Ekonomi dan Bisnis
Vol.11, No.1, 2024, 78-94
DOI: 10.35590/jeb.v10i1.7697
P-ISSN 2356-0282 | E-ISSN 2684-7582

Received : 25 March 2024
Revised : 16 July 2024
Accepted : 25 July 2024

Convergence of Regional Income Among Provinces in Kalimantan

Fikrie Lazuardi Imaduddin[1)], Bayu Kharisma[2*)]
bayu.kharisma@unpad.ac.id
[1,2]Master of Applied Economic, Faculty of Economic & Business,
Universitas Padjadjaran

Abstrak

Perekonomian Indonesia menunjukkan bahwa Kalimantan memiliki peran penting dalam perekonomian nasional, dengan kontribusi sebesar 8,45% pada tahun 2014, menempatkannya sebagai yang terbesar ketiga setelah Jawa dan Sumatera. Namun, terdapat kesenjangan pendapatan antar provinsi di Kalimantan, yang mengakibatkan kesenjangan pembangunan ekonomi. Oleh karena itu, pemerintah harus secara bertahap meningkatkan investasi dan sektor industri untuk meratakan distribusi pendapatan. Penelitian ini bertujuan untuk menganalisis konvergensi sigma dan beta provinsi-provinsi di Kalimantan. Hasil penelitian menunjukkan bahwa perekonomian provinsi-provinsi di Kalimantan masih perlu diperbaiki. Tingkat penyebaran pendapatan per kapita dari tahun 2000-2021 telah membaik, atau terjadi konvergensi sigma. Melalui analisis data panel dinamis, ditemukan bahwa konvergensi beta absolut dan beta bersyarat terjadi pada tingkat di seluruh wilayah Kalimantan. Tingkat konvergensi beta bersyarat menunjukkan bahwa variabel-variabel yang mewakili faktor-faktor produksi dapat mempercepat tingkat konvergensi. Variabel yang mempengaruhi pertumbuhan pendapatan dan proses konvergensi adalah PMA, PMDN, Industri, dan pendapatan asli daerah.

Keywords: Pertumbuhan Ekonomi, Konvergensi, Investasi, Industri, Fiskal.

Abstract

The Indonesian economy shows that Kalimantan has an important role in the national economy, contributing 8.45% in 2014, placing it as the third largest after Java and Sumatra. However, there are income disparities between provinces in Kalimantan, resulting in disparities in economic development. Therefore, the government must gradually increase investment and the industrial sector to even out income distribution. This research aims to analyze the Kalimantan provinces' sigma and beta convergence. The results indicate that the provinces' economies in Kalimantan still need to be fixed. The per capita income dispersion level from 2000-2021 has improved, or sigma convergence has occurred. Through dynamic panel data analysis, it was found that absolute and conditional beta convergence occurred at levels throughout the Kalimantan region. The conditional beta convergence rate shows that the

Cite This As: Imaduddin, et al, 2024. Convergence of Regional Income Among Provinces in Kalimantan. *Ekonomi dan Bisnis*, 11(1), 78-94 doi.org/10.35590/jeb.v10i1.7697

variables representing production factors can accelerate the convergence rate. Variables influencing income growth and the convergence process are FDI, DI, Industry, and locally generated revenue.

Keywords*: Economic Growth, Convergence, Investment, Industry, Fiscal.*

Introduction

Regional development is an integral part of advancing the nation to improve the population's standard of living and reduce disparities between regions. It addresses inequality and improves the balance between developed and developing regions. In this context, it is expected that each region will be able to manage development effectively to achieve significant economic growth and fairer income distribution, which will ultimately reduce inequality and improve people's living standards or welfare(Smirnykh & Wörgötter, 2021). Generally, development in various world regions often focuses on economic growth. The view is that with the development of the economy, it is expected that the region can improve the welfare of its people. However, the more interesting goal of economic growth is that all levels of society can enjoy the positive benefits. However, there is an imbalance between high economic growth and the equitable distribution of welfare in society (Johnson & Papageorgiou, 2020).

Between 1950 and 1990, several countries experienced economic progress after experiencing various political dynamics and the aftermath of two World Wars. In general, the rapid economic growth that most Asian countries have experienced in recent decades results from a combination of factors, including government policies, investment in infrastructure and education, and an emphasis on export-oriented and high-tech manufacturing industries. China, for example, has experienced significant economic growth in recent years, as evidenced by its average GDP growth of more than 9% per year from 1978 to 2013. This growth was largely driven by the country's emphasis on manufacturing and exports and the adoption of market-oriented economic reforms. Similarly, Japan in the 1960s and 1970s grew at an average rate of about 9% per year. South Korea and Taiwan have also experienced significant economic growth in recent decades. The growth rate for South Korea was 6.7%, while for Taiwan, it was 6.0% in 1960-2019. Japan became the first major country in Asia to achieve the highest economic growth. Japan's GDP to US ratio in 1980 reached 1:2.6, in 1990 reached 1:0.96, and finally, in 2021, it reached 1:5, making it the world's third largest economic growth country (Fournier et al., 2022).

Indonesia, one of the world's most diverse nations, is made up of hundreds of ethnic groups that are dispersed across the biggest archipelago in the world, each with their own distinct culture and systems of religion. The nation has endured significant regional disparities in the economy ever since gaining its independence (Aginta et al., 2023). The most developed area, notably in the capital-intensive processing sectors of the Java and Sumatra islands, and the remote areas with minimal connectivity to other regions demonstrate the inequality. Reducing regional inequality and promoting regional convergence is therefore one of the primary issues in Indonesia's development setting The problem of regional income

convergence in Indonesia refers to the disparities in economic development between different regions of the country and the tendency for these disparities to diminish over time. With its vast archipelago and diverse regional characteristics, Indonesia faces significant challenges and opportunities in addressing this issue.

