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Original Article

Economic Growth Convergence of Indonesia and 10 Main Trading Partner Countries

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Abstract **-** *Economic growth and economic welfare represented by per capita income in each country have differences, resulting in economic disparities. Country with lower-income per capita relatively tries to catch up the income inequality against higher-income country. This process is called convergence of economic growth. Based on the data, it is known that Indonesia has differences in economic growth with its main trading partner countries. Therefore, this study aims to see whether there is convergence of economic growth in Indonesia and the main trading partner countries. Convergence analysis includes sigma convergence, absolute beta convergence and conditional beta convergence. The calculation of the sigma convergence uses the calculation of the coefficient of variation and the calculation of the beta convergence uses panel data regression. The research period is 2009 - 2018. The results showed that there was a decrease in the coefficient of variation during the study period so that sigma convergence was occured. The panel data regression results show absolute beta convergence and conditional beta convergence were occured in Indonesia and its main trading partner countries. In addition, it was known that foreign direct investment had a positive and significant effect on economic growth as represented by per capita income.*

Keywords **-** *Absolute Beta convergence, Conditional Beta Convergence, Economic Growth, Per Capita Income, Sigma convergence.*

I. INTRODUCTION

Per capita income from a country is a measure of the welfare of a country. However, the condition of the natural, economic, social, population, technological and cultural characteristics of each country differs from one another. This results in productivity and income differences of each country that will lead to economic disparities. Therefore, countries with relatively lower income attainment (poor) than other countries need to overcome this problem. Efforts that can be made by the government are encouraging the country's economic activities and increasing economic growth. Thus, poor countries are expected to be able to catch up with their economies against countries with relatively higher incomes.

The process of catching up the per capita income equality by low-income countries regions against high-income countries is known as income convergence. The convergence of income is certainly expected by developing countries to pursue income equality with developed countries. In the long run, convergent economic growth from a region will achieve steady or steady stade economic growth (Barro and Sala-i-Martin, 1995).

Convergence can be divided into two types such as sigma convergence and beta convergence. Sigma convergence explains the convergence between regions by looking at the standard deviation and coefficient of variation for each year (Kuncoro, 2013). Meanwhile beta convergence is divided into two types such as absolute convergence and conditional convergence. Absolute convergence is seen without including control variables which are the characteristics of each region. This can be done by estimating an econometric model in which initial period income is the only explanatory variable for income growth. Meanwhile, conditional convergence explains how the economy of poor regions tends to grow faster than rich countries by looking at GDP per capita growth, as well as using other factors outside of GDP per capita. This conditional convergence can be seen through the coefficient of lag of per capita income that less than one and significant at the five percent significant level.

Every country always strives to increase the economic growth of its country. One of the ways that can be done is by establishing various collaborations between countries through involvement in world trade. Including Indonesia which participates in world trade by becoming a member of several trade organization, multilateral, and bilateral as well as being part of global economic and trade cooperation and agreements. Indonesia has 10 main trading partners such as China, Japan, Singapore, United States, India, South Korea, Malaysia, Thailand, Australia and Vietnam.

The data shows that there is an inequality in the per capita income of Indonesia and the 10 main trading partner countries. Therefore, this study aims to analyze sigma convergence and beta convergence of Indonesia and the 10 main trading partner countries to find out whether in the long term, countries with relatively lower GDP can catch

up to countries with higher GDP. In addition, there are several variables that can affect the increase in GDP per capita, but this study only uses FDI, labor, and net exports as factors that affect GDP per capita.

Some research has written the topic about economic convergence analysis, one of which is conducted by Zaenal and Masaru (2010). The differences between this study and previous research are the country analyzed, the time of the study, identified economic disparities that were carried out only in Indonesia with major trading partner countries based on the amount of GDP per capita, as well as differences in variables that affect the level of income in that country.

The formulation of the problems constructed in this study are (1) does the sigma convergence of per capita income occur between Indonesia and the main trading partner countries? (2) Does absolute beta convergence of per capita income occur between Indonesia and major trading partner countries? (3) Does conditional beta convergence of per capita income occur between Indonesia and major trading partner countries?

II. EMPIRICAL AND THEORETICAL STUDIES

A. Economic Growth

According to Mankiw (2007), economic growth refers to the extent to which economic activity will generate additional income for the community in a certain period. The indicator used to measure economic growth is the growth rate of Gross Domestic Product (GDP).

According to Budiono (in Ningrum, 2015) explains that in general economic growth means an increase in the Gross Domestic Product of a country. Economic growth is also associated with an increase in "output per capita". In this sense the theory must include a theory of GDP growth and a theory of population growth. Because these two aspects are the explanation of the per capita output development. Moreover, economic growth in the long run occur if during a long enough period of time, the per capita output shows an increasing trend.

B. Per Capita Income

The welfare of the population of a country is usually based on the amount of per capita income. per capita income is the average form obtained from dividing the total gross national product by the total population. The greater the value of per capita income, it is assumed that members of a country's society are more prosperous and economic development is considered to be more successful (Purbayu Budi Santoso and Muliawan Hamdani, 2007).

Sadono Sukirno (2004) states that one of the components of national income that is always calculated is per capita income, namely the average income of the population of a country at a certain period. The value is obtained by dividing the GDP or PNB value for a particular year by the total population for that year.

C. Convergence

A convergence of economic growth states that an underdeveloped region or country with relatively lower-income can catch up the income equality against the higher-income country. Otherwise if the region or country cannot catch up the income equality means convergence does not occur. The difference in per capita income in each region will create an interesting problem. If the economy of the poor region can grow faster than the economy of the rich region means these poor regions have a tendency to lag behind rich regions, or this can be interpreted as convergence. A convergent economy is an economy of poor areas that can reduce the income gap with rich regions each year. In the long run, convergent economic growth from a region will achieve steady or steady stade economic growth (Barro and Sala-i-Martin, 1995).

The concept of convergence is divided into two types such as sigma convergence and beta convergence. Marques and Soukiazis (1998), Lall and Yilmaz (2000), and Paas et al. (2007) stated that the sigma convergence illustrates the decreasing gap in per capita income over time. To see whether there is convergence or not, it can be done by looking at the dispersion through the coefficient of variation. The smaller the level of the gap per capita is indicated by the smaller the coefficient of variation over time, so that the smaller coefficient of variation indicates the existence of sigma convergence. To measure convergence by calculating the dispersion of Indonesia and major trading partner countries. Referring to Barro and Salla-i-martin (1996), Sigma convergence analysis can be done by looking at the value of per capita income dispersion from year to year. The level of dispersion is seen by calculating the value of the standard deviation of the logarithm of annual per capita income or the coefficient of variation of annual GDP per capita. If the coefficient of variation in a certain year is smaller than the coefficient of variation in the previous year, the convergent sigma occurs, on the other hand, if the coefficient of variation for a certain year is greater than the previous year, the convergent sigma does not occur. (Shankar and Shah, 2001)

Beta convergence is divided into two types such as absolute beta convergence and conditional beta convergence. Absolute convergence is a condition of convergence which assumes that the economies between countries or regions are similar, such as in terms of economic structure, demographic conditions, savings rates, and other economic variables. Absolute convergence is seen without including control variables which are the characteristics of each region. Each region is considered to have the same steady state condition and does not include other variables that differ between regions. Therefore, absolute beta convergence only use the previous year's GDP as the explanatory variable to see its effect to economic convergence (Barro and Sala-i-Martin, 1996).

Meanwhile, conditional beta convergence assumes that the structural characteristics between countries or regions have inequalities so that convergence is influenced by the structural characteristics of the country or region (Lall and Yilmaz, 2000; Islam, 2003; Paas et al., 2007; Onder et al., 2007; Schmitt and Starke, 2011). Conditional convergence explains how poor regional economies have a tendency to grow faster than rich countries, by looking at GDP per capita growth, and using other factors besides GDP per capita. This conditional convergence can be seen from the coefficient of lag of per capita income which is less than one and significant at five percent significant level (Barro and Sala-i-Martin, 1996).

In this study, several economic variables are used as structural characteristics of a country or region to measure conditional beta convergence. This economic variable is used as an independent variable which will explain per capita income as the dependent variable. The independent variables used in this study are the lag of per capita income, foreign direct investment, labor, and net exports.

D. Framework

Income from a country is a measure of a country's welfare. However, the condition of the natural, economic, social and cultural characteristics of each country differs from one another. This result the ability differences of countries to increase income and in turn will lead to economic disparities, so that some countries are able to grow rapidly while others grow slowly. The government can carry out various programs to encourage the economies of poor countries to be able to catch up against the economies of developed countries. The pursuit of a poor economy against a developed economy is called convergence.

Convergence is divided into two types such as sigma convergence and beta convergence. Beta convergence is divided into two types such as absolute beta convergence and conditional beta convergence. The data shows that there is an inequality in per capita income in Indonesia and the 10 main trading partner countries. For this reason, this study will examine whether there is sigma convergence and beta convergence in Indonesia and the 10 main trading partner countries.

III. RESEARCH METHOD

This type of research is quantitative descriptive. The data used is panel data using secondary data types. The data obtained based on information that has been compiled and published by certain agencies. Data starts from 2009 to 2018 on Indonesia and the 10 main trading partner countries such as China, Japan, Singapore, the United States, India, South Korea, Malaysia, Thailand, Australia and Vietnam. The data used to analyze the convergence process that occurs are GDP per capita, Foreign Direct Investment (FDI), Labor, and Net Exports. The data used is in the form of annual data obtained from the World Bank.

A. Sigma Convergence

To measure sigma convergence by calculating the dispersion of Indonesia and major trading partner countries. Referring to Barro and Salla-i-martin (1996), Sigma convergence analysis can be done by looking at the value of per capita income dispersion from year to year. The level of dispersion is seen by calculating the value of the standard deviation of the logarithm of annual per capita income or the coefficient of variation of annual GDP per capita. The following is the formula for estimating the coefficient of variation for each year (Shankar and Shah, 2001):

$$CV = \frac{\sqrt{\frac{\sum(Y_i - Y)}{n}}}{Y}$$

Where:

CV = Coefficient of Variation in certain year
Y_{it} = GDP per capita of each country for 2009-2018 period
Y = The average of GDP per capita of each country for 2008-2018 period
n = The amount of country

B. Absolute Beta Convergence

Absolute convergence is seen without including control variables which are the characteristics of each region. Each region is considered to have the same steady state condition and does not include the role of other variables that differ between regions. Therefore, it use the previous year's GDP to see its effect to economic convergence. Barro and Sala-i-Martin (1996) state that absolute convergence can be measured using the panel data regression equation as follows:

$$ln\left(\frac{y_{it}}{y_{it-1}}\right) = \alpha + \beta_1 Lny_{it-1} + \mu_{it}$$

Where:

Ln y_{it} = GDP per capita
$Lny_{it\,t-1}$ = Previous year's GDP per capita
i = Country
t = *Time-series*
μ_{it} = *Error Term*

C. Conditional Beta Convergence

Conditional convergence explains how poor regional economies have a tendency to grow faster than rich countries by looking at GDP per capita growth and using other factors outside of GDP per capita. This conditional convergence can be seen from the coefficient of lag of per capita income which is less than one and significant at the five percent significant level. Barro and Sala-i-Martin (1996) state that conditional convergence can be measured using the panel data regression equation as follows:

$$Ln\left(\frac{y_{it}}{y_{it-1}}\right) = \alpha + \beta_1 Lny_{it-1} + \beta_2 \mathrm{LnFDI_{it}} + \beta_3 \mathrm{LnTK_{it}} + \beta_4 \mathrm{LnNX_{it}} + \mu_{it}$$

Where:
Ln y_{it} = GDP per capita
$Lny_{it\ t-1}$ = Previous year's GDP per Capita
β_0 = Intercept
LnFDI = *Foreign Direct Investment*
LnTK = Labour
LnNX = Net Export
μ_{it} = *Error Term*

IV. RESULTS

A. *Sigma Convergence*

Based on Table 1, it can be seen that the coefficient of variation in per capita income of 2009 was 1.006. However, this value continues to decline over time until 2018, the coefficient of variation was 0.949. This shows that during the study period 2009-2018 there was a sigma convergence of economic growth in Indonesia and its major trading partners. As stated by Shankar and Shah (2001), if the coefficient of variation of a certain year is smaller than the coefficient of variation in the previous year, the convergent sigma occurs, on the other hand, if the coefficient of variation of a certain year is greater than the previous year, the convergent sigma does not occur.

Table 1. Coefficient of Variation of Indonesia and major trading partners

Year	Coefficient of Variation
2009	1.006
2010	0.996
2011	0.990
2012	0.984
2013	0.978
2014	0.973
2015	0.966
2016	0.959
2017	0.954
2018	0.949

Source. Data processed

B. *Absolute Beta Convergence*

Absolute beta convergence was calculated using panel data regression. The dependent variable was the natural logarithm of this year's per capita income divided by last year's per capita income (LnY), while the independent variable was the natural logarithm of last year's per capita income (LnYt-1). The panel data regression model consists of the Common Effect Model, Fixed Effects Model and Random Effect Model. Therefore, the Chow test and Hausman test were conducted first to select the appropriate regression model. Based on the results of the Chow test and the Hausman test, it can be concluded that the appropriate model was the Random Effect Model. The results of panel data regression for absolute beta convergence were presented in Table 2.

Based on the results of the random effect model regression, LnYt-1 variable has a t-count value of (-3.889296) > a t-table value of (1.982173) with probability (0.0002) < alpha (0.05). In addition, the value of LnYt-1 has a coefficient of -0.011414, a negative sign on LnYt-1 indicates that there was absolute convergence of economic growth in Indonesia and major trading partner countries. In addition, it shows that the previous year's per capita income has an effect on the country's economic growth.

Based on the results of the random effect model regression, the value of f-count was (15.25) > f-table (3,929). So that Ho is rejected and Ha is accepted that statistically the independent variable, namely LnYt-1, together has a significant effect on the dependent variable, namely LnY.

The regression results of the random effect model show that the coefficient of determination (R^2) was 0.123778. This means that 12.3% of changes in LnY in Indonesia and major trading partner countries can be explained by the independent variable, namely LnYt-1. Meanwhile, 87.7% was explained by other variables not included in the model.

Table 2. Result of Random Effect Model Regression for Absolute Beta Convergence

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.139299	0.027656	5.036830	0.0000
LNYt-1	-0.011414	0.002935	-3.889296	0.0002
Effects Specification				
			S.D.	Rho
Cross-section random			0.011912	0.2791
Idiosyncratic random			0.019145	0.7209
Weighted Statistics				
R-squared	0.123778	Mean dependent var		0.014900
Adjusted R-squared	0.115665	S.D. dependent var		0.020272
S.E. of regression	0.019064	Sum squared resid		0.039250
F-statistic	15.25641	Durbin-Watson stat		2.141082
Prob(F-statistic)	0.000164			

The conditional beta convergence was calculated using panel data regression. In contrast to absolute beta convergence, conditional beta convergence assumes that the structural characteristics between countries or regions were different so that convergence was influenced by the structural characteristics of the country or region. The dependent variable was the natural logarithm of this year's per capita income divided by last year's per capita income (LnY) while the independent variable were the natural logarithm of last year's capita income (LnYt-1), FDI (LnFDI), labor (LnTK) and net exports (LnNX) . The panel

data regression model consists of the Common Effect Model, Fixed Effects Model and Random Effect Model. Therefore, the Chow test and Hausman test were conducted first to select the appropriate regression model.

Based on the results of the Chow test and the Hausman test, it can be concluded that the appropriate model was the Random Effect Model. The results of panel data regression for conditional beta convergence were presented in Table 3.

Table 3. Result of Random Effect Model Regression for Conditional Beta Convergence

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010361	0.093924	0.110316	0.9124
LNYt-1	-0.016388	0.003634	-4.509306	0.0000
LNFDI	0.009941	0.002301	4.319793	0.0000
LNTK	-0.003647	0.003151	-1.157358	0.2498
LNNX	5.48E-05	0.001300	0.042181	0.9664
Effects Specification				
			S.D.	Rho
Cross-section random			0.011290	0.2972
Idiosyncratic random			0.017361	0.7028
Weighted Statistics				
R-squared	0.258974	Mean dependent var		0.014523
Adjusted R-squared	0.230473	S.D. dependent var		0.020170
S.E. of regression	0.017718	Sum squared resid		0.032650
F-statistic	9.086475	Durbin-Watson stat		2.181860
Prob(F-statistic)	0.000002			

(0.0000) < alpha (0.05). In addition, the value of LnYt-1 had a coefficient of -0.016388, a negative sign on LnYt-1 indicates that there was a conditional beta convergence of economic growth in Indonesia and major trading partner countries. In addition, it shows that the previous year's per capita income has an effect on the country's economic growth.

Based on the results of the random effect model regression, the LnFDI variable had a t-count value of (4.319793) > a t-table value of (1.982173) with a probability (0.0000) < alpha (0.05). This means Ho is rejected and Ha is accepted so it can be concluded that the foreign direct investment variable had a positive and significant effect on the convergence of economic growth in Indonesia and its major trading partners.

Based on the results of the random effect model regression, the LnTK variable had a t-count value of (-1,157358) < t-table value of (-1,982173) with probability (0.2498) > alpha (0.05). This means Ho is accepted, so it can be concluded that the labor variable does not have a significant effect on the convergence of economic growth in Indonesia and its major trading partners.

Based on the results of the random effect model regression, the LnNX variable had a t-count value of (0.042181) < t-table value of (1.982173) with probability (0.9664) > alpha (0.05). This means Ho is accepted, so it can be concluded that the net export variable does not have a significant effect on the convergence of economic growth in Indonesia and its major trading partners.

Based on the results of the random effect model regression, the value of f-count was (9.086475) > f-table (3.929). So that Ho is rejected and Ha is accepted that statistically the independent variables, namely LnYt-1, LnFDI, LnTK, LnNX together have a significant effect on the dependent variable, namely LnY.

The coefficient of determination shows how much the ability of the independent variable to explain the dependent variable. The regression results of the random effect model showed the coefficient of determination (R^2) was 0.258974. This means that 25.8% of changes in LnY in Indonesia and major trading partner countries can be explained by independent variables, namely LnYt-1, LnFDI, LnTK, LnNX. Meanwhile, 74.2% was explained by other variables not included in the model.

V. DISCUSSION

The coefficient of variation which continues to decline every year shows that sigma convergence occurs in Indonesia and major trading partner countries. As stated by Shankar and Shah (2001) that if the coefficient of variation in a certain year is smaller than the coefficient of variation in the previous year, a convergent sigma occurs. The occurrence of sigma convergence shows that the per capita income gap between Indonesia and major trading partner countries was decreasing. This was indicated by the lower growth rate of income per capita in developed countries compared to developing countries.

Sigma convergence only addresses the per capita income gap between developed and poor countries and whether poor countries can reduce the gap over time. So that, to see further whether there was convergence, a beta convergence measurement was carried out.

Based on the regression results using the random effect model, the coefficient value of LnYt-1 for absolute beta convergence was negative and significant. This shows that there was absolute beta convergence in Indonesia and major trading partner countries. As stated by Yusianto and Keni (2013), if the regression coefficient on initial per capita income is negative, it means that the economy of a poor country or region grows faster than a rich country or region so that it is said to have absolute beta convergence. In addition, the results obtained through absolute beta convergence were in line with the measurement results of sigma convergence. So this reinforces the conclusion that

there was a convergence of per capita income in Indonesia and the main trading partner countries.

Based on the results of the random effect model regression for conditional beta convergence, the LnYt-1 coefficient was less than one. So it can be concluded that there was conditional beta convergence in Indonesia and the main trading partner countries.

The conditional beta convergence explains how poor regional economies have a tendency to grow faster than rich countries by looking at the growth in per capita income and using other factors outside of per capita income. Based on the regression results, the factor affecting the growth in per capita income was FDI. This was due to the existence of investment inflows that can support economic activity in that country. In countries with a level of income per capita below the average, the level of FDI greatly influences the increase in income per capita. Countries that classified as developing countries were considered to be profitable as investment destination countries. So that investment can support the convergence process in developing countries.

Therefore based on the calculation of sigma convergence, absolute beta convergence and conditional beta convergence, it can be concluded that there was a convergence of per capita income or economic growth in Indonesia and major trading partner countries. The results of this study were supported by Yusianto and Keni (2013).

V. CONCLUSION

Based on the calculation and explanation, it can be concluded that sigma convergence, absolute beta convergence, and conditional beta convergence of per capita income were occured between Indonesia and major trading partner countries. In addition, FDI had a positive and significant effect on conditional convergence of per capita income, while labor and net exports have no significant effect on conditional beta convergence of Indonesia and major trading partner countries.

VI. SUGGESTION

Countries with per capita income below average have begun to catch up against developed countries but the difference in levels of per capita income was still quite high. So that countries such as Indonesia, India, China, Malaysia, Vietnam and Thailand need to encourage economic activities that support an increase in national income.

Absolute beta convergence emphasizes the growth of per capita income so that it was the same as sigma convergence, that the state needs to encourage economic activity to support an increase in national income. Conditional beta convergence assumes that each country had a different structure and characteristics so that countries need to review the characteristics that will affect the conditional beta convergence process. In this case, it was FDI, so the country needs to create a favorable and profitable business climate to attract investors in order to increase the country's productivity and ultimately increase the growth of income per capita.

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