International Journal of Economic Literature (INJOLE) e-ISSN: 3026-0221
Vol. 2 No. 2 February 2024, page., 493-504

FACTORS AFFECTING PHYSICAL INVESTMENT IN ASEAN COUNTRIES

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Abstract

This study aims to analyze the effect of economic growth, labor force, interest rate, tax revenue, trade, and industrial value added on gross fixed capital formation / PMTB in ASEAN countries with a panel data approach. The methodology used in this study is panel data regression with Fixed Effect Model approach. The data used in this study are from 2001 to 2021 in 5 ASEAN countries. The results of this study show that labor force, trade value and industrial value added have a positive influence on gross fixed capital formation, while economic growth, interest rate and tax revenue have a negative influence on gross fixed capital formation. The implication of this research is that ASEAN countries must increase the competitiveness of industrial products to increase capital inflow in the ASEAN Region.

Keywords: Gross Fixed Capital Formation, Fixed Effect Model, ASEAN.

INTRODUCTION

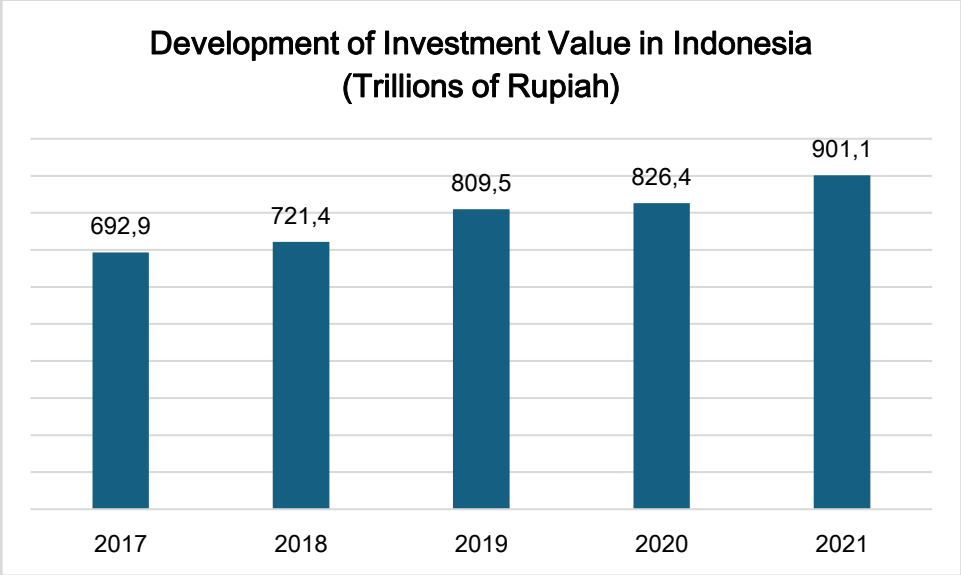
Understanding investment according to Samuelson and Nordhaus (2009), investment is an important thing in building the economy because it is needed as a supporting factor in improving the production process. Investment is defined as goods purchased by individuals or companies to increase their capital stock (Mankiw, 2013), while according to Todaro &; Smith (2020), investment is a resource used to increase income and consumption for the future.

Investment is defined as an investment activity in various economic activities (production) with the hope of obtaining benefits (benefits) in the future. In principle, investments are distinguished according to "financial investment" and "nonfinancial investment". Financial investment is more aimed at investment in the form of ownership of financial instruments such as cash, savings, deposits, capital and participation, securities, bonds and the like while non-financial investment is realized in the form of physical investment (real investment) in the form of "capital" or capital goods, including inventory (inventory). Nevertheless, financial investments in time can also be realized into physical investments.

Capital is defined as various forms of capital goods such as buildings, machinery, and equipment, means or means of transportation, and other capital goods that contribute to the sustainability of the production process in an economy. Capital goods that become inputs in the production process will be used continuously, which is calculated to be used up in more than one year. However, this concept does not apply to capital goods that have a relatively small value / cheap but have a service life of more

than one year, such as stationery, calculators, tableware, hoes and sickles, and so on. Expenditure on these goods is considered as intermediate consumption that will be used up in the production process.

Another terminology of capital used in SNA 2008 is gross fixed capital formation (GFCF). The concept of PMTB is identical to the amount of physical investment (real investment) realized in a country / region at a certain time (physical domestic investment). Furthermore, this study will focus more on the gross fixed capital formation (PMTB) component. The Indonesian government pays very serious attention to investment as one of the backbones of the economy in encouraging economic growth.



Source: Investment Coordinating Board (BKPM) 2022

Figure 1. Development of Investment Value in Indonesia

During the 2017-2021 period, investment realization in Indonesia has increased every year with an average increase of 6.91%. Based on data from the Investment Coordinating Board (BKPM), Indonesia's investment realization in 2017 amounted to Rp692.9 trillion. Then in the following years the value continued to rise as shown in the chart, reaching IDR 901.1 trillion in 2021. Investment realization in 2021 increased 9% (*year-on-year* / yoy) compared to 2020 which was valued at IDR 826.4 trillion.

The acceleration of Indonesia's economic development is strongly influenced by investment which serves as an economic driving force. Developing countries often face capital constraints (*saving-investment gap*) so that investment cannot be spurred quickly. In addition, limited capital is covered by debt or foreign investment, thus burdening the state budget, and reducing allocations for other interests. As a result, Foreign Direct Investment (FDI) has become an alternative debt subsidy. This paper aims to analyze the effect of economic growth, labor force, interest rate, tax revenue,

trade, and industrial value added on gross fixed capital formation / PMTB in Indonesia with a panel data approach in several ASEAN countries.

Classical investment theory pays attention to macroeconomic factors that affect investment, such as inflation and interest rates. According to Keynes, the amount of investment does not only depend on return or one factor, but also on the cost of capital or interest rate. Investments will be said to be profitable to the point where the value of the MEC at the cost of capital is at the same level (Gordon, 1990). In addition to the interest rate, the factors influencing corporate investment decisions based on Keynes's investment theory are the rate of economic growth. While Intriligator, et al. (1996) that the variables that affect investment are national income, capital stock, and interest rate.

Research conducted by Ullah & Khan (2017) shows that real GDP, domestic investment, and economic freedom index have a positive and significant effect on FDI inflows in the SAARC region. Another study conducted by Podrecca & Carmeci (2001) and Kumari, et al. (2023) states that the causality between investment and economic growth goes both ways. Investment causes economic growth rates and economic growth rates lead to investment. Research by Asiamah, et al. (2019) shows that gross domestic income has a positive influence on investment in Ghana.

Research conducted by Were (2015) shows that trade is the main determinant of foreign direct investment (FDI) in all groups of countries including developing countries, as well as domestic investment in developing countries and developing countries. Research conducted by Asiedu (2002) states that openness to trade encourages foreign investment into SSA and non-SSA countries. Research conducted by Bokpin, et al. (2017) shows that the impact of trade or the formation of regional blocs, natural resources in their combined form affect FDI in Africa.

Research conducted by Li (2018) states that increasing industrial capabilities through innovation-driven manufacturing, optimizing China's industrial structure, emphasizing quality over quantity, training and attracting talents will promote the improvement of manufacturing industries and environmentally friendly environments. Another study conducted by Liao, et al. (2022) stated that changes in the value-added ratio of industry will increase GDP through increasing environmentally friendly investment. Another study by Sayari, et al. (2018) shows that the value-added components of services and industry have a positive effect on EFI, and the relationship between EFI and FDI has a negative relationship.

Research conducted by Butunoi (2017) states that the training system and workforce improvement can be used to increase investors who can bring in foreign capital. Research conducted by Adhikary (2017) states that human resources are one of the most common factors that attract FDI. Meanwhile, research conducted by Azam, et al. (2020) stated that empirical results support the hypothesis of economic growth driven by population growth, which shows that population growth stimulates economic growth and development through increased investment. Research by Na & Lightfoot

(2006) concluded that the government should consider further development of skilled labor to encourage capital-intensive foreign investment (FDI).

Research conducted by Hindriks, et al. (2008) shows that tax competition decreases public investment and that equity grants discourage public investment with little impact on the tax balance. Another study conducted by Sari, et al. (2015) shows that tax holiday will have an impact on increasing investment activities in Indonesia, and tax holiday policy can have a positive impact on investment activities in Indonesia. Research De Simone, et al. (2022) states that international tax considerations made by multinational companies change their real investment decisions at the local level. Meanwhile, Wang, et al.'s (2022) research states that the higher the fiscal decentralization, the weaker the impact of FDI on haze pollution. Research by Becker, et al. (2013) concluded that tax payments have a major impact on the dynamics of investment and company growth, tax payments will change capital allocation.

Research conducted by Saini & Singhania (2018) in various countries shows different results. In developed countries, GDP growth, trade openness, and freedom indices affect foreign direct investment. Meanwhile, in developing countries, the determinants of foreign direct investment are gross fixed capital formulation (GFCF), trade openness, and efficiency variables.

Research conducted by Kumari & Sharma (2017) concluded that trade openness, interest rates and human resources generate significant coefficients in relation to FDI inflows. While research conducted by Khurshid (2015) shows that there is a long-term relationship between interest rates and investment. The relationship between interest rates and investment is negative in the long run but positive in the short term. Another study conducted by Gordon (2016) concluded that the change from investing in neoclassical theory is due to the addition of a risk premium to risk-free interest rates. Research conducted by Musyoka & Ocharo (2018) concluded that real interest rates and exchange rates have a negative and significant influence on FDI inflows to Kenya.

RESEARCH METHOD

The analysis model used in this study used a panel data regression model. This model was chosen because panel data provides more informative data, more variation, less collinearity among variables, more free degrees, and better efficiency. In this study, data were used from 2001 and ended in 2021, with cross data coming from Indonesia, Singapore, Malaysia, the Philippines, and Thailand. The data in this study comes from the World Development Indicator. Panel data regression will result in the following model:

The common effects model is the simplest panel data approach. This model does not pay attention to individual dimensions or time, so it is assumed that behavior between individuals is the same in various periods of time. This model simply combines time series and cross section data in the form of a pool, estimating it using the pooled

least square approach (Gujarati, 2002; 637; Basuki &; Prawoto, 2016). The regression equation in the common effects model can be written as in equation (1).

$$\text{Log}(INV_{ti}) = \alpha + \beta_1 \log(GDP_{it}) + \beta_2 \log(IVA_{it}) + \beta_3 \log(LIBOR_{it}) + \beta_4 \log(TAX\_REV_{it}) + \beta_5 \log(TRADE_{it}) + \beta_6 \log(LIR_{it}) + \varepsilon_{it} \quad (1).$$

Information:
i: Indonesia, Singapore, Malaysia, Philipines, Thailand
t: 2001, 2002, 2003, 2004, 2005, ..., 2021
Where i indicates the cross section and t indicates the period. Assuming the error component in ordinary least squares processing, the estimation process separately for each cross-section unit can be performed.

Fixed effects models assume that there are different effects between individuals. That difference can be accommodated through differences in interceptions. Fixed effects model, everyone is an unknown parameter and will be estimated using the dummy variable technique which can be written as follows (Gujarati, 2002). The regression equation in a fixed effects model can be written as in equation (2).

$$\text{Log}(INVti) = (\alpha + i\alpha it) + + \beta1 \log(GDPit) + \beta2 \log(IVAit) + \beta3 \log(LIBORit) + \beta4 \log(TAX\_REVit) + \beta5 \log(TRADEit) + \beta6 \log(LIRit) + \varepsilon it \quad (2).$$

The analysis technique as above is called Least Square Dummy Variable (LSDV). In addition to being applied to individual effects, LSDV can also accommodate systemic effects of time. This can be done through adding time dummy variables inside the model.