Specifically, Kalimantan is a region that has received a major focus in efforts to align Indonesia's economic development. As illustrated in Figure 1 below, Kalimantan is a part of Indonesia with striking economic development in each region, which contributes positively to the national economy. The GRDP of all provinces in Kalimantan still contributes significantly to the national economy over the last ten years, with an average of 9.46% of Indonesia's total GDP. Thus, Kalimantan is a region that has an important role in national development and needs to be considered in efforts to integrate Indonesia's development. However, there is an income gap on the island of Kalimantan, as evidenced by the variation in GRDP in each province in Kalimantan between 2000 and 2021. In terms of GRDP per capita, during the last 20 years, East Kalimantan has an average growth rate of 8.48%, which is 1.12 times slower than the average growth of South Kalimantan, which reached 9.43%. Central Kalimantan has the fastest rate of 10.51%, 1.15 times faster than South Kalimantan. The difference in per capita GRDP growth rates between provinces emphasizes the need to analyze the factors influencing this economic disparity.

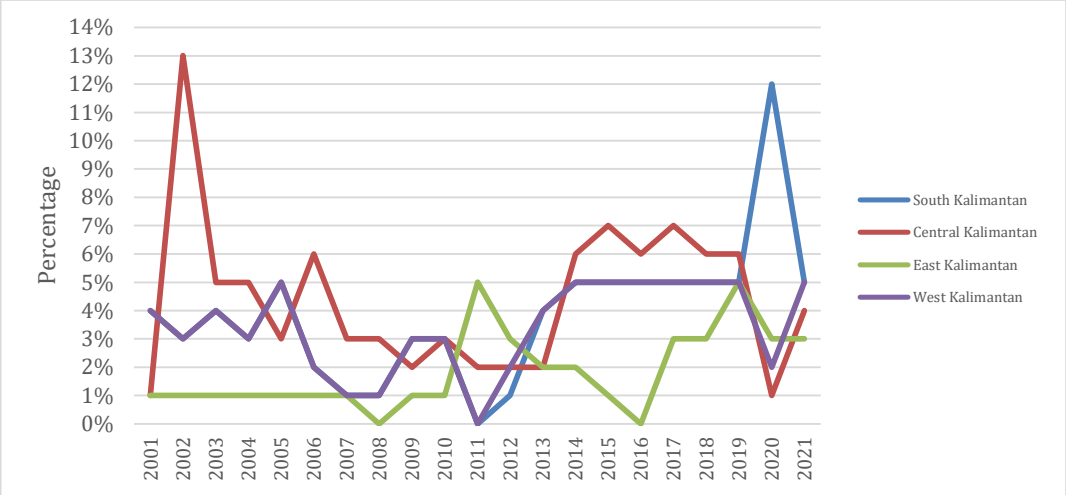

Figure 1. Ecnomic Growth in all Provinces in Kalimantan.
Source: Badan Pusat Statistik, 2001-2021

Kalimantan has the potential to be a rich region with high economic development apart from Java and Sumatra. However, the high income disparity in the region indicates that economic progress in Kalimantan has not yet reached its optimal peak. Although inequality does not necessarily reflect the effectiveness of development distribution policies, a high level of inequality may indicate that development has not been evenly distributed across the region.

The study of interregional convergence has long been of interest to economists and policymakers who use various analytical methods. Smirnykh &

Wörgötter (2021) conducted the research with the concept of two convergences. The first, called β-convergence, relates to the economies of poorer category countries having faster growth than developed countries, and the second, called α-convergence, involves the order over time of a country's per capita income. Cavallaro & Villani (2021) have also examined a similar topic, but specifically for countries that belong to the European Union. They examined how successful the European Union was in integrating its economy in 1960 - 1995. The empirical results showed ongoing convergence among EU economies over the entire sample period, except the sub-period in 1980-1985. When a 10-year sub-period is used (1980-1989), it can be seen that convergence in the EU is very strong and uninterrupted. The study also examines convergence or divergence among groups of EU countries. Comparing convergence between the five continents, the EU15 and APEC, it was found that the EU was the group of countries that successfully pursued economic convergence during the last three and a half decades of 1960-1995. In addition, studies on economic convergence range from regional income convergence. According to Savoia (2019), the change in the shape of income distribution that leads to an increase in inequality is an improvement obtained by one region at the top of the income distribution. However, the situation of other regions below it also has a share. In addition, Bobeva's research (2021) analyzed convergence in 24 European Union member countries from 1994-2016. In this study, the unit of analysis includes regions within the country and 24 EU member states. In the study, sigma convergence occurred between 1990-2013 and 2004-2013. A study conducted by Ranjbar & Rassekh (2017) even predicted that the value of supporting variables affecting convergence in China, Japan, and Korea will decrease between 2008 and 2050. In light of the disparities between the abovementioned studies, the current study aims to analyze the sigma and beta convergence of provinces in Kalimantan.

This research is expected to provide a meaningful empirical contribution to the study of Convergence Of Regional Income Among Province In Kalimantan. Kalimantan, one of the developing provinces in Indonesia, has made significant national contributions, especially after Java and Sumatra. However, despite this, there are still inequalities in growth and development between regions in Kalimantan. To achieve sustainable development, each region in Kalimantan needs to prioritize increasing economic growth. This factor is key to sustainable development in both developed and developing regions.

Research Method

Data

This study uses secondary data from the Central Statistics Agency (BPS). The data used is panel data in the form of cross-section data with five (5) provinces and time series data from 2000 - 2021, where in that period, there were two RPJMN, namely the RPJMN 2014 - 2019 (Bappenas, 2014) and 2020 - 2024 (Bappenas, 2020). The RPJMN sets several strategies, including increasing investment, developing human resources, and increasing economic competitiveness. One of the priority national programs is equitable development with a strategic focus on

improving regional competitiveness, which is expected to accelerate sustainable economic growth. This can also positively impact improving the welfare of the people in these regions.

Table 1. List of Variable

No	Variables	Description
1.	PDRB (Y)	GRDP at Constant Prices
2.	PMA (X_1)	Realization of foreign investment in Kalimantan
3.	PMD (X_2)	Realization of domestic investment in Kalimantan
4	IND (X_3)	Development of value added (market price) in Kalimantan
5	PAD (X_4)	Realization of Regional Revenue for each province in Kalimantan
6	BDA (X_5)	Realization of Regional Expenditure for each province in Kalimantan

Estimation Strategy

This study uses static and dynamic panel data with the system of generalized method of moments (SYS-GMM) estimation method. SYS-GMM aims to overcome the endogeneity problem of the model and other classical assumption problems such as heteroscedasticity and autocorrelation, especially when the first lag of the dependent variable is included as an independent variable (Roodman, 2009). In addition, the use of dynamic panel data is done because current economic growth tends to be influenced by economic growth in the past. For this reason, it is necessary to add an independent variable in the form of a lag of the dependent variable (yt-1). The use of the lag of the dependent variable as an independent variable can be correlated with errors so that regression using pooled least square, random effect, and fixed effect gives inconsistent results (Georgiou, 2014). In addition, the use of cross-section regression methods in growth models has been criticized by Levine & Renelt, (2016) because the independent variables included in the specification or in other words the estimated value of the parameters changes very significantly when one or more variables are included or excluded from the model. This suggests the possibility of the model being subject to omitted variable bias problems.

Convergence theory is divided into two types: sigma and beta convergence. Sigma convergence is measured by observing income distribution. Sigma convergence occurs when income dispersion decreases (the variation value coefficient gets smaller). This indicates that income disparities are getting smaller over time. Meanwhile, beta convergence refers to neoclassical economic growth theory, which states that the economy will reach a condition where capital per worker can no longer grow, known as the steady state (Castelló-Climent et al., 2022). Beta convergence is divided into two categories, namely absolute and conditional beta. The difference lies in the independent variable, the coefficient of variation (CV) of income per capita.

Convergence theory derived from neoclassical economic growth theory is derived from applying the Cobb-Douglas production model with constant returns to scale. Based on Önder et al. (2014), the explanation can be detailed as follows.

$$Y = A_t K^{\alpha} L^{1-\alpha} \quad (1)$$

The Solow model presents variables such as Y as output, K as capital, and L as labor, while A indicates the level of technology. In this model, savings rate (s), population growth (n), and technological progress are considered exogenous variables (Manzi et al., 2023). The variables of technological growth (g) and population growth (n) represent each growth rate of A and L. Meanwhile, the share of output that is saved is considered as constant, hence:

$$k(t) = s\, y(t) - (n + g + \delta)k(t) \quad (2)$$

Using the steady state value of k in the equation above, the steady state income per capita is:

$$\ln\left[\frac{Y(t)}{L(t)}\right] = \ln A(0) + g_t + \frac{\alpha}{1-\alpha}\ln s - \frac{\alpha}{1-\alpha}\ln(n + g + s) \quad (3)$$

If y* denotes the steady state income level, then:

$$\frac{d\ln y_t}{dt} = \lambda\,(\ln y^* - \ln y_t) \quad (4)$$

Thus, the convergence model to be obtained based on neoclassical growth theory is:

$$\ln y_t = e^{-\lambda\tau}\ln y_{t-1} + (1 - e^{-\lambda\tau})\ln y^* \quad (5)$$

τ is the time period while λ is the rate of convergence. Abrhám & Vošta (2022) stated that the term economic convergence is used when two or more economies are heading towards similar levels of development and prosperity. On the other hand, the study of convergence is debated between neoclassical growth models, endogenous growth models, and distribution dynamics models. Sigma convergence is a concept formulated by Barro and Sala-i-Martin in 1995. This formula is able to capture inequality trends with the following formula:

$$CV_i = \frac{\frac{\sqrt{\sum_{i=1}^{n}(y_i - \underline{y})^2}}{n}}{\underline{y}} \quad (6)$$

If the coefficient of variation in a particular year is smaller than the sigma convergence of the previous year ($CV_t < CV_{t-1}$), it can be said that inequality has decreased. But if $CV_t > CV_{t-1}$, there is no reduction in inequality or in other words, the gap continues to widen. If the standard deviation decreases over time, it indicates sigma convergence. On the other hand, if the logarithm values of GRDP and inflation do not decrease over time, it does not prove sigma convergence. Therefore, the absence of sigma convergence can be interpreted as a clue that a region is not experiencing a convergence process or is actually experiencing divergence. Beta convergence includes absolute and conditional, where beta convergence is said to occur if the lag coefficient of the variable to be analyzed for convergence is smaller than 0, α_1, γ_1, $\beta_1 < 0$. Dynamic panel data is required as indicated by the lag of the dependent variable which is one of the independent variables in the same

regression model. The general form of dynamic panel data model according to Studenmund & Johnson (2016) is as follows:

$$y_{it} = \delta y_{i,t-1} + x'_{it}\beta + \mu_{it} \; ; \; i = 1,\ldots,N; t = 1,\ldots,T \tag{7}$$

Equation (7) can be developed and applied in this study. In detail, the equations to test whether unconditional convergence (equation 8) and conditional convergence occur (equation 9) can be written as follows:

$$lnY_{it} = \alpha_0 + \alpha_1 lnY_{i,t-1} + \epsilon_{it} \tag{8}$$

$$lnY_{it} = \theta_0 + \theta_1 lnY_{i,t-1} + \theta_2 lnPMA_{i,t-1} + \theta_3 lnPMD_{i,t-1} + \theta_4 lnIND_{i,t-1} + \theta_5 lnPAD_{i,t-1} + \theta_7 lnBDA_{i,t-1} + \epsilon_{it} \tag{9}$$

after the values of β in absolute and conditional convergence are known, the time required to close half of the initial gap called the half-life of convergence is calculated by the formula:

$$\beta = \frac{[ln(b+1)]}{T} \tag{10}$$

Furthermore, this study will calculate and analyze the half-life, which is the time needed to catch up to half in the lagging regions, as follows:

$$Half\ of\ Life = \frac{-ln(0.5)}{\beta} \text{ atau } \frac{ln(2)}{lnln\,(1+\ \beta)} \tag{11}$$

Result and Discussion

The sigma convergence analysis is a calculation used in economics. This approach focuses on changes in income inequality per capita over time. Sigma convergence is measured by calculating the standard deviation of real GRDP per capita divided by the average real GRDP per capita between provinces in Kalimantan 2000-2021. If the income differential among provinces in Kalimantan decreases each time, sigma convergence can occur among the five provinces in Kalimantan. Conversely, if income differences among provinces in Indonesia increase over time, then divergence over time, then divergence occurs in Indonesia.

The calculation of the coefficient of variation indicates that the growth of real GRDP per capita of the provinces in Kalimantan fluctuated from year to year during the study period, indicating the unstable growth of GRDP per capita of the provinces in Kalimantan. The difference in regional income had increased from 3.87% in 2000 to 6.89% in 2004. This increase was more driven by the expansion of new regions in Kalimantan. This is consistent with what Kurniawati & Suratman (2010) stated that in Kalimantan there was an increase in income differences in Kalimantan in early 2000. On the other hand, in the period from 2015 to 2018, σ convergence has occurred. Based on the calculation of the coefficient of variation of provinces in Kalimantan in 2000-2021, it shows that there is a decrease in the difference in real

GRDP per capita between provinces in Kalimantan in 2000-2021, namely from 5.98% to 4.37% in 2015-2018. The downward trend shows that there has been σ-convergence of economic growth between provinces in Kalimantan in 2000-2021, which means that there is an effort from the lagging provinces to catch up with the developed provinces. This is in line with research conducted by Wulandari & Istiqomah (2021) which states that σ-convergence has occurred in Kalimantan in 2014 to 2015.

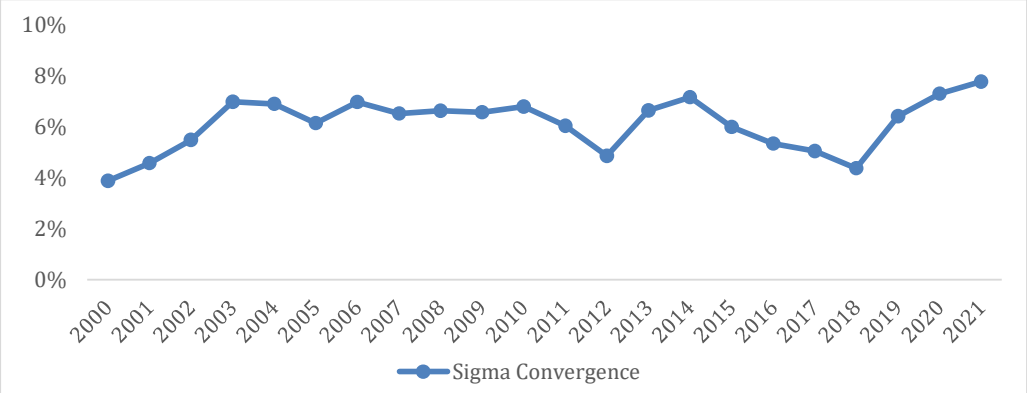

Figure 2. Dispersion of Income Across Provinces in Kalimantan, 2000-2021
Source: Author's Calculation

Basically, after the 1998 crisis period, the Indonesian economy weakened and the impact on income inequality between regions increased. In addition, public discontent was growing against the Soeharto government. Another factor affecting income disparity is fiscal decentralization in Indonesia, which has a huge impact on the regional economy. Actually, the result of increased economic growth is relatively higher in the central business districts and regions rich in natural resources than in regions with little natural resource wealth and non-business districts. However, in the midst of the global financial crisis in 2008-2009, economic growth in Kalimantan remained stable as Indonesia's economic growth tended to grow during that period. According Suharmi (2018), Indonesia's economy continued to grow due to significant support from the Chinese and Indian economies, despite a slowdown due to global economic turmoil. Indonesia has had the experience of facing an economic crisis in the previous decade so it has anticipated it by actively building infrastructure to attract foreign investors to place their funds in the domestic market to boost economic growth and create new jobs. In anticipation of a slowing market, the country lowered its economic growth and inflation targets.

In the period 2013 - 2014, income differences increased again, this was due to the General Election in 2014. The general election gave a boost to the increase in consumption, investment and money supply in the period before, during and after the election. According to Hakim & Purnamasari (2014) in his research shows that elections cause an increase in money supply during the quarter leading up to and during elections, but are negative in the post-election period. Elections have a positive impact on money supply due to increased campaign spending, including in the regions. At the same time, interested investors also contribute funds as a form

of political investment if the supported candidate is elected and has the authority of policy makers.

In the 2019-2021 period, the Covid-19 pandemic caused an economic crisis caused by various policies such as social restrictions, closing educational institutions, limiting workers, limiting people's mobility, and socialization in maintaining personal hygiene to lockdown. Before the pandemic, economic conditions had also experienced slowing growth due to the trade war between China and America, especially since foreign investment in Kalimantan was mostly obtained from China. Sari et al. (2021) explained that Indonesia is one of the main trading partners of the US and China. In 2019, Indonesia's trade performance slowed down compared to the previous year due to a contraction in both oil and gas and non-oil and gas commodities. Indonesia's trade balance performance was influenced by several factors, including the US-China trade war that trade war that led to a contraction in import growth, lower export demand, and lower commodity prices in the global market.

Beta convergence analysis is one of the methods used in economics to measure the level of economic convergence between different regions or countries. This concept assumes that regions or countries that initially have low income levels will tend to grow faster than regions or countries that initially have high income levels, so that eventually there will be convergence or equalization of income between them. Absolute convergence is a test conducted to assess whe ther convergence occurs, using the previous year's GRDP per capita as the only explanatory variable. By referring to the hypothesis contained in absolute convergence, there is a conclusion of absolute beta convergence if there is a negative relationship between the level of per capita income at the beginning of the period and the level of economic growth in the next period ($\beta 1 < 0$). In the following table, there are test results of the convergence analysis model without policy changes where β1 is denoted by the initial GDP Per Capita variable (lnYit) along with the R-Squared value used in regression analysis to measure how well the regression model explains variations in the data. R-squared has a value between 0 and 1, the higher the value, the better the regression model explains the variation in the data.

Table 2. Absolute Convergence Estimation Results

Variables	**Dependent Variables**				
	OLS	**Random Effect**	**Fixed Effect**	***DIF-GMM***	***SYS-GMM***
lnY_{it}(t-1)	0.9614 *** (0.0232)	0.9816*** (0.0235)	0.9822*** (0.0306)	0.9702*** (0.0496)	0.9890*** (0.0298)
Implied λ	1.79%	1.80%	1.85%	3.02%	1.10%
Half-Life					22
Hausman-Test		0.7821	0.7815		
R-Squared	0.956				

* significant at the 10%, ** significant at the 5% and *** significant at the 1%. Values in parentheses are robust standard errors.

Source: Processed Data

Table 2 shows the panel data estimation results of absolute convergence estimation in all provinces in Kalimantan from 2000-2021. Based on the estimation, results strongly indicate absolute convergence in the Kalimantan region during the study period. This is reflected by the positive coefficient of less than one on the initial log GRDP per capita and statistically significant at the 1 percent level. The OLS estimation results show that the absolute convergence is 0.9614 and statistically significant at the 1 percent level. In addition, the R-Square value reaches 0. 956 or 95.6 percent. It means that the variation of independent variables that can explain the dependent variable is 95.6 percent, while other factors outside the model explain the remaining 4.4 percent. Based on the estimation of the coefficient of log GRDP per capita, the speed of convergence was found to be 3.92 percent per year. Furthermore, the choice between fixed effect and random effect estimation as the right model can be calculated based on the Hausman test. In the fixed effect and random effect columns, there is a Hausman test result at 0.7821. It means that the random effect model, when compared to the fixed effect model, where the p-value = 0.7821 > 5 percent. The random effect column shows that the absolute convergence base is 0.9816 at the 1 percent level. Furthermore, the speed of convergence is 1.80 percent per year. One of the relevant and crucial issues in the estimation results regarding the OLS estimator tends to be biased as the regressor tends to be correlated with the error al, known as the endogeneity problem. An endogeneity problem is a condition in which one or more independent variables (regressor) in the OLS regression model are correlated with the error term in the model. When endogeneity occurs, the OLS estimator becomes biased, and the estimation results are inconsistent. In this case, OLS no longer fulfills the Gauss-Markov assumption, which requires the independent variables (regressors) to be exogenous or uncorrelated with the error term (Hsiao, 2014). Meanwhile, a consistent estimator of fixed effects depends on increasing T, which is the time or period observed in the panel data analysis. The more time observations (T) available, the more profound the fixed effect estimation. This is because the fixed effect estimator uses differences in individual variables that are constant over time and have more variation in the data to estimate the fixed effect more accurately. According to Barro, (2015), when the time horizon of the study is short, there is reason to believe that growth regressions with fixed effects for a region will produce biased estimates of convergence rates.

The First-Difference GMM estimation results column states the initial log GRDP per capita at 0.9702. This means that the initial log GRDP per capita coefficient is positive and statistically significant at the 1 percent level. The initial coefficient of GRDP per capita is smaller than one, which means that absolute convergence occurred in Kalimantan during the study period. In the column, information is given that the convergence speed is 3.02 percent per year.

The estimation in the System GMM column shows that the coefficient on the initial log GRDP per capita is positive at 0.9890 and statistically significant at the 1% level. The coefficient of System GMM is higher than that of First-Difference GMM, but the convergence speed is lower than that of First-Difference GMM at 1.10 percent per year. This indicates that the convergence speed estimated using the First-Difference GMM is faster to reach a steady state than the System GMM estimate. In

addition, the time required to cover the half-life of the difference in GRDP per capita is about 22 years.

Conditional convergence is the calculation of a convergency model that takes into account the characteristics of economic growth in each region. The conditional convergence hypothesis has the assumption that there is a negative correlation between the per capita income rate of the initial period and the growth rate, i.e. if the Per Capita income variable is negative (= < 0), this theory can then be accommodated on empirical observations of convergens if there is economic heterogeneity between the observation areas. In the following table are the results of testing the convergence analysis model with the presence of policy – economic policy where β1 is represented by the initial PDRB per capita variable (lnYit) accompanied by R-Squared.

Table 3. Variable Inter-Correlation Matrix

Independent Variables	PDRB (-1)	PMA	PMDN	PAD	BDA
PDRB (-1)	1.00000				
PMA	-0.3209	1.00000			
PMDN	0.4454	0.3962	1.00000		
PAD	0.6063	0.4649	0.5644	1.00000	
BDA	0.6384	0.4416	0.5091	0.3776	1.00000

Source: Processed Data

Violation of an econometric model's assumption will result in a value that does not describe the influence of a purely independent variable on a dependent variable. Based on the results of the tests in Table 3, there is no multicollinearity between variables in the model. This is demonstrated by the correlation matrix test, which does not show the multicollinearity assumption in a model since all the correlation values of each variable are below 0.8.

Furthermore, to address other problems such as autocorrelation and heteroskedasticity, then use the standard Error of the entire estimate in this study uses the Robust Standard Error, except for the random effect estimate, which does not use the robust standard Error because to address the autocorrelation and heteroscedastic that has been corrected using the Ordinary Least Square estimate (OLS) (Rodrik et al., 2022). Thus, it is expected that the resulting value can indicate that the value is efficient and non-biased and can describe the pure influence of independent variables on dependent variables worthy of being the basis for analysis.

Table 4. Conditional Convergence

Variables	Dependent Variables				
	OLS	**Random Effect**	**Fixed Effect**	***FD-GMM***	***SYS-GMM***
Ln (Y_{t-1})	0. 9164***	0.9164***	0. 8652***	0.8601***	0.8812***
	-0.0417	-0.0417	-0.0376	-0.1034	-0.0926
Ln(PMA)	-0.0004	-0.0004	0.0040	0.0030*	0.0019**
	-0.0370	-0.0370	-0.0372	-0.0159	-0.0242

Variables	Dependent Variables				
	OLS	**Random Effect**	**Fixed Effect**	***FD-GMM***	***SYS-GMM***
Ln(PMDN)	0.0111**	0.0111**	0.0311	0.0339**	0.0476***
	-0.0385	-0.0385	-0.0402	-0.0422	-0.0296
Ln(IND)	0.0275**	0.0275**	0.0279	0.0312	0.0263*
	-0.0423	-0.0423	-0.0501	-0.0532	-0.0563
Ln**(**PAD)	0.0544	0.0544	0.0897*	0.0945	0.0771*
	-0.0421	-0.0421	-0.0511	-0.0588	-0.0457
Ln(BDA)	0.0487	0.0487	0.0173	0.0139	0.0056
	-0.0369	-0.0369	-0.0446	-0.0249	-0.0162
Implied λ	8,72%	8,72%	14,47%	15,06%	12,63%
Half-Life					21.2
AR(1)				0.0761	0.0737
AR(2)				0.4566	0.4781
Sargant Test				0.03	0.64
R-Squared	0.9586	0.9206	0.922		

Description: *** is significant at the level of 1%. ** is significant at the level of 5%. *** is significant at the level of 10%. Half-Life is calculated using the formula ln(2)/(□ln ln (1+ β)) and which is the convergence rate calculated by - ln(1+ β)/τ . The instrument used in the DIF-GMM are ln (Y_(i,t-2)) and for SYS-GMM are Δln(Y_(i,t-2)). The variables used are PMAi,t-1, PMDi,t-1, INMi,t-1, INKi,t-1, PADi,t-1, dan BDAi,t-1 used in SYS-GMM.

Source: Processed Data

Based on the presentation in Table 4 shows the estimated results of the data of the conditional convergence panel between provinces in Kalimantan for the period 2000 – 2021. According to the estimates of the OLS, a conditional conversion coefficient is 0.9164 and is statistically significant at the level of 1 percent. Meanwhile, on the domestic investment (PMDN), it can be seen that it is at the figure of 0.0111, which means that it has a significant positive influence at the rate of 5 percent. This indicates that domestic investment has a strong influence on the regional economy. In contrast, foreign investment (PMA), industry, local real income, and local spending have no impact on economic growth, and all these variables do not show statistically significant results. Control variables in random effect estimates can influence economic growth among other variables such as local real income. These results are consistent with the research carried out by Marelli et al. (2019). The fact that industry has a positive influence on the entire territory of the European Union countries shows that industrial influence can drive the country's economic growth. Coefficients on industrial variables (IND) also positively influence economic growth at the figure of 0.0275 and are statistically significant at the level of 5 percent. Other control variables, such as foreign investment, locally generated revenue (PAD), and regional expenditure (BDA), do not show statistically significant results. Sargan's test in Table 4 showed that the variable used in the First Difference-GMM estimate was invalid. This is reflected in the p-value of 0.03, which is statistically significant at the 10 percent level. This indicates that the instruments

used in the estimation techniques first-differenced GMM are relatively weak compared to the SYS-GMM, which has a p-value of 0.64.

One of the areas for improvement of First-Difference GMM is that if a weak instrument is used in a study, it will affect the initial per capita income variable with biased results. In the case of panel data with limited observation, First-Difference GMM does not deliver consistent or efficient results (Shin, 2014). One alignment with the Kharisma & Saleh (2013) One alignment with the Kharisma & Saleh (2013) research is that the System-GMM then completes instruments with fewer observation estimates to address such issues. In addition, the values indicated by AR (1) and AR (2) are p-values for the first and second-order autocorrelated disturbances in the first-differenced equation that reached 0.4566 for AR (1) and 0.4781 for AR (2). There is no autocorrelation; the first and second-order autocorrelation, as reflected in the AR (1) and AR (2), is not statistically significant at the 1 percent level. One of the weak points in the first-differenced GMM estimator, namely the existence of a weak instrument that can impact initial per capita income, will be biased (Arellano and Bond, 1991). To cope with the weak instruments, they are then resolved by system GMM estimation.

Table 4 shows System-GMM estimates based on PDRB per capita of the previous year of 0.8812, which is statistically significant at a rate of 1 percent. Subsequently, the industry also positively impacts the economic growth of 0.0263 at a significant 10%. Industry can have a significant impact in boosting regional economic growth. Industry can have a significant impact in boosting regional economic growth. The locally-generated Revenue coefficient, measured by local taxes, regional remuneration, and local business income, positively impacts the economic growth of 0.0771 at a level of 5% significance. System-GMM estimates show that the convergence rate was 12.63 percent per year, slower than the First-Difference GMM, which reached 15.06 percent per annum to reach the steady state point. Meanwhile, the estimated time needed to reduce the per capita income gap between the provinces in Kalimantan with the boost of PMDN (Direct Investment), Industry, and PAD (locally Generated Revenue) is 21.2 years.

