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CONVERGENCE ANALYSIS OF ECONOMIC GROWTH IN SOUTH KALIMANTAN

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ABSTRACT

The objectives of this research are 1) testing and analyzing the level of sigma convergence in South Kalimantan; 2) testing and analyzing the convergent beta, including the absolute beta convergence and conditional beta convergence. This study uses static panel data covering 13 regencies/cities in South Kalimantan observed between 2010 and 2019. The data analysis uses the ordinary least square (OLS) regression model. The results showed a sigma convergence marked by a declining variation coefficient in each regency/city. The absolute beta and conditional beta also converged. Poor areas' economic growth is faster than the prosperous regions so they catch up. There has to be close coordination between the central and local governments in formulating policies in handling government and private investment and improving workers' productivity in the agricultural and mining sectors in South Kalimantan.

Keywords: *Sigma Convergence, Absolute Beta Convergence, Economic Growth*
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Introduction

Development is a planned process to make changes and achieve better goals. National development has sectoral missions, which target to support national economic growth, and regional missions aim to support equitable development. Development convergence is when disparity among sectors or regions declines. Theoretically, convergence is proof of the neoclassical with an endogenous growth model. Practically, it can recognise regional characteristics and development patterns. While convergence argues that poorer regions have the potential to catch up with the richer regions in increasing their per capita income, endogenous growth believes that the differences in economic growth between regions can last for a long time.

South Kalimantan Province is an interesting research subject because it has diverse economic and geographical characteristics and natural resources. The investment and labour (endowment factors) continