



ANALYSIS OF THE EFFECT OF ECONOMIC GROWTH AND FOREIGN DIRECT INVESTMENT ON ENVIRONMENTAL DEGRADATION IN ASEAN CASE STUDY 2016 – 2022

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ABSTRACT

Development is an important aspect of a country because it impacts the welfare of society. However, environmental degradation is a major problem due to the development process of a country which is generally caused by economic activity. This paper aims to analyze the effect of economic growth and foreign direct investment on environmental degradation, especially in ASEAN. The analysis method used is panel data regression using data of 10 ASEAN members from 2016 to 2022. In this study, environmental degradation is represented by Environmental Performance Index (EPI) data. The results of this study state that economic growth has a significant effect on environmental degradation, while Foreign Direct Investment (FDI) has no significant effect on environmental degradation. This research is expected to contribute to environmental economics.

Keywords: *environmental degradation, economic growth, foreign direct investment*

1. Introduction

The state is responsible for the welfare of its citizens through development. According to Adam Smith (2008) the state has a duty, one of which is to encourage and create economic welfare for all citizens. Development can mean transformation in economic, social, and cultural terms through an appropriate policy or strategy. In terms of the economy, development can be seen through a country's economic growth.

Economic growth is one of the indicators of development in a country. The progress of a country's economy is determined by the size of growth with changes in national output. So, it can be said that economic growth refers to an increase in the value of a country's economic output within a certain period of time. According to Suparmoko (1998) economic growth can be measured by several indicators such as Gross Domestic Product (GDP) which describes the total value of goods and services produced by a country. Economic growth is said to be high if the value of GDP increases significantly.

Economic growth in a country is influenced by several factors, one of which is investment. Limited financing is one of the problems that often occurs in economic growth. Investment is one of the answers to these problems (Thirafi, 2013). Countries can attract foreign investors to invest in their country. According to Leitao (2010), investment is a very important indicator of openness for economic growth. Foreign direct investment (FDI) can help a country to boost a country's economic growth.

Every country will of course increase development continuously to achieve prosperity, including countries that are members of the Association of Southeast Asian Nations (ASEAN). ASEAN is an organization founded in 1967 by five countries, namely Indonesia, Malaysia, the Philippines, Singapore and Thailand. Over time, this organization expanded with the inclusion

of five other countries such as Brunei Darussalam, Vietnam, Laos, Myanmar and Cambodia. Initially ASEAN only aimed to resolve political and security conflicts between member countries, over time ASEAN moved to strengthen economic cooperation so that it could improve the welfare of the people of member countries. One of the implementations of these goals is the establishment of the ASEAN Economic Community (AEC) in 2015. The AEC is one of the special efforts undertaken by ASEAN to achieve economic equality in ASEAN (Setnas Indonesia, 2020).

As time goes on and development increases to improve human welfare, this will have an impact on the decline in the function or role of the environment due to increased pollution (Suparmoko, 2000). In development activities, human activities cause environmental changes. In addition to changes that are beneficial to the country's development, there are also negative impacts that are detrimental to humans, such as environmental damage and pollution. Environmental degradation is a major problem due to the process of economic development because it impacts economic growth and human welfare. Environmental degradation is damage to the environment due to depletion of natural resources. With the increase in population, the exploitation of natural resources increases. Similarly, pollution continues to increase due to the process of production and consumption (Panayotou, 2003).

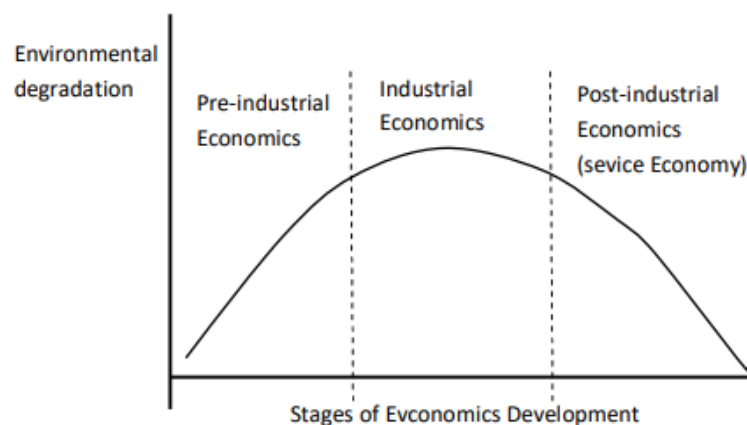
Good development is development that does not only focus on high economic growth. Development that only encourages high economic growth but ignores environmental aspects leads to a decline in environmental quality (Phimphanthavong, 2013). Subjective well-being, which includes happiness, life satisfaction and positive affect, is one of the three dimensions of sustainable development, namely environmental, social and economic.

Based on the explanation that has been explained, this study aims to determine how economic growth and Foreign Direct Investment (FDI) affect environmental degradation, especially in the ASEAN region in 2016 - 2022.

2. Literature Review

The relationship between environmental degradation and economic growth has been studied since 1955 with the Environmental Kuznet Kurve (EKC) theory. The EKC hypothesis is Grossman and Krueger's (1995) development of Kuznets' 1991 theory of an inverted U-curve that explains the relationship between income inequality and economic growth, where at the beginning of economic growth inequality increases, but inequality will decrease as economic growth increases. After its discovery, the EKC hypothesis was popularized in the 1992 World Development Report by the World Bank, which viewed that greater economic activity would inevitably damage the environment (Managi & Kaneko, 2015).

Figure 1.1
Environmental Kuznet Kurve: Locus of State



Source: Panayotou (2003)

Panayotou (2003), The Kuznet curve or EKC illustrates the relationship between economic development and environmental degradation. The curve is divided into three stages, as shown in Figure 1.1. This curve illustrates the stage of development of a country, where the first stage is called pre-industrial economics, the second stage is called industrial economics, and the third stage is called post-industrial economics (service economics). Industrialization starts with small industries that develop into heavy industries. This development used more natural resources and increased environmental degradation. The second stage is where there is a shift from the industrial sector to the service sector followed by a decrease in pollution as income increases. When income starts to increase, the demand for environmental quality also increases. The third stage, namely, an increase in income is able to increase environmental awareness by the community. People will have the awareness to pay for environmental losses due to economic activities. This stage is also characterized by the emergence of public awareness to sacrifice the consumption of a good to protect the environment. (Choudhary et al., 2015).

3. Research Methods

This research uses a quantitative descriptive approach using secondary data in the form of GDP, FDI, and EPI data from 10 ASEAN member countries from 2016 to 2022 obtained from World Bank Data and Yale University publications. This study uses panel data which is a combination of cross section and time series data, so the analysis method in this study is panel data regression. Data processing using Eviews 9 software. Estimation methods using panel data can be done through three approaches which include: common effect, fixed effect, and random effect (Ghozali, 2016). Panel data analysis uses three kinds of tests to determine the model, including the chow test, hausman test, and lagrange multiplier test. Meanwhile, to determine the effect, the F test (simultaneous), t test (partial), and the coefficient of determination (R²) are used.

3.1 Panel Data Model Selection Test

In a data processing model selection used in a study, it needs to be based on various statistical considerations. In the panel data model, there are three kinds of tests in testing model selection, namely the Chow Test, Hausman Test, and Langrangge Multiplier Test (LM Test) to determine one of the most appropriate estimation models to answer research objectives. Below is a table of the results of the model selection.

Table 1. Model Selection Test Results

Model Test	Result	Model Selection
Chow Test	Cross-section $F < \alpha$ (0.0000 < 0,05)	Fixed Effect
Hausman Test	Cross-section Random $< \alpha$ (0.0000 < 0,05)	Fixed Effect
Langrangge Multiplier Test (LM)	Breusch-Pagan Both $< \alpha$ (0,0184 < 0,05)	Random Effect

Source: Processed Data Eviews 9

Table 1. shows that the chow test cross-section F value has a probability of 0.0000 < 0.05, so that in this test the model used is fixed effect rather than common effect. Meanwhile, in the Hausman test, the cross-section random value obtained a probability of 0.0000 < 0.05, so the model used is fixed effect rather than random effect. In the Breusch-Pagan Both LM test, the probability is 0.0184 < 0.05 so that the model used is random effect rather than common effect.

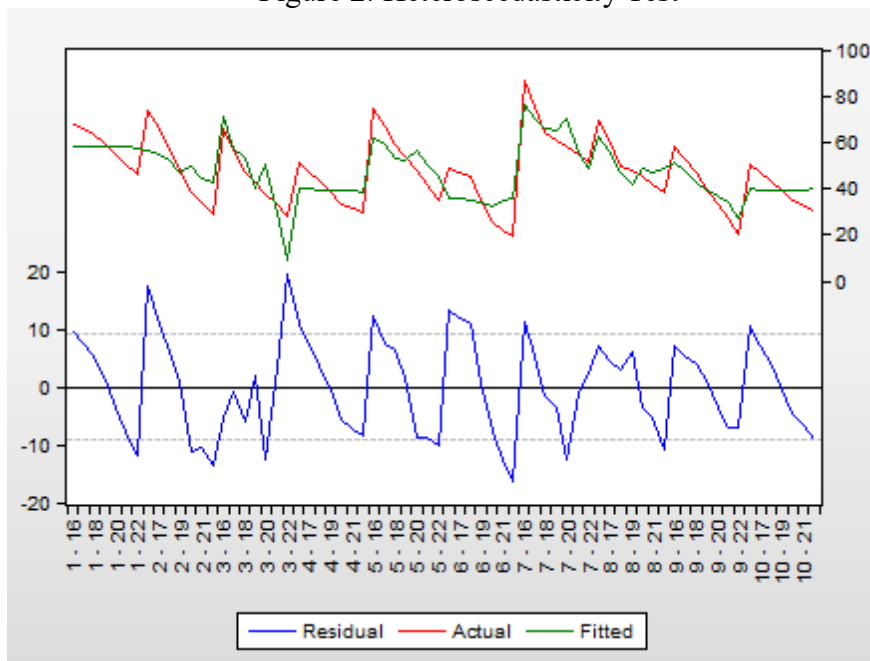
So, it can be concluded from the three tests, the model chosen is fixed effect as the regression model in this study.

3.2 Classic Assumption Test

Based on model selection testing, the fixed effect model was chosen to be the best model in answering this research. According to Widarjono (2015), the fixed effect model only needs two classic assumption tests, namely the Heteroscedasticity test and the Multicollinearity test to see whether or not there are classic assumption problems in the research data.

3.2.1 Heteroscedasticity Test

Figure 2. Heteroscedasticity Test



Source: Processed Data Eviews 9

Based on the picture above, the residual graph (blue color) does not cross the boundaries (500 and -500), meaning that the residual variance is the same. So the data does not occur symptoms of heteroscedasticity (Napitupulu et al., 2021).

3.2.2 Multicollinearity Test

Table 2. Multicollinearity Test

	FDI	GDP
FDI	1	0.2479528070888732
GDP	0.2479528070888732	1

Source: Processed Data Eviews 9

Based on the results of multicollinearity testing on the data above, the correlation coefficient shows 0.25 or smaller than 0.8 so that the data is free from multicollinearity.

3.3 Panel Data Regression Test

In the panel data regression, it has been determined that the fixed effect model is used, so the regression on the fixed effect model is as follows:

Table 3. Fixed Effect Model Regression Test Results

Dependent Variable: EPI

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	98.02499	7.446264	13.16432	0.0000
FDI	-4.94E-11	1.29E-10	-0.381694	0.7041
GDP	-1.59E-10	2.55E-11	-6.224826	0.0000

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.671054	Mean dependent var	47.42764
Adjusted R-squared	0.608667	S.D. dependent var	14.52977
S.E. of regression	9.089329	Akaike info criterion	7.406884
Sum squared resid	4791.722	Schwarz criterion	7.792340
Log likelihood	-247.2409	Hannan-Quinn criter.	7.559992
F-statistic	10.75641	Durbin-Watson stat	0.520764
Prob(F-statistic)	0.000000		

Source: Processed Data Eviews 9

The fixed effect regression model equation formula is as follows:

$$\begin{aligned}
 & \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + e_{it} \\
 & .02499 + (-0.0000000000494) X_{1it} + \\
 &).000000000159) X_{2it} + e_{it}
 \end{aligned}$$

The constant is 98.02499 which means that if the value of the independent variable is fixed, the value of environmental degradation is 98.02499. The coefficient of the FDI variable is -0.0000000000494, which means that if the other independent variables are fixed and FDI increases by 1%, environmental degradation will decrease by -0.0000000000494. The coefficient of the GDP variable is -0.000000000159, which means that if the other independent variables are fixed and GDP increases by 1%, environmental degradation will decrease by -0.000000000159.

3.4 T Partial Test

Partial test is a test that shows how far the influence of one independent variable individually in explaining the variation in the dependent variable (Ghozali, 2016). The T test was conducted to determine the effect of each independent variable, namely FDI (X1) and GDP (X2) on the dependent variable of environmental degradation partially.

Table 4. Partial Test Results (T Test)

Variable	t-statistik	t-tabel	Prob	Alpha	Conclusion
FDI	-0.381694	1.66792	0.7041	>0,05	no effect
GDP	-6.224826	1.66792	0.0000	<0,05	effect

Source: Processed Data Eviews 9

From the results of the fixed effect model panel data regression in table 2. the t-test results of the FDI variable (X1) obtained a probability value $> \alpha$ ($0.7041 > 0.05$) then the X1 variable

is not significant or does not affect variable Y. While the GDP variable (X2) obtained a probability value $> \alpha$ ($0.0000 < 0.05$) then the X2 variable is significant or affects variable Y.

3.5 Simultaneous F Test

The F test shows whether together the independent variables have an influence on the dependent variable (Ghozali, 2016).

Table 5. F Test (Simultaneous Test)

F-statistic	10.75641
Prob(F-statistic)	0.000000

Source: Processed Data Eviews 9

The results obtained are f count $10.75641 > f$ table 3.14 with a probability value $> \alpha$ ($10.75641 > 0.05$) so that the independent variables together have no effect on the dependent variable.

3.6 Test Coefficient of Determination (R2)

The coefficient of determination aims to describe the level of relationship between one or more dependent variables.

Table 6. R2 Test

R-squared	0.671054
Adjusted R-squared	0.608667

Source: Processed Data Eviews 9

The results obtained show an R-squared value of 0.671054 which means that the independent variables, namely FDI and GDP, affect environmental degradation in ASEAN in 2016-2022 by 67.1% while the remaining 32.9% is influenced by other variables outside the regression.

4. Research Findings and Discussion

4.1 The Effect of Foreign Direct Investment on Environmental Degradation

The results of the analysis show that the probability t-statistic obtained a probability value $> \alpha$ ($0.7041 > 0.05$), which means that FDI has no effect on environmental degradation in ASEAN during 2016 - 2022. The results of this study are in line with the research of Kizilkayaa (2017) where FDI has no effect on the environment, especially in Turkey. This study uses data on FDI and CO2 emissions in Turkey during the period 1990-2015, with the results of the study that FDI has no significant relationship with carbon emissions, water quality, and air quality. Based on the results obtained, this study is in line with Kizilkayaa's research because FDI does not significantly affect environmental degradation.

So FDI does not always have a negative effect on the environment. This can happen if FDI is directed to environmentally friendly industries, environmentally friendly technology, and is also supported by government policies so that there is emission control and environmental protection.

4.2 Effect of Gross Domestic Product on Environmental Degradation

The results of the analysis show that the probability of the t-statistic obtained a probability value $> \alpha$ ($0.0000 < 0.05$), which means that GDP has a significant effect on environmental degradation in ASEAN during 2016 - 2022. The T-statistic value is also negative so that if GDP

increases, environmental quality will decrease. This is in line with Kuznet's theory which states that economic growth has a relationship with environmental quality like an inverted U curve.

The relationship between economic growth and environmental quality can be described as an inverted U curve, in accordance with Kuznet's theory. In the early stages of economic growth, increased production and consumption will lead to increased environmental degradation. This is caused by the increasing use of natural resources and increasing environmental pollution. However, in the next stage, economic growth will cause an increase in people's income. Increasing people's income will lead to increased public awareness of the importance of the environment. Society will begin to demand the government to implement policies that protect the environment. This will lead to improvements in environmental quality (Kuznet, 1955).

This study is also in line with research conducted by Grossman and Krueger (1995) regarding the relationship between GDP and several environmental indicators, including urban air pollution, oxygen levels in rivers, fecal contamination, and heavy metal contamination in rivers. Grossman and Krueger's results show that most indicators of economic growth initially worsen environmental conditions, followed by subsequent environmental improvements. As time goes by which makes the increasing development for human welfare, it can have an impact on the decline in the function or role of the environment due to increased pollution. In development activities, human activities cause environmental changes. In addition to changes that are beneficial to human health, there are also negative impacts that are detrimental to humans, such as environmental damage and pollution.

5. Conclusion

FDI has no effect on environmental degradation in ASEAN in 2016-2022. This could be because incoming foreign investment has implemented environmentally friendly technology and uses renewable energy, so it has no impact on environmental pollution. Meanwhile, economic growth has a significant negative effect on environmental degradation in ASEAN in 2016-2022. When economic growth increases, environmental quality will decrease.

ASEAN must establish policies regarding the environment by encouraging sustainable economic development in order to continue to improve the economy while still paying attention to the environment.

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