The fixed effects model assumes that the specific effects of everyone are treated as part of a random error component that does not correlate with observed explanatory variables; such models are called random effects models (REM). This model is often referred to as the error component model (ECM). The equation of the random effects model can be written like equation (3).

$$\text{Log}(INV_t) = \alpha + + \beta_1 \log(GDP_{it}) + \beta_2 \log(IVA_{it}) + \beta_3 \log(LIBOR_{it}) + \beta_4 \log(TAX\_REV_{it}) + \beta_5 \log(TRADE_{it}) + \beta_6 \log(LIR_{it}) + w_{it} \quad (3).$$

Information:

wit	: εit + u1; E (wit) = 0; E (wit2) = α2 + αu2
E (wit, wjt-1)	: 0; i ǂ j; E (ui,εit)= 0
E (εi,εis)	: E (εit,εjt)= E (εit,εjs)=0

Error component Although wt is homoscedastic, there is a correlation between wt and wit-s (equicorrelation), which is like equation (4)

$$\text{Corr}\,(w_{it}, w_{i(t-1)}) = \alpha_u^2/(\alpha^2 + \alpha_u^2) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

OLS methods cannot be used to obtain efficient estimators for random effects models. The appropriate method for estimating random effects models is Generalized Least Squares assuming homokedastics and no cross-sectional correlation (Gujarati, 2002).

After obtaining the three equations (Common Effect Model, Fixed Effect Model, and Random Effect Model), the model selection was carried out with the Chow test and Hausman Test. Furthermore, the selected model is tested by Classical Assumptions.

Results and Discussion

Regression using static panel data will produce 3 regression equation models, namely: *commont effect* model, *fixed effect model* and *random effect model.* The *commont effect* model is the simplest panel data model approach because it only combines *time series* and *cross section data.* In this model, neither time nor individual dimensions are considered, so it is assumed that the company's data behavior is the same in various time periods. This method can use the *Ordinary Least Square (*OLS) approach or the least squares technique to estimate the panel data model (Table 1).

Table 1. Panel Data Regression Results

Notasi	GRDP Dependent Variables		
	Common Effect	***Fixed Effect***	***Random effect***
LOG(GDP)	-3.050	-3.376	-2.705
	[-13.005***]	[-2.318***]	[-13.590***]
LOG(LIBOR)	0.772	0.892	0.462
	[4.664***]	[8.528***]	[3.544***]
LIR	-0.076	-0.169	-0.117
	[-2.338**]	[-5.310***]	[-4.992***]
LOG(TAX_REV)	-0.594	-0.479	-0.674
	[-2.482**]	[-1.894*]	[-4.106***]
LOG(TRADE)	4.140	4.652	3.638
	[12.404***]	[18.532***]	[13.923***]
LOG(IVA)	1.042	0.885	1.302
	[2.563**]	[2.299**]	[4.526***]

C	-3.202	-3.780	-2.686
	[-9.473***]	[-14.437***]	[-10.363***]
R-squared	0.9878	0.9960	0.9817
Uji Chow		8.6995***	
Uji Hausman			128.683***
Jarque-Bera		3.4788 Prob. 0.175	

Source: Data processed 2023

Remarks: [ ] t count
significant α 1% ** significant α 5% * significant α 10%

From the table above, the panel data regression model equation can be derived as follows:

Model *Common Effect* (Equation 5)

$$\text{Log}(INV_{ti}) = -3.050 - 3.050 \log(GDP_{it}) + 1.042(IVA_{it}) + 0.772 \log(LIBOR_{it}) - 0.594 \log(TAX\_REV_{it}) + 4.140 \log(TRADE_{it}) - 0.076 \log(LIR_{it}) + \varepsilon_{it} \quad \ldots\ldots\ldots (5).$$

Model *Fixed Effect* (Equation 6)

$$\text{Log}(INV_{ti}) = -3.780 - 3.376 \log(GDP_{it}) + 0.885(IVA_{it}) + 0.892 \log(LIBOR_{it}) - 0.479 \log(TAX\_REV_{it}) + 4.652 \log(TRADE_{it}) - 0.169 \log(LIR_{it}) + \varepsilon_{it} \quad \ldots\ldots\ldots (6).$$

Random Effect *Model* (equation 7)

$$\text{Log}(INV_{ti}) = -2.686 - 2.708 \log(GDP_{it}) + 1.302(IVA_{it}) + 0.462 \log(LIBOR_{it}) - 0.674 \log(TAX\_REV_{it}) + 3.638 \log(TRADE_{it}) - 0.117 \log(LIR_{it}) + \varepsilon_{it} \quad \ldots\ldots\ldots (7).$$

Based on the results of the Chow test and the Hausman test (Table 1) has consistently chosen a fixed effect model, so the Lagrange Multiplier test does not need to be done. The best model set in this study is the fixed effect model.

A good multiple regression is categorized if it satisfies the requirements of classical assumptions. The classical assumptions in panel data are slightly different from multiple linear regression tests. The classical assumption test performed for the selected model based on the results of the model selection test is the classical assumption test for *fixed effect models*.

Table 2. Fixed Effect Model Regression Results

Notasi	*Fixed Effect*	
	Coefficient	**t-Statistic**
LOG(GDP)	-3.376.624	[-2.3188**]
LOG(LIBOR)	0.892727	[8.5282***]
LIR	-0.169359	[-5.310***]
LOG(TAX_REV)	-0.479388	[-1.8946*]
LOG(TRADE)	4.652.913	[18.535***]
LOG(IVA)	0.884902	[2.2999**]
C	-3.780.708	[-14.437***]
R-squared	0.996045	

Source: Data processed 2023

Description: [] t count
sign. a 1% ** sign. a 5% * sign. a 10%

To test normality in panel data, the descriptive statistic used is the Jargue-Bera probability value can indicate the normality of the data. Data is categorized as normal if the value is close to 0. Based on Table 1 the Jarque-Bera value is 3.4788 and the probability value is 0.175 (0.175 > 0.05), it means that the equation model of the fixed effect model satisfies the assumption that the residuals are normally distributed.

This problem can be solved by converting regression to Generalized Least Square (GLS) regression, since GLS is one of the remedial autocorrelations (Gujarati, 2002).

The purpose of the multicollinearity test is to look for correlations between independent variables. The problem of multicollinearity has been solved with panel data (Gujarati, 2002). The problem of multicollinearity in this study can be ignored because it uses the Generalized Least Square (GLS) model.

The problem of heteroscedasticity in panel data can be addressed with the white test at the time of estimation.

Table 3. Heteroscedasticity Test

Dependent Variable: **ABS(RESID_02)**
Method: Panel Least Squares
Total panel (balanced) observations: 105

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(GDP)	-0.003874	0.099656	-0.038878	0.9691
LOG(LIBOR)	-0.047271	0.064250	-0.735730	0.4641

LIR	-0.026745	0.014259	-1.875.711	0.0644
LOG(TAX_REV)	0.078406	0.120252	0.652016	0.5163
LOG(TRADE)	-0.056427	0.151962	-0.371323	0.7114
LOG(IVA)	0.005463	0.195976	0.027874	0.9778
C	0.731965	1.587.514	0.461076	0.6460

Based on the results of regression with the White method in Table 3, almost all values are obtained at probabilities above 0.05. This shows that *fixed effect* models avoid heteroscedasticity problems or regression models meet the assumption of homoscedasticity.

Based on Table 2 Gross Domestic Income, ASEAN countries have a negative influence on gross fixed capital formation. An increase in Gross Domestic will lead to a decrease in investment. Behavior in developing countries, increased income will encourage increased consumption of imported goods. The increase in consumption of imported goods has an impact on reducing the sales turnover of domestically produced goods, and ultimately has an impact on the bankruptcy of several investments. So one solution is to increase the role of entrepreneurs to produce imported substitutes and change the consumer culture of ASEAN residents through loving products made in ASEAN countries, so that increasing GDP will have a positive impact on ASEAN Regional investment.

The labor force of ASEAN countries has a positive influence on gross fixed capital formation. The positive effect between the labor force and gross fixed capital formation shows that the rate of labor transfer and job creation in the modern sector is comparable to the rate of capital accumulation in the modern sector in ASEAN countries. The faster the rate of capital accumulation, the higher the growth rate of the modern sector and the faster the creation of new jobs. But what will happen if the profits of the capitalists are reinvested in the form of capital goods and saving labor, then an increase in the labor force will create unemployment.

Interest rates in ASEAN countries have a negative influence on gross fixed capital formation. The increase in average lending rates in ASEAN countries will have an impact on decreasing investment in the ASEAN region. One way to overcome this situation is the liberalization of the financial sector by allowing interest rates to increase to close to market interest rates. This move will raise real interest rates to a positive level, thus eliminating subsidies enjoyed by a few powerful entrepreneurs to enjoy cheap credit subsidies. Rising interest rates will also increase savings, so the supply of credit will multiply. Thus, reform and liberalization in organized money markets through selective and prudent government intervention can lead to better conditions.

Tax levies in ASEAN countries have a negative influence on gross fixed capital formation. To overcome the decline in investment due to the imposition of tax rates,

governments in ASEAN countries provide attractive policies for investment through tax breaks. Various forms of tax breaks and tax incentives are offered to attract investment. This step proved successful, due to the surge in manufacturing exports of ASEAN countries such as Thailand, Malaysia, Indonesia, the Philippines, Vietnam and Singapore, which was driven by the entry of foreign investors from Japan, Korea and China, as well as from Europe and America.

Based on Table 2 The trade value of ASEAN countries has a positive influence on gross fixed capital formation. To encourage increased investment in ASEAN countries, ASEAN governments agreed to impose tariffs on various intermediate goods (components and parts) deliberately increased dramatically during the 1970s. The goal is to spur competitiveness and enlarge welfare for consumers. The pattern of providing protection for the domestic industry coupled with export promotion efforts has also been carried out by Japan and South Korea. ASEAN countries utilize this strategy to usher in as one of the most important powers in international trade. Some of the imported products are successfully produced by countries in the ASEAN Region.

The added value of industry of ASEAN countries has a positive influence on gross fixed capital formation. Governments in ASEAN countries such as Thailand, Indonesia, Malaysia and Vietnam require entrepreneurs in a number of sectors, including automotive and two-wheelers, to use local components and parts in certain proportions. The aim is to develop domestic component and spare parts industries. Since the early 90s, governments in ASEAN countries have required entrepreneurs to use locally made machines which will have an impact on reducing imports and strengthening the domestic industry.

CONCLUSION

Based on the results of the analysis above, it can be concluded that the labor force, trade value and industrial value added have a positive influence on gross fixed capital formation, while economic growth, interest rate and tax revenue have a negative influence on gross fixed capital formation. The implication of this research is that ASEAN countries must increase the competitiveness of industrial products to increase capital inflow in the ASEAN Region. ASEAN countries hope that incoming investors will produce products capable of producing goods not only to meet the needs of the domestic market, but also for export to other countries. This can only be done by investors who are able to produce products with a very cheap cost structure so that the prices offered are very competitive and able to penetrate external markets.

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