

# HOW FOREIGN DIRECT INVESTMENT AND URBANIZATION AFFECT THE ENVIRONMENT OF INDONESIA

## DAMPAK INVESTASI ASING LANGSUNG DAN URBANISASI TERHADAP KONDISI LINGKUNGAN DI INDONESIA

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### ABSTRACT

*This study is an attempt to analyze the relationship between Foreign Direct Investment (FDI), economic growth, and environmental pollution and agricultural land in Indonesia. The study introduces urbanization as measures of the growth of urban sectors to analyze its contributions to pollution and agricultural land. Using Error Correction Mechanism (ECM) and co-integration techniques, the result confirms the existence of Environmental Kuznets Curve (EKC) in Indonesia in long-run study. FDI shows positive relationship with environmental pollution both in long and short-run. Economic growth also contributes to the increase of CO<sub>2</sub> emission in Indonesia in long-run. Although urbanization happens intensively in Indonesia, it doesn't trigger the air pollution in long and short-run analysis but shows negative relationship to agricultural land. FDI also followed by the decrease of agricultural land in short-run analysis but shows different sign in long-run study. It indicates that FDI in Indonesia sustain the agricultural sector in long term.*

*Key Words: Urbanization, Environment, ECM*

### ABSTRAK

Studi ini merupakan upaya untuk menganalisis hubungan antara Investasi Asing Langsung (FDI) dan pertumbuhan ekonomi terhadap pencemaran lingkungan dan lahan pertanian di Indonesia. Studi ini memperkenalkan urbanisasi sebagai ukuran pertumbuhan sektor perkotaan untuk menganalisis kontribusinya terhadap polusi dan lahan pertanian. Dengan menggunakan Error Correction Mechanism (ECM) dan teknik integrasi, hasilnya menunjukkan terbentuknya pola Kurva Kuznets Lingkungan (EKC) di Indonesia dalam studi jangka panjang. FDI menunjukkan hubungan positif dengan pencemaran lingkungan baik dalam jangka panjang maupun jangka pendek. Pertumbuhan ekonomi juga berkontribusi pada peningkatan emisi CO<sub>2</sub> di Indonesia dalam jangka panjang. Meskipun urbanisasi terjadi secara intensif di Indonesia, namun hal tersebut tidak memicu pencemaran udara dalam analisis jangka panjang maupun pendek, tetapi menunjukkan hubungan negatif dengan lahan pertanian. FDI juga diikuti oleh penurunan lahan pertanian dalam analisis jangka pendek tetapi menunjukkan hubungan yang berkebalikan dalam studi jangka panjang. Hal ini menunjukkan bahwa FDI di Indonesia menopang sektor pertanian dalam jangka panjang.

*Key Words: Urbanisasi, Lingkungan, ECM*

### INTRODUCTION

Globalization is something unavoidable and happening in all aspects of

life. Economic globalization occurs in all aspects of the economy of the country which resulted in the freedom of countries

in the world to conduct economic activities between countries. One form of globalization in the economy is inflow of foreign direct investment (FDI). Recruiting Eliza (in Frederica and Juwita, 2003), FDI is an investment made by a country (home country) to another country (host country) in the long-run. Ball et al (2011) adds that FDI is a variable that is usually used to measure where and how quickly internationalization takes place.

FDI plays an important role both in developed and developing countries. The United Nations Conference on Trade and Development (UNCTAD), an organization under the auspices of the United Nations (UN), has released the latest report on world investment summarized in the World Investment Report 2015. Annual reports summarizing FDI in each developing country in the world by 2014 shows that East Asia (comprising East Asia and Southeast Asia) is one of the largest foreign investment destinations in the world. Indonesia experienced an increase in foreign investment by 20 % to

US\$ 22.6 billion from US\$ 18.8 billion compared to the previous year. The growth of foreign investment in Indonesia is the second highest in East Asia, while in terms of value of FDI is the fourth largest. If focused on Southeast Asia only, Indonesia's FDI growth of 20 % is the highest among other countries. Graphically, the realization of foreign direct investment (FDI) in Indonesia from 2005 to 2014 can be seen in Figure 1.

In practice, FDI plays an important role in the development of the economy in Indonesia. But another issue that is also important is the environmental issue. There's no doubt that increase in economic activity will surely put more pressure to the environment. Economic activities require raw materials from nature and remove residues that can damage nature. One of the residues of economic activity is CO<sub>2</sub> so that pollution problems are a major environmental issue in many countries with high industrial activities.

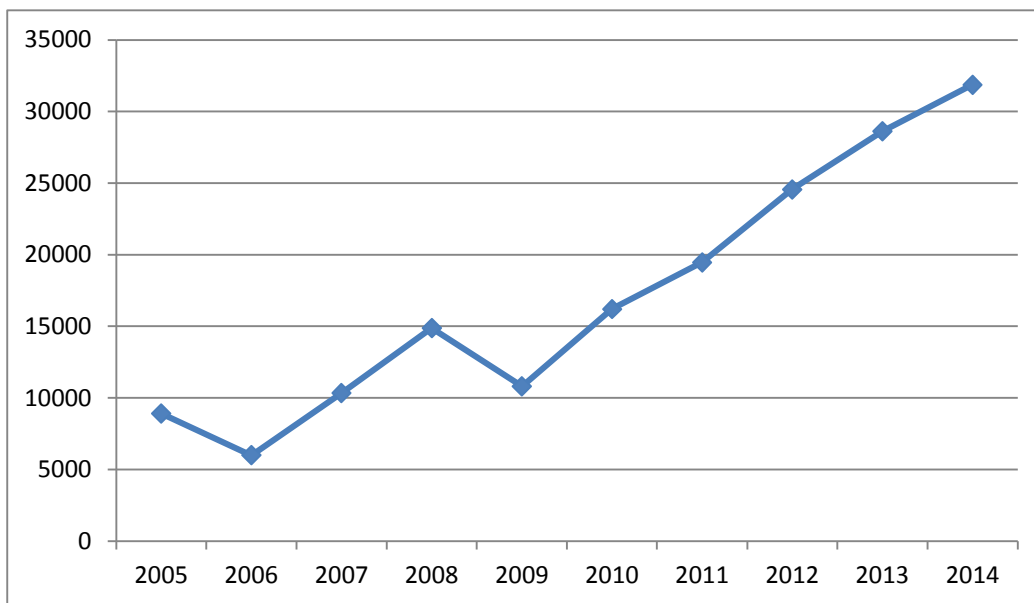


Figure 1.  
Trend of FDI in Indonesia, 2005-2014 (Billion USD)

Another phenomenon of globalization is the existence of urbanization. In a developing country, urbanization can lead to a population explosion in a big city. People flocked to the city moved by globalization and technology. This problem can also contribute to air pollution as urban activity tends to exclude more pollution. Another problem arising from urbanization is the area problem. It does not rule out the possibility that an increase in urban population should be accompanied by an increase in settlement so that urban areas are expanding and can threaten other lands to be converted, such as agricultural land.

The process of land conversion takes place generally from activities with a lower economic land rent to activities with higher economic land rent. But on the other hand, land conversion generally takes place from activities with higher environmental rent to activities with lower environmental rent. Thus the overall activity of life tends to decrease the carrying capacity of natural resources, whereas on the other side the demand for the resource keeps increasing due to the increasing population pressure and the increase of per capita consumption.

In connecting globalization, economy, and environment, the flow of thought can be seen in Figure 2.

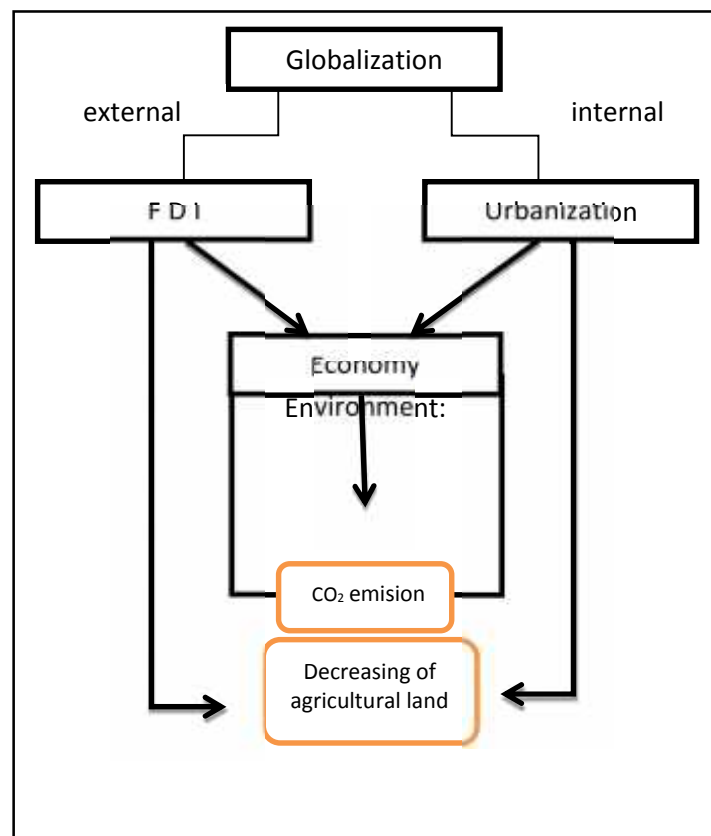


Figure 2.

The relationship between globalization, economic growth, and environment

This paper aims to examine the relationship between FDI development and economic growth and urbanization in

Indonesia on environmental aspects such as air pollution and agricultural land availability in Indonesia. This paper

describes the fact that globalization has an impact on the environment but does not intend to generalize that globalization always has a negative impact on mankind.

Peters, 2003 in Hutabarat (2010) illustrates the relationship between air pollution problems and the growth rate of a country. In the early stages of development, the country developed the industry to increase output in order to improve the welfare of the community. As industrialization increases, air pollution also increases. A country that has increased its economic growth will have the ability to control the pollution. After the country succeeds in developing

methods and procedures to control pollution, pollution levels can be retained and can even be lowered in line with economic growth. State capabilities will also be used to improve air quality. In the end the country will develop environmentally friendly technology so that pollution can be reduced. The relationship between air pollution problems and the growth of a country is presented in Figure 3. As a country grows, the problem of air pollution increases rapidly. This occurs before any stabilization or control of air pollution has not yet been implemented.

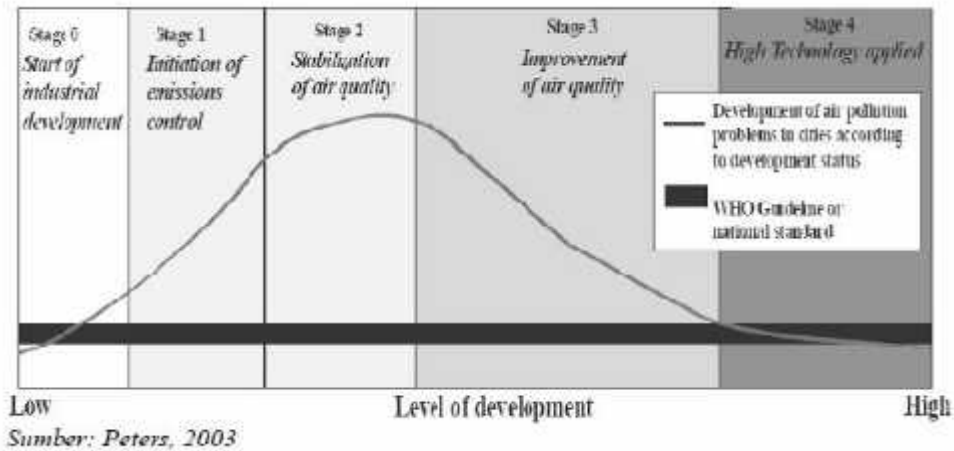


Figure 3.  
The relationship between air pollution and economic growth

Panayotou, T (2003), describes the link between the stage of economic development with environmental degradation in the form of the Kuznet curve known as the Environmental Kuznet Curve -EKC which is divided into three stages, as shown in Figure 4. Figure 4 illustrates that in the first stage, economic development will be followed by an increase in environmental damage called pre-industrial economics, the second stage known as industrial economy, and the third stage, known

as post-industrial economics (service economy). Industrialization begins with a small industry and then moves into heavy industry. This movement will increase the use of natural resources, and increase environmental degradation. After that industrialization will expand its role on the formation of national domestic product that is more stable. The presence of foreign investment has also led to economic transformation from the agricultural sector to the industrial sector.

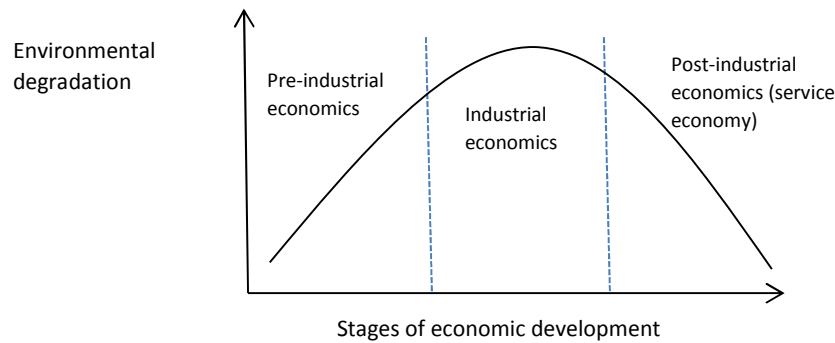


Figure 4.  
Environmental Kuznet Curve (EKC)

Increased role of industrial sector within the economy of a country will cause an increase in pollution in the country. In the next stage of economic transformation, there will be movement from industrial sector to service sector. This movement will be followed by a decrease in pollution that is in line with the increase of income. In addition, the increasing demand for environmental quality goes hand in hand with the increase of income. In turn, the increase in income will be followed by an increase in the community's ability to pay for environmental losses incurred by economic activity. So, according to Andreoni & Levinson (2004), this stage is also marked by the emergence of the willingness of society to sacrifice consumption of other goods for the protection of the environment.

Basically economic growth in a region will encourage the increasing demand for land for various needs including the needs of agriculture, service industries and other activities. Since land inventories do not change in a region, with changes in the economic structure occurring as seen primarily in urban areas, the change has shifted the role of the agricultural sector to the industrial sector which also needs land for its activities.

Under such circumstances, agricultural lands will be pressured by demand for land use for the benefit of off-farm activities (Anwar, 1993).

In line with the increased development of economic growth, the rate of land use will increase. The increasing demand for land encourages the conversion of agricultural land to non-agricultural land. According to Pakpahan et al (1993), the factors affecting the conversion of wetland to non-agricultural use can be distinguished into two, that is external factors, for example, related to urbanization and internal factors, which is the farmer's own desire to have a land use conversion.

#### METHOD OF ANALYSIS

This section discusses the methodology used in this work. It includes the data sources, specification of the model, explanation of variables, and estimation methods used.

#### *Data Type and Sources*

The study uses annual time series data from 1981 to 2012. The data is sourced from the World Bank's World Development Indicators (2017). The data are collected on variables like carbon dioxide emissions (CO<sub>2</sub>) used as proxy for environmental pollution, agricultural area,

real GDP (constant 2005) used as proxy for economic growth, and urban population growth as proxy for urbanization.

**Statistical Model**

The model used is regression with time series data as followed:

$$EP_t = \beta_1 + \beta_2 GDP_t + \beta_3 GDP_t^2 + \beta_4 FDI_t + \beta_5 URBAN_t + \epsilon_t \dots (1)$$

$$AGRI_t = \beta_1 + \beta_2 GDP_t + \beta_3 FDI_t + \beta_4 URBAN_t + \epsilon_t \dots (2)$$

Where

- EP : Environmental Pollution (kiloton of CO<sub>2</sub> emission)
- GDP : Gross Domestic Products at Constant Price (US\$)
- GDP2 : Quadratic value of GDP (US\$)
- FDI : Foreign Direct Investment (US\$)
- URBAN: Urbanization (% of population growth in urban area)
- AGRI : Agricultural land (% of land area)

The work is analyzed using Error Correction Model. The reason behind the use of the method is the nature of the data which is all stationary at the stationary level but not the difference 1. Through the

co-integration test, the result is that the variables are co-integrated over the long term so that the appropriate method used for such data is ECM.

This research will generate four equations including:

1. Examining the short-term and long-term relationships of FDI, economic growth, and urbanization on CO<sub>2</sub> emissions.
2. Examining the short-term and long-term relationships of FDI, economic growth, and urbanization on the extent of agricultural areas.

**ANALYSIS OF ESTIMATION RESULTS**

In this section, the results of the empirical findings are presented and discussed. It begins with the results of the time-series properties of the variables.

**a. Unit Root Test**

As noted in the methodology, the method for testing for the presence of unit root in the series is the ADF unit root test. The results are presented in the Table 1.

Table 1  
Augmented Dickey-Fuller Stationarity Test Result

Series	Level I(0)			Level I(1)		
	Critical value (5%)	ADF	P-value	Critical value (5%)	ADF	P-value
EP	-2.957110	-0.861921*	0.7872	-2.963972	-5.561834	0.0001
GDP	-1.951687	-1.366073*	0.1561	-1.952066	-6.982856	0.0000
FDI	-2.957110	-0.077692*	0.9437	-2.960411	-6.164788	0.0000
URBAN	-2.957110	-0.314988*	0.9118	-2.960411	-5.570643	0.0001
AGRI	-2.957110	-0.112033*	0.9397	-2.960411	-4.763069	0.0006

Note: the asterisk \* stands for non-rejection of the null hypothesis at the 5% significance level, and MacKinnon (1996) one-sided p-values.

The results of the ADF test show the presence of unit root in all the series. This shows that all the variables are not stationary at level. They are however stationary at the first difference. We next proceed to the estimation of the co-integration test.

**b. Co-integration Test**

Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be co-integrated. The stationary linear combination is called the co-integrating equation and may be interpreted as a long-run equilibrium relationship among the variables. The purpose of the co-integration test is to determine whether a group of non-stationary series is co-integrated or not.

If an OLS regression is estimated with non-stationary data and residuals,

then the regression is spurious. To overcome this problem, the data has to be tested for a unit root (i.e. whether it is stationary). If both sets of data are I(1) (non-stationary), then if the regression produces an I(0) error term, the equation is said to be co-integrated. To test for co-integration between two or more non-stationary time series, it simply requires running an OLS regression, saving the residuals and then running the ADF test on the residual to determine if it is stationary. The time series are said to be co-integrated if the residual is itself stationary. In effect the non-stationary I(1) series have cancelled each other out to produce a stationary I(0) residual.

Since we have 2 endogenous variables, we conduct two test of co-integration for each residual from each model. The result of co-integration test is presented in Table 2:

Table 2.  
Augmented Dickey-Fuller Stationarity Test Results of Residuals

Series	Level I(0)		
	Critical value (5%)	ADF	P-value
RESID2 (AGRI as endogenous variable)	-2.998064	-5.031362	0.0005
RESID1 (EP as endogenous variable)	-2.960411	-3.800650	0.0071

The results show that all the residuals are stationer at level I(0) so we can conclude that the two equations are co-integrated.

**c. Error Correction Model (ECM)**

ECM consists of two parts: the matrix of long-run co-integrating

coefficients (used to derive the long-run co-integrating relationship), and the short-run coefficients (for the short-run analysis). The results are presented in Table 3 and Table 4.

Table 3.

Co-integration Coefficients with Dependent variable: Environmental Pollution

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	1.79E-11	6.06E-12	2.943810	0.0065
GDP	1.55E-16	7.38E-17	2.103626	0.0445
GDP2	-1.48E-32	1.03E-32	-1.438596	0.0613
URBAN	-0.396379	0.038123	-10.39727	0.0000
C	13.64269	0.192594	70.83665	0.0000

The presence of co-integrating equation shows that in the long-run, environmental pollution can be explained by FDI, GDP, and urbanization. The long-run impact of FDI on pollution is found to be positive. A hundred billion increase in economic growth will increase pollution by 1.8%. The long-run impact of GDP also increase the CO<sub>2</sub> emission but less than FDI's effect. This shows that increased of the investment and economy contribute leads to increase in pollution. This is consistent with a-priori expectation.

Meanwhile, the coefficient of GDP2 has a negative and not significant at

the 5 % confidence level but significant in 10 % confidence level. This shows that the phenomenon of EKC is still not fully established in Indonesia. The addition of population in urban areas does not seem to have a negative impact on air pollution levels in Indonesia. From the long-term equation it can be seen that the increase in urban population by 1 % is followed by a decrease in CO<sub>2</sub> emissions by 0.39 %. This is an indication that urban areas in Indonesia have begun to apply the green lifestyle such as the use of mass transportation and the use of biofuels.

Table 4.

Co-integration Coefficients with Dependent variable: Agricultural land

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	8.10E-11	2.68E-11	3.021944	0.0052
PDB	1.35E-16	9.70E-17	1.389033	0.1754
URBAN	-2.691631	0.193899	-13.88163	0.0000
C	36.21024	1.067193	33.93036	0.0000

In the second long-run equation it can be seen that FDI over the long term has a positive impact on agricultural areas in Indonesia. This is an indication that foreign investment that goes to Indonesia in the long term is in favor of food stability in Indonesia. This is a good signal for Indonesia to become a sovereign country of food. Based on Indonesia Investment Coordinating Board (BKPM), foreign investment in agriculture includes 397 projects, 8 % increasing than previous

year. The increase in investment is also contributed by the direction of the Minister of Agriculture to spur the efforts to increase domestic corn production, to meet the increasing domestic demand. The investment will ensure the supply of agricultural products to the market on an ongoing basis. Investors are constantly monitoring Ministry's policies, especially in efforts to boost maize production, including targeting the increase of maize land up to 1 million hectares (ha) by 2016.

Meanwhile, urbanization has a negative effect on the extent of agricultural areas. Increasing the number of urban population triggers the conversion of agricultural land into

residential areas. In ECM analysis, there are often differences in outcomes for long-run and short-run. Short-run relationship results can be seen in Table 5 and Table 6.

Table 5.

Short-run Coefficients with Dependent variable: D(Environment Pollution)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDI)	4.35E-12	4.48E-12	0.972151	0.0023
D(PDB)	-5.00E-17	3.84E-17	-1.301043	0.2047
D(PDB2)	1.05E-32	5.34E-33	1.958588	0.0610
D(URBAN)	-0.075669	0.104178	-0.726346	0.0460
RESID1(-1)	-0.221932	0.123998	-1.789806	0.0351
C	0.038612	0.017860	2.161943	0.0400

In the above short-run equations it shows that FDI triggers CO2 emissions and is consistent with its long-term effects, but economic growth gives different sign. In the long-run, economic growth increases CO2 emissions, but in the short-run economic growth has an indication of lowering the air pollution even though it is not statistically significant. In the short-run, the EKC does not exist indicated by a positive value of GDP2 coefficient. This

supports that EKC phenomenon cannot be seen in a short period of time in Indonesia. Meanwhile, urbanization is consistent showing negative relationship with CO2 emissions. In the long and short-run analysis, CO2 emissions decrease despite the increase in urban population. ECT is negative and statistically significant indicates that the model converge to the steady-state with 22% speed of adjustment.

Table 6.

Short-run Coefficients with Dependent variable: D (Agricultural land)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDI)	-3.08E-12	3.57E-11	-0.086404	0.0318
D(PDB)	2.51E-17	6.30E-17	0.399250	0.6928
D(URBAN)	-0.997156	0.634351	-1.571930	0.1276
ECT	-0.358107	0.155910	-2.296885	0.0296
C	0.238412	0.131135	1.818065	0.0802

For the agricultural area, the variable that significantly influence is only FDI. What is interesting is that the long-term and short-term relationships of FDI give different directions to agricultural land in Indonesia. In the short-run, FDI has a negative effect on agricultural land area. This indicates that FDI in the long term can be said to be pro to the

agricultural sector. Meanwhile, economic growth and urbanization do not significantly affect the agricultural land area but the direction indicates the same between short and long-run analysis. The ECT of the equation is negative and significant, which means the rate of convergence is 35% to the long-run equilibrium.

## **CONCLUSION AND RECOMMENDATION**

### ***a. Conclusion***

Globalization cannot be denied have impacts on the environment, but the impact is not all negative. This study is an attempt to analyze the relationship between FDI, economic growth, and environment in Indonesia. The study introduces urbanization (a measure of the growth of urban sector to analyze the contribution of the urban areas to pollution and agricultural land in the country). The result shows that there is a positive relationship between FDI and pollution in both the long-run and short-run. This shows that increased growth of FDI contributes to increase in pollution. Also, the short-run relationship between economic growth and pollution is negative, but positive in the long-run. This shows that economic growth also trigger the increasing of CO<sub>2</sub> emission in long term. The study also tests the existence of EKC in Indonesia by introducing the square of the GDP. The result confirms the existence of the Environmental Kuznets in the long-run but not in the short-run. It means that EKC could not be observed in a short term of time. However, urbanization doesn't bring negative impact on air pollution. In long and short-run, there is a negative relationship between urbanization and CO<sub>2</sub> emission. The increase of people in urban area doesn't followed by the increase of CO<sub>2</sub> emission.

For agricultural land, FDI gives different sign between long and short-run. In the long-run, there is a positive relationship between FDI and agricultural land, but different sign shown in the short-run. It indicates that FDI in Indonesia is supporting the agricultural sector in long term. Economic growth gives insignificant effect towards agricultural land both in long-run and short-run, but it indicates

positive relationship that increase in agricultural land in line with the increase of economic growth. While urbanization, as predicted before, have negative relationship with agricultural land. The increase of urban people leads to decreasing in agricultural land area in long-run and indicates the same in the short-run.

### ***b. Recommendation***

Given the findings of this work, this paper concludes with the recommendation that there is a need for policymakers to enact and enforce environmental laws that are aimed at regulating various sources of environmental pollution in the country. FDI as the source of development must be enforced a requirement for FDI to enter the pro to the environment, including agriculture. Urbanization as part of globalization is expected to maintain its growth-rate so that it does not have much impact on the conversion of agricultural land. The use of biofuels can be maintained so that activities in urban areas do not contribute to increase CO<sub>2</sub> emissions.

This work has been carried out using aggregate data. A sectorial analysis will help to provide an insightful analysis into the contribution of various sectors to pollution in Indonesia. Further analysis can also look at the provincial-level contributions to pollution in the country. Since the concept of globalization is very broad, further research could improve the scope of variables in defining globalization such as globalization in westernization and deterritorialization. In addition, environmental aspects can also be expanded not only to see CO<sub>2</sub> emissions but also the amount of waste water or water quality.

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