Based on the results of the Conditional Convergence, it can be seen that the PMDN coefficient of 0.0476 has a very strong impact on the rate of economic convergence. This is because domestic investment contributes directly to the domestic economy. Local investment can create jobs, increase public income, and support local economic growth. Moreover, the PMA also positively impacts the regional economy, which means that foreign investment can facilitate the transfer of technology that supports other sectors of the economy. This statement is in line with a study conducted by Nguyen & Darsono (2022) that states that foreign investment can help expand a country's or region's production and export capacities. This can lead to increased exports of goods and services, which contribute positively to economic growth. Furthermore, foreign investment can play an important role in accelerating the process of economic convergence between countries or regions that initially have lower income rates due to additional technology, management practices, and more advanced knowledge.

The calculation results on conditional convergence show that the industrial coefficient is 0.0263, which means that industry has a strong impact on the region's economic growth rate. It is consistent with the research carried out by Andrijasevic

& Bacovic (2022) , who state that industrialism can often be the backbone of the local economy and has the potential to drive inclusive economic growth. The strong impact of the industrial sector on economic growth suggests that policies and initiatives aimed at promoting industrial development may yield substantial benefits for the local economy. By fostering a thriving industrial base, regions can create employment opportunities, enhance productivity, and stimulate economic diversification. This not only bolsters the financial well-being of businesses within the industrial sector but also contributes to a more resilient and dynamic regional economy.

Furthermore, the findings highlight the potential of industrialism to serve as the backbone of the local economy. This implies that strategic investments in the industrial sector, coupled with supportive policies, could act as a catalyst for sustainable economic growth. As industries flourish, they can drive innovation, attract investment, and generate a ripple effect that positively impacts other sectors.

The coefficient of locally generated revenue (PAD) based on the results of the conditional convergence calculation shows a positive impact on the regional economy, with a coefficient of 0.0771. The results are consistent with a study by Ruan & Zhao (2022), in which the study stated that locally generated revenue provides greater financial resources for local governments to invest in some areas of infrastructure development, such as roads, bridges, airports, and other public facilities. It could enhance connectivity and facilitate access to various regions within the region, improve the investment climate, and boost economic growth. Additionally, according to Benedek et al. (2022), locally generated revenue can also be used to improve the quality of public services such as education, health, and other basic services, thereby improving people's quality of life and well-being. Furthermore, stable economic conditions and investments in good infrastructure and public services can provide a positive signal for private investors to invest in the region.

According to Fournier et al. (2022), regional spending can significantly impact regional economic growth and convergence. However, the impact can vary depending on several factors, including how local spending is managed and directed, such as corruption in the region, causing the funds to fail to reach their goals well and can hinder the expected positive impact on local economic growth. Another factor that could affect this is the need for local government spending to be prioritized in regional spending to sectors with high economic growth potential.

Conclusions

Based on the results of studies conducted on the convergence of income between villages in Kalimantan in the period 2000 – 2021, it can be concluded that in the 2000-2021 period, there was a phenomenon of sigma convergence in Kalimantan, which is reflected in the decrease of the Gross Regional Domestic Product (GRDP) difference per capita between the provinces. This phenomenon marks an increase in income disparity in the region. In other words, the Kalimantan economy, which may have previously experienced fast growth or had lower incomes than other more prosperous regions, is now experiencing slower economic growth, as well as increased per capita income.

Beta absolute convergence analysis shows the existence of divergences in the provinces of Kalimantan. The annual rate is about 12.63%, with a half-life of about 21.2 years. It depicts that each province in Kalimantan will lead to an inconsistent growth rate and increasing economic gaps between provinces. Conditional convergence analysis shows that the System GMM method is more efficient than the First-Difference GMM method in identifying factors that influence economic growth in Kalimantan. Factors such as per capita GDP lag, Domestic Capital Growth, Industry, and locally generated revenue significantly influence economic growth in the region. The results reflect that certain policies and economic factors drive economic development in Kalimantan, thereby potentially increasing economic disparities between provinces.

The results of this research guide future perfection. The authors suggested considering the use of longer periods of research in order to obtain more accurate results, although data constraints must be overcome. In addition, highlighting the importance of efforts to economic divergence between different regions, policies that support equal economic growth can help reduce economic disparities between regions. In such an effort, things like encouraging investment are also needed because a favorable investment environment can reduce bureaucracy, provide legal protection for investors, and preserve political and economic stability. Basic infrastructure also needs to be improved to support industrial activity. A form distribution of infrastructure and resources can strengthen industrial sectors in previously underdeveloped areas. The regional government is also expected to provide tax incentives to companies to boost the growth of technology-based sectors, thereby enhancing the region's competitiveness.

References

Abrhám, J., & Vošta, M. (2022). Impact of the COVID-19 Pandemic on EU Convergence. Journal of Risk and Financial Management, 15(9). https://doi.org/10.3390/jrfm15090384

Akram, V., & Rath, B. N. (2020). Does export diversification lead to income convergence? Evidence from cross-country analysis. Buletin Ekonomi Moneter Dan Perbankan, 23(3), 319–344. https://doi.org/10.21098/BEMP.V23I3.1251

Andrijasevic, Z., & Bacovic, M. (2022). Is Income Convergence Possible with a Diminishing Industry's Output? Development Gap and Structural Changes in Montenegro Since the World War II. European Journal of Sustainable Development, 11(1), 1. https://doi.org/10.14207/ejsd.2022.v11n1p1

Bappenas. (2014). Rencana Pembangunan Jangka Menengah Nasional (RPJMN) 2015-2019. Buku I Agenda Pembangunan Nasional, 2015–2019. https://doi.org/10.1088/1757-899X/114/1/012081

Bappenas. (2020). Rencana Pembangunan Jangka Menengah Nasional 2020-2024. National Mid-Term Development Plan 2020-2024, 313.

Barakhvostov, P., & Rusakovich, A. (2017). Eastern Partnership Countries and Eurasian Integration in 2012~2015. Journal of Economic Integration, 32(4), 804–841. https://doi.org/10.11130/jei.2017.32.4.804

Barreca, A., Clay, K., Deschênes, O., Greenstone, M., & Shapiro, J. S. (2015). Convergence in adaptation to climate change: Evidence from high temperatures and mortality, 1900-2004. American Economic Review, 105(5), 247–251. https://doi.org/10.1257/aer.p20151028

Barro, R. J. (2015). Convergence and modernisation. Economic Journal, 125(585), 911–942. https://doi.org/10.1111/ecoj.12247

Barro, R. J. (2016). Economic Growth and Convergence, Applied to China. China and World Economy, 24(5), 5–19. https://doi.org/10.1111/cwe.12172

Barro, R. J., & Sala-i-Martin, X. (1997). Technological Diffusion, Convergence, and Growth. Journal of Economic Growth, 2(1), 1–26. https://doi.org/10.1023/A:1009746629269

Benedek, D., Benitez, J. C., & Vellutini, C. (2022). Progress of the Personal Income Tax in Emerging and Developing Countries. IMF Working Papers, 2022(020), 1. https://doi.org/10.5089/9798400201134.001

Bobeva, D. (2021). Nominal, Structural and Real Convergence of the EU Candidate Countries' Economies. Journal of Central Banking Theory and Practice, 10(3), 59–78. https://doi.org/10.2478/jcbtp-2021-0024

Bond, S., & Arellano, M. (1991). Some tests of specification for panel data:monte carlo evidence and an application to employment equations. Review of Economic Studies, 58(2), 277–297. https://doi.org/10.2307/2297968

Castelló-Climent, A., Doménech, R., Castelló-Climent, A., & Doménech, R. (2022). Converging to Convergence: The Role of Human Capital Converging to Convergence: The Role of Human Capital * (Issue December).

Cavallaro, E., & Villani, I. (2021). Club convergence in eu countries: A sectoral perspective. Journal of Economic Integration, 36(1), 125–161. https://doi.org/10.11130/jei.2021.36.1.125

Chatterjee, S., & Giannone, E. (2021). Unequal global convergence. 16802(January), 1–16.

de Genaro, A., & Astorino, P. (2022). A Tutorial on the Generalized Method of Moments (GMM) in Finance. Revista de Administracao Contemporanea, 26, 1–11. https://doi.org/10.1590/1982-7849rac2022210287.en

Fournier, J.-M., Hisanaga, T., & Nguyen, A. D. M. (2022). The Fiscal Stance in Japan.

Gammadigbe, V. (2021). Is Regional Trade Integration a Growth and Convergence Engine in Africa? IMF Working Papers, 2021(019), 1. https://doi.org/10.5089/9781513567716.001

Goschin, Z. (2015). Regional Divergence in Romania Based on a New Index of Economic and Social Development. Procedia Economics and Finance, 32(March), 103–110. https://doi.org/10.1016/s2212-5671(15)01370-2

Hainsworth, P. (2021). At The Front Line: Reflections on The Bank's Work With China Over Forty Years (1980 - 2020). West European Politics, 19(3). https://doi.org/10.1080/01402389608425156

Hakim, L., & Purnamasari, D. (2014). Dampak Pemilihan Umum 2014 terhadap Indikator Makroekonomi. LPEM FEUI Brief, 1, 1–5.

Hsiao, C. (2014). Analysis of panel data: Third edition. Analysis of Panel Data: Third Edition, 1–539. https://doi.org/10.1017/CBO9781139839327

Johnson, P., & Papageorgiou, C. (2020). What remains of cross-country convergence? Journal of Economic Literature, 58(1), 129–175. https://doi.org/10.1257/JEL.20181207

Kant, C. (2019). Income convergence and the catch-up index. In North American Journal of Economics and Finance (Vol. 48). https://doi.org/10.1016/j.najef.2018.07.017

Kharisma, B., & Saleh, S. (2013). Convergence of Income Among Provinces in Indonesia, 1984 – 2008: A Panel Data Approach. Journal of Indonesian Economy & Business, 167–187. https://doi.org/10.22146/jieb.6221

Kindberg-Hanlon, G., & Okou, C. (2021). Productivity Convergence: Is Anyone Catching Up? Global Productivity: Trends, Drivers, and Policies, September, 155–208. https://doi.org/10.1596/978-1-4648-1608-6_ch4

Kurniawati, S., & Suratman, E. (2010). Konvergensi Pendapatan Per kapita di Provinsi Kalimantan Barat dan Kalimantan Timur Tahun 2001-2007 serta Faktor - Faktor yang Mempengaruhi. In Jurnal Ekonomi dan Pembangunan Indonesia (Vol. 10, Issue 1, pp. 35–52). https://doi.org/10.21002/jepi.v10i1.108

Licchetta, B. M., & Mattozzi, G. (2022). I . Convergence in GDP per capita in the euro area and the EU at the time of COVID-19. Quarterly Report on the Euro Area, 20(3), 7–18. https://doi.org/10.2478/ie-2023-0012

Madina, M., & Muzdalifah. (2020). Ketimpangan Pembangunan Ekonomi Regional Kalimantan. Ecoplan : Journal of Economics and Development Studies, 3(1), 22–25. https://doi.org/10.20527/ecoplan.v3i1.79

Manzi, G., Alsayed, A., Martins, H., & Saibene, G. (2023). Regional economic convergence in federation contexts: a comparative analysis of Brazil and the European Union. Regional Studies, 57(11), 2269–2284. https://doi.org/10.1080/00343404.2023.2167971

Marelli, E. P., Parisi, M. L., & Signorelli, M. (2019). Economic convergence in the EU and Eurozone. Journal of Economic Studies, 46(7), 1332–1344. https://doi.org/10.1108/JES-03-2019-0139