The Convergence of Economic Growth between District/Cities in Papua Province

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Abstract

Differences in economic growth, geographical conditions, and potential between regions cause development inequality. Therefore, there is a need for inter-regional convergence. The convergence will explain the equality of economic growth between regions. Papua Province has 29 regencies/cities with different economic characteristics and inequality. The purpose of this study was to determine the convergence in Papua Province based on the concept of convergent sigma and beta. This research was conducted using panel data regression analysis techniques. The research method used is sigma convergence, absolute beta convergence, and conditional beta convergence. The results of this study are the existence of sigma convergence, absolute beta convergence, and conditional beta convergence between districts/cities in Papua Province in 2010-2020. In addition, there is a positive and significant correlation between education, electricity, and economic growth, but there is no significant relationship between roads, vehicles, and economic growth.

I. Introduction

The implementation of development in Indonesia has been going on for quite a long time, from the old order era to the reform era. One of the challenges faced is the disparity between regions. One of the provinces currently being pushed for development in Papua Province. Papua Province is one of the provinces that has very abundant natural potential and has 29 regencies/cities that have diversity between regencies/cities. Although the economic conditions in Papua Province have improved and have extraordinary natural potential and have a very strategic position Papua Province is a province that is included in the top 10 provinces with the poorest population. Papua Province occupies the first position with a poverty rate of 26.80%. This shows that development efforts carried out in Papua are still not optimal and cause quite complex problems. Another problem that occurs in Papua Province is the problem of inequality.

It is known that there are differences in growth rates in Papua Province where the highest growth rate is in Jayapura district while the lowest is in Mimika District. In addition, there is an unequal distribution of population expenditure which causes inequality. Unequal distribution of expenditure can be seen through the Gini ratio. The Gini ratio of the villagers in Papua Province is 0.414. In addition, the Gini ratio in urban areas was 0.296 which increased by 0.001 compared to the previous month. Based on this, it can be concluded that the level of inequality in population spending based on the Gini Ratio in Papua in March 2020 was high because the value was above the national inequality of 0.381.

Based on this, it is known that there is a development disparity that includes differences in the rate of growth between regencies/cities and is accompanied by the development of inequality in income expenditures in Papua Province which can be seen from the Gini ratio. Therefore, we need an approach that can predict the equality of economic growth between regions. One appropriate approach is the convergence approach. According to Barro Sala-i Martin (in the journal Aulia, 2019), convergence is the hope of poor regions to catch up with rich regions. Convergence conditions are achieved at different speeds (Supriyanti, 2020).

Based on research by Adha and Wahyunadi (2015), the speed of convergence in NTB is around 3% per year. The convergence approach in this research is carried out to see the extent to which economic equality will occur. Thus, the convergence approach can support research to see the time it takes to reach convergence and see what factors affect the speed of convergence.

This research was conducted in Papua because Papua is one of the provinces that experienced an increase in economic growth in 2020 when other provinces experienced contractions, while the research time used was from 2010 to 2020 to describe the dynamics of the characteristics of development outcomes and meet the requirements for observations with econometric models.

II. Review of Literature

2.1 Convergence Theory

According to Barro and Sala-i-Martin, there are two concepts of convergence in the analysis of economic growth between countries or regions. First, -convergence states that the economic growth of poor countries or regions is faster than that of rich countries or regions so that poor countries or regions catch up. Second, -convergence where there is a continuous decrease in the disparity of per capita income as measured by the standard deviation, the logarithm of per capita income between countries or regions. The concept of the first convergence will result in the second convergence. However, in the process, it is balanced with disturbing factors that tend to increase the disparity. The relationship between these two concepts can be expressed in the following model (Wau, 2015).

$$\log\left(\frac{Y_{i,t}}{Y_{i,t-1}}\right) = a_{i,t} - \left(1 - e^{-\beta}\right).\log(Y_{i,t-1}) + \varphi_{i,t}$$

2.2 Neoclassical Growth Theory

This theory was developed by Robert M. Solow and TW Swan. This growth model uses elements of population growth, capital accumulation, technological progress, and the amount of output that interact with each other. This model uses a production function model that allows for substitution between capital and labor. Based on this theory, the growth rate comes from three sources, namely capital accumulation, increased labor supply, and technological improvements (Tarigan, 2005). The Solow growth model on economic growth can be formulated as follows (Mankiw, 2013).

$$Y = Ak^a L^{1-a}$$

2.3 Endogenous Growth Theory

Growth theory is an economic model that optimizes the potential that exists within a country. This model prioritizes human resources with the power of science, natural resources, technological assets, and institutions (Saefuddin, 2019).

Economic growth can be measured by an increase in Gross Domestic Product (GDP) or Gross Regional Domestic Product (PDRB), where an increase in GDP or GRDP is considered as a measure of economic growth regardless of whether the increase is greater or less than the population growth rate or whether changes in structure economy happens or not (Suriani, et al., 2019). The GRDP used in this study is GRDP at constant prices, to determine economic growth from year to year. (Hakim, M et al. 2021)

According to this model, savings and investment can promote sustainable growth. To illustrate the idea behind the theory of endogenous growth is as follows.
Y=AK

III. Research Methods

This study uses secondary data obtained from the Central Bureau of Statistics of Papua Province which consists of GRDP, Electricity Users, Length of Roads, Number of Vehicles available between regencies/cities in Papua Province in 2010-2020.

3.1. Sigma Convergence

Convergence is one of the convergence concepts that can be measured by calculating the distribution of per capita income in a country or region. The calculation of the spread is based on the results of the coefficient of variation each year. If the coefficient value decreases every year, sigma convergence will occur (Sari, 2018). The Sigma Convergence Equation is as follows:

$$CV = \frac{\sqrt{\frac{\sum(Y_i - \overline{Y})^2}{n}}}{\overline{Y}}$$

Where CV is the coefficient of variation in a certain year, is the GRDP in each district/city in a certain year, is the average GRDP, and n is the number of districts or cities.

3.2. Absolute Beta Convergence

This model has an assumption where there is a negative correlation between GRDP growth and GRDP in the previous year without being influenced by other factors. The beta hypothesis is said to occur if there is a negative and significant correlation. According to Barro Sala-i Martin (in the journal Young, 2018), the absolute convergence equation is as follows:

$$\ln\left(\frac{Y_{it}}{Y_{it-1}}\right) = \beta_0 + \beta_1 \ln(Y_{it-1}) + \epsilon_1 \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where, $\ln\left(\frac{Y_{it}}{Y_{it-1}}\right)$ is the growth rate of GRDP per capita, Y_{it-1} is the PDRB of the district/city in the previous year, is the GRDP of the district/city of year t, and is the estimated parameter, and is the normally distributed error. After it is known whether or not convergence occurs, the next step is to determine the speed of convergence (speed convergence) and the time required for an area to eliminate the gap that occurs (Half time). Based on this, the following will explain the equation of the speed of convergence and half time.

$$\text{Convergence Speed } (\beta) = \frac{\ln(b+1)}{T}$$

$$\textit{Half Time } (h) = \frac{\ln(2)}{\beta}$$

Where b is the value of the GRDP coefficient and T is the amount of time used in the study.

3.3. Conditional Beta Convergence

This concept has the assumption that there is a negative relationship between GRDP growth and GRDP in the previous year and other factors that affect GRDP growth. The beta hypothesis is said to occur if there is a negative and significant correlation. The equation for testing the existence of conditional beta convergence in this study is (in the journal Achmad, 2017):

$$\ln\left(\frac{Y_{it}}{Y_{it-1}}\right) = \beta_0 + \beta_1 L_n Y_{it-1} + \beta_2 L_n Pend + \beta_3 L_n JB + \beta_{4L_n} Lis + \beta_5 L_n Jln + \epsilon$$

Where, $\ln\left(\frac{Y_{it}}{Y_{it-1}}\right)$ is the economic growth of districts/cities based on constant prices in 2010-2020. The independent variables in the convergence model are the district/city GRDP of the previous year $(L_n Y_{it-1})$, minimum education level of high school SLTA $(L_n Pend)$, number of motorized vehicles $(L_n JB)$, electricity customers $(L_n lis)$, and the length of roads with good condition $(L_n jln)$ And ϵ is an error. In this study, regression techniques were used. Panel data analysis technique with panel data regression is used in this study because it has the advantages of having a lot of information, lots of variation, little collinearity between variables, has many degrees of freedom, and is more efficient (Gujarati, 2013).

IV. Results and Discussion

4.1. Sigma Convergence Analysis Results

Results of this study indicate that there is sigma convergence between districts/cities in Papua Province. This is because the results of the convergence calculation have a downward trend. Based on the results of the study obtained the results of the sigma convergence calculation. Based on these results, it indicates the occurrence of sigma convergence between regencies/cities in Papua Province as indicated by a decrease in the dispersion of per capita income. These shows a decrease in income inequality where regions that tend to be poor and lagging are likely to grow faster than richer regions. This is in line with Barro Sala I-Martin's theory of convergence, namely the occurrence of a continuous decrease in income disparity per capita (Sigma convergence) which can be measured by standard deviation and logarithm of GRDP per capita or the coefficient of variation of GRDP per capita each year.

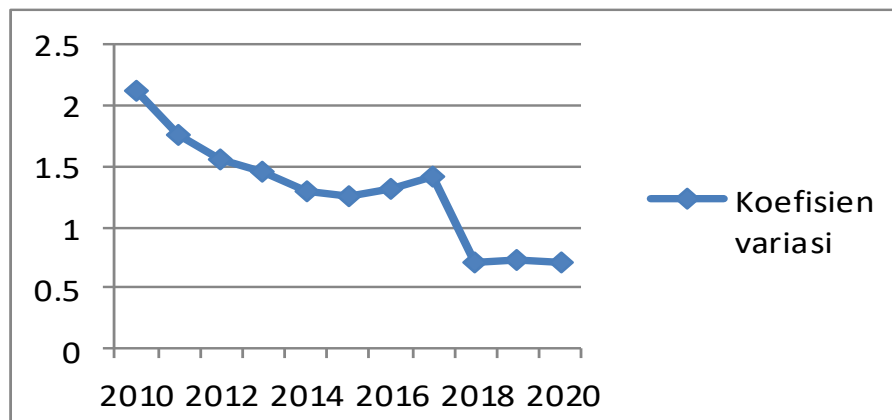Based on this, Figure 1 will clearly explain the sigma convergence between districts/cities in Papua Province.

Figure 1. *Sigma Convergence*

Based on Figure 1. It is known that the coefficient of variation from 2010 to 2020 as a whole shows a declining trend. Where in 2010 it was 2.1...% and in 2020 it was 0.703...%. Based on these results, it indicates the occurrence of sigma convergence between regencies/cities in Papua Province as indicated by a decrease in the dispersion of per capita income.

4.2. Absolute Beta Convergence Analysis Results

Based on the results of the study, it is known that there is absolute beta convergence between districts/cities in Papua Province. Based on the results of the analysis, it is known that there is absolute beta convergence between districts/cities in Papua Province in 2010-2020 which is marked by a negative correlation between GRDP and economic growth. This is following the absolute beta convergence hypothesis where the economy of underdeveloped regions or regions tends to grow faster than developed regions without paying attention to or paying attention to other economic characteristics that influence economic growth. Based on this, table 1.1 will explain the results of the calculation of absolute beta convergence analysis.

Table 1. Absolute Beta Convergence.

Variable	Coefficient	Standard Eror	Probability
C	10,07242	0,215616	0,0000
PDRB	-0,698696	0,015227	0,0000
R-squared	0,880968		
Adjusted R-Squared	0,869023		

Based on the results of the convergence test in table 1.1, it is known that the GRDP coefficient is -0.698696 with a significance level of 5%. This means that there is an absolute beta convergence between districts/cities in Papua Province in 2010-2020. In addition, in table 1.1 there are R-squared and Adjusted R-Squared values. This value is useful to describe how much influence the independent variable, namely GRDP, has on the dependent variable, namely economic growth. Based on this, it is known that the adjusted R-squared value is 0.869023. This means that 87 percent of economic growth in Papua Province is influenced by GRDP while the rest is influenced by factors other than GRDP.

4.3. Results of Conditional Beta Convergence

Based on the results of the analysis, it is known that between districts/cities in Papua Province experienced conditional beta convergence. This is indicated by the regression results between GRDP and economic variables with economic growth where there is a negative and significant correlation between GRDP and economic growth. This is by the conditional beta convergence hypothesis, namely, convergence will occur if there is a negative and significant correlation between GRDP and economic growth and pay attention to other economic characteristics that are considered to influence the acceleration of economic growth. In this study, the economic characteristics used were education (number of students with the highest education level, namely high school), vehicles (number of motorized vehicles), electricity (number of electricity users), and roads (length of roads with the good condition). Table 1.2 will explain in detail conditional beta convergence.

Table 2. Conditional Beta Convergence

Variable	Coefficient	Probability
C	10,19221	0,0000
LN GRDP	-0,752490	0,0000
Education LN	0,072183	0,0000
Vehicle LN	0,001020	0,9103
LN Electric	0,035625	0,0035
LN_Street	-0,018562	0,1350
R squared	0,893237	
Adjusted R-Squared	0,880874	

Based on table 2, it is known that GRDP has a negative and significant correlation to economic growth. This is indicated by the GRDP coefficient value of -0.752490 and is significant at the 5 (five) percent level. In addition, there are several economic characteristics selected to determine their effect on the acceleration of economic growth. Based on table 1.2, it is known that education has a positive and significant correlation to economic growth with a coefficient value of 0.072183 and a probability of 0.0000. Furthermore, the vehicle variable has a positive but not significant correlation to economic growth. This is because the coefficient value of the vehicle variable is 0.001020 with a probability greater than the significant level ($\alpha=5\%$).

