, corruption to capture political aspect, technology gap, number of populations, and labour productivity. FDI inflows to the recipient country is the most common variable for represent investment inflow. [7] prolong the finding of [8] by using FDI stocks as the independent variable and employed gravity equation to estimate bilateral FDI stocks. FDI is one of growth accelerating indicator that benefits any economy in terms of improvement in technology, skilled labour and transferring knowledge to the host country.

Trade openness (XM) means that trade barrier has been relaxed by the host country and it is an opportunity for investors to fully utilized the comparative advantage. Studies done by [9] and [10]

found a significant positive impact of trade openness and GDP.

Labour productivity (LP) represent the labour efficiency in the economy and it is a significant indicator to attract foreign investors to the host country [11]. Minimizing cost of production is one of the important indicators to answer basic economic problems: How to produce? Thus, inflation rate (INF) always been chosen as a proxy for cost of production as it shows the fluctuation of the price level in host country [12]. Population growth (PG) might influence GDP in several aspect such as average propensity to consume and stock of human capital. In this study, relationship between population growth and GDP aspects to be positive [12].

### METHODOLOGY

Data used in this article were obtained from the World Bank databases to analyse factors influence GDP in ASEAN-5 countries for the twenty-year period 1998-2018. Stata software were used to analyze data. Dependent variable is GDP (expressed in US dollar) and Net FDI inflow expressed in US dollar as represented by LFDI and this value was transformed into logarithm value to allow comparability with other variables. As mentioned in [1] factors influence GDP in ASEAN countries was FDI (proxy for investment inflows), labour productivity, trade openness, inflation rate (proxy for cost of production) and population growth (proxy for population density). GDP reflects the economic conditions and it gives positive impact to FDI as it reflects potential of the host country as validated by [9].

Table 1: Variables with its symbol and definition.

Symbol	Variable	Definition
<b>GDP</b>	Gross domestic product	Annual GDP
<b>FDI</b>	Foreign direct investment inflow	Annual amount of FDI
<b>LP</b>	Labour productivity	Annual growth of labour productivity
<b>XM</b>	trade openness	Annual amount of net export over import
<b>PG</b>	population growth	Annual amount of population growth
<b>INF</b>	Inflation rate	Annual amount of inflation rate

From Table 1, FDI expected to give positive impact to GDP as technology transfer earns from investment inflow can increase national output tremendously [2][3][4]. Labour productivity (LP) is expected to provide positive impact to GDP because it can increase number of outputs more than input used [11]. Trade openness (XM) is an indicator to measure country willingness to adapt technology from other country and enhance specialization which is a tool for a long run economic growth [6]. A country with high population growth (PG) means country has a greater market size that will influence consumption and economic growth as stated by [12]. Inflation rate (INF) always been used as an indicator to measure cost of production and it will provide negative impact to economic growth [12].

The model specification for this article is as follows:

$$GDP_{i,t} = \alpha + \beta_0 + \beta_1 FDI_{i,t} + \beta_2 LP_{i,t} + \beta_3 XM_{i,t} + \beta_4 PG_{i,t} + \beta_5 INF_{i,t} + \varepsilon_{i,t}$$

*i* represents the *i*th country and *t* represents the year. This article employed traditional panel data technique which is static panel data. Static panel data analysis studies time series and cross-sectional data at once. There are three types approaches for static panel data models variation which are pooled OLS, random and fixed effect model.

Pooled model uses all variation in the data. It assumes that both the intercept and the slope are the same across units and time and it might provide results with heterogeneity bias. In the random effect model, the error term  $\varepsilon_{it}$  is serially correlated within a unit and  $\lambda_i$  are drawn independently from probability distribution. This is because all observations within a unit have a common component  $\lambda_i$  and its error term become  $\varepsilon_{it} = \lambda_i + \mu_{it}$ . Meanwhile for fixed effect model,  $\lambda_i$  is treat as a constant/ fixed for each individual. It means, individual specific effects are assumed to be individual specific intercepts, or more crucially when  $Cov(\lambda_i, x_{it}) \neq 0$ . In the fixed effect model, some unobservable variables are correlated with the independent variables. Thus, each equation will be as follow:

Pooled OLS:

$$GDP_{i,t} = \alpha + \beta_0 + \beta_1 FDI_{i,t} + \beta_2 LP_{i,t} + \beta_3 XM_{i,t} + \beta_4 PG_{i,t} + \beta_5 INF_{i,t} + \varepsilon_{i,t}$$

Random effect model:

$$GDP_{i,t} = \alpha + \beta_0 + \beta_1 FDI_{i,t} + \beta_2 LP_{i,t} + \beta_3 XM_{i,t} + \beta_4 PG_{i,t} + \beta_5 INF_{i,t} + \lambda_{i,t} + \mu_{i,t}$$

Fixed effect model:

$$GDP_{i,t} = (\alpha + \lambda_{i,t}) + \beta_0 + \beta_1 FDI_{i,t} + \beta_2 LP_{i,t} + \beta_3 XM_{i,t} + \beta_4 PG_{i,t} + \beta_5 INF_{i,t} + \mu_{i,t}$$

Breusch-Pagan test was conducted to differentiate between pooled model and random effect model. The hypotheses for the test are as follow:

$$H_0: \sigma_1^2 = 0 \text{ (Pooled OLS – Homogeneity)}$$

$$H_1: \sigma_1^2 > 0 \text{ (Random effects – Heterogeneity)}$$

If p-value from Breusch-Pagan test is less than 0.05, reject  $H_0$  at 5 percent significance level, thus, random effect is preferable or there is a heterogeneity in the data sets.

Then, Hausman test were carried out to determine the appropriate specification either random effect or fixed effect in estimating the model.

$$H_0: Cov(\lambda_i, x_{it}) = 0 \text{ (no correlation between } \lambda_i \text{ \& } x_{it}\text{); support random effect}$$

$$H_1: Cov(\lambda_i, x_{it}) \neq 0 \text{ (correlation between } \lambda_i \text{ \& } x_{it}\text{); support fixed effect}$$

If the Chi-square test of Hausman is greater than the critical value or p-value from test is less than 0.05, reject  $H_0$  at 5 percent significance level, thus, fixed effect is preferable than random effect and implies there is a correlation between  $\lambda_i$  and  $x_{it}$ .

After obtaining, the best fitted model, diagnostic tests need to be performed to ensure the model is free from multicollinearity, heteroscedasticity, serial correlation and outlier problems. Tests that need to be conduct is as follows:

Table 2: Diagnostic tests

Econometric problem	Diagnostic test
Multicollinearity	Variance inflation factor (vif.)
Heteroscedasticity	Wald test
Serial Correlation	Woolridge serial correlation test
Outlier	Cook's distance test

## RESULTS AND DISCUSSION

The descriptive statistics for ASEAN-5 were present in Table 3. From observation, GDP in ASEAN-5 countries ranged from USD72.20 billion to USD 1040 billion from 1998 to 2018. FDI inflow to ASEAN-5 ranged from USD-4.55 billion to USD94.80 billion between 1998 and 2018, with an average of USD13.60 billion and a standard deviation of USD9 billion. For other significant descriptive statistic can be seen in Table 3.

Table 4 shows estimation results of five different models. Five different models were regressed to choose the best fitted model that can be used to estimate factors influence GDP in ASEAN-5 countries. From Breusch-Pagan test, the p-value is less than 0.05, thus random effect model is more appropriate than pooled OLS model. Next, Hausman test that is commonly used in applied panel data is conducted to determine which model is appropriate: random effect or fixed effect.

The p-value of the Chi-square value from the Hausman test for random effect were less than 0.05. Thus, fixed effect model specification was employed to estimate the panel model. Table 4 represent a summary of the results.

The best appropriate estimation model is identified as fixed effect model (Model 3). However, the results in Table 4 indicate that the model has heteroscedasticity and serial correlation problems. To rectify the model specification, this article based on cluster() command since it could rectify both problems as suggest by [13] from Stata Journal. Fixed effect estimation result using the cluster() command represent by Model 4. Model 5 shows result that exclude the outliers from the estimation and by comparing the fixed effect result that with outliers (Model 4), LFDI and LLP are statistically significant determinants of LGDP. It specifies that foreign direct investment inflows and labour productivity are the most important variables influencing GDP in ASEAN-5 countries. This finding is similar with finding by [2][3][4] where FDI inflows will provide benefits to host country in terms of technology, knowledge and capital transfer thus stimulate production process. The coefficient of LFDI is positive postulates that USD1 billion increase in FDI will increase GDP to USD 1.13 billion.

Labour productivity shows that technological development allows country to use less input but producing more physical output. The coefficient of LLP is positive suggests that 1 percent increase in labour productivity will increase GDP by 16.29 percent. Other three independent variables show insignificant results in influencing GDP and it shows positive impact for inflation rate and negative impact by trade openness and population growth.

### CONCLUSIONS

Based on observation, fixed effect model is the most appropriate estimation model to determine factors influencing GDP in five ASEAN countries; Malaysia, Thailand, Indonesia, Singapore and Philippines. Foreign direct investment, inflation rate, trade openness, labour productivity and population growth provide different level of significant in different type of model namely pooled OLS, random effect and fixed effect model. In fixed effect model without outliers the most influential role in determining GDP are FDI and labour productivity. Thus, in achieving a sustain increase in FDI inflows, the government of each ASEAN-5 need to guarantee that their countries persistently being attractive for investment. This implies that in each country must develop attractive policies and investment incentive. Other insignificant factors such as trade openness and population growth shall be considered because it provides negative impact on GDP. Population growth by means of labour supply is one of important aspects to influence FDI, at the same time it provides a high amount of consumption to promise a bigger market size. Uncontrol amount of population growth will bring to high dependency to public expenditure. Thus, family planning should be included in government policy to sustain increasing in GDP in the future.

Table 3: Descriptive statistics for ASEAN 5

Variable	GDP	FDI	INF	XM	LP	PG
Mean	285.00	13.6000	4.06	97.18	46008.66	1.48
Standard deviation	225.00	19	6.28	12.93	43606.51	0.83
Minimum	72.20	-4.5500	-0.90	62.00	11128.88	-1.47
Maximum	1040.00	94.8000	58.45	132.90	152417.9	5.32

Note: List of countries used in this descriptive analysis: Malaysia, Singapore, Indonesia, Thailand, and Philippines.

Table 4: Results of panel data analysis  
Dependent variable: LGDP

	<b>Model 1: Pooled OLS</b>	<b>Model 2: Random Effect</b>	<b>Model 3: Fixed Effect</b>	<b>Model 4: Rectify the problem</b>	<b>Model 5: Fixed Effect Model Without Outliers</b>
Constant	15.24*** (2.099)	15.24*** (2.099)	-5.088** (2.207)	-5.088 (4.140)	-3.790 (2.492)
LFDI	0.301*** (0.0604)	0.301*** (0.0604)	0.0673*** (0.0247)	0.0673* (0.0272)	0.120*** (0.0340)
LINF	0.164** (0.0666)	0.164** (0.0666)	0.0252 (0.0241)	0.0252* (0.0110)	0.0287 (0.0278)
LXM	1.270*** (0.409)	1.270*** (0.409)	-0.0701 (0.255)	-0.0701 (0.415)	-0.349 (0.274)
LLP	-0.170 (0.109)	-0.170 (0.109)	2.903*** (0.168)	2.903*** (0.308)	2.791*** (0.203)
LPG	-0.330*** (0.102)	-0.330*** (0.102)	-0.0213 (0.0473)	-0.0213 (0.0215)	-0.0206 (0.0737)
Breusch-Pagan LM test	-	0.000 (1.000)	-	-	-
Hausman test	-	-	338.27 (0.000)***	-	-
Observations	93	93	93	93	87
Multicollinearity (vif)	-	-	1.73	-	-
Heteroskedasticity ( $\chi^2$ -stat)	-	-	32.53 (0.000)***	-	-
Serial correlation (F-Stat)	-	-	258.434 (0.001)***	-	-
R-squared	0.492	-	0.905	0.905	0.910

1. Figures in the parentheses are t-statistics, except for Breusch-Pagan LM test, Hausman test, Heteroskedasticity and Serial correlation tests, which are p-values.
2. \*\*\*, \*\* and \* indicate the respective 1%, 5% and 10% significance levels, respectively.

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