The electricity variable has a positive and significant correlation to economic growth where the coefficient value of the electricity variable is 0.035625. Meanwhile, the last variable is the road has a negative and insignificant correlation to economic growth. It is known from the coefficient value of the road variable, which is -0.0018562 and the probability value is greater than the significance level ($\alpha=5\%$). In addition, in table 1.3 there are values of R-squared and Adjusted R-squared which function to determine how much the model's ability to explain the dependent variable. Based on table 4.8, it is known that the adjusted R-squared value is 0.880874.

This means that 88 percent of the additional economic growth between districts/cities in Papua Province in 2010-2020 is influenced by GRDP, education (number of students with the highest level, namely high school), vehicles (number of motorized vehicles), electricity (number of electricity users), and roads (length of roads in good condition).

4.4. Convergence Speed and Half Time

Based on the results of the analysis of absolute beta convergence and conditional beta convergence, it can then be seen how quickly GRDP can reach a steady-state and the time required to eliminate half the gap that occurs. Based on this, table 1.3 will explain the rate of convergence and the time required to reach steady-state (half time).

Table 3. Convergence Speed and Half Time

Convergence	Speed Convergence	Half Time
Absolute Beta Convergence	0,0482	14,39
Conditional Beta Convergence	0,051	13.59

Based on table 3, it is known that the absolute beta convergence speed is 0.0482 or 4.8 percent. This indicates that regencies/cities in Papua Province, especially regencies/cities with low GRDP, must grow at least 4.8 percent per year so that the growth dispersion will

decrease. In addition, the time required to cover half of the inequality in economic growth is 14.39 years. In addition, the speed of convergence is 0.051 or 5.1 percent and half time is 13.59 years. This means that economic growth will reach convergence if the GRDP of each region, especially underdeveloped areas, is at least 5.1 percent per year with the required time of 13.59 years. This time is calculated faster than absolute beta convergence which does not take into account economic characteristics. Based on this, it is known that in addition to GRDP, economic characteristics can also affect the acceleration of economic growth.

V. Conclusion

Based on the results of the study, it is known that there is sigma convergence which can be seen from the decreasing trend of the coefficient of variation from 2010-2020 and there is a trend of increasing the average GRDP from 2010 to 2020, absolute beta convergence as seen from the negative and significant correlation between GRDP and growth the economy is -0.698696 and the probability is 0.000 and beta convergence is conditional on a negative and significant correlation between GRDP and economic growth and taking into account other economic characteristics.

That can be conveyed from the results of this research is that this research is expected to be used as a reference for the central government and provincial governments to make policies to reduce inequality and accelerate the convergence of economic growth, especially in Papua Province.

References

Aulia, Muhammad Gyda. (2019). Analisis Konvergensi Pertumbuhan Ekonomi Provinsi Jawa Barat Tahun 2007-2016. *Jurnal Ilmiah Universitas Brawijaya*.

Gujarati, Damodar N. Dan Dawan C. Porter. (2013). *Dasar-dasar Ekonometrika*. Jakarta: Salemba Empat.

Hakim, M. et al. (2021). Analysis of the Influence of Tourism Growth on Economic Growth and Human Development Index in West Java Province 2012-2018. Budapest International Research and Critics Institute-Journal (BIRCI-Journal). P. 160-169.

Mankiw, N. Gregory. (2008). *Makro Ekonomi Edisi keenam*. Jakarta: Erlangga.

Sari, Velda Nurmala (2018). Analisis Konvergensi Pertumbuhan Ekonomi dan Konvergensi Inflasi Pada 63 Kabupaten/Kota di Indonesia. *Jurnal Ilmiah Mahasiswa FEB Universitas Brawijaya*. 6(2):1-16.

Supriyanti, Any, et.al. (2019). Analysis of Regional Development Disparities in Situbondo Regency: Sigma Convergence Approach. *IJARSET*. 6(12):12035-12043.

Tarigan, Robinson. (2005). *Ekonomi Regional (Teori dan Aplikasi)*. Jakarta: PT. Bumi Aksara.

Wau, Taosige. 2015. Konvergensi pembangunan Ekonomi Antar Daerah Kabupaten dan Kota di Sumatera Utara. *SNEMA*. 104-115.

Young, Andrew T. et.al. (2018). Sigma Convergence Versus Beta Convergence: Evidence from U.S. Country-Level Data. *Journal of Money Credit and Banking*. 40(5):1083-1093.

Supriyanti, Eny. (2020). Disparitas Wilayah dan Konvergensi Pertumbuhan Ekonomi di Kabupaten Situbondo: Pendekatan Sigma dan Beta Konvergen. *Tesis*. Universitas Jember.

Saefuddin, Asep. (2019). Model Pertumbuhan Ekonomi Endogen. https://www.ybb.or.id/model-pertumbuhan-ekonomi-endogen/ [Diakses 19 Januari 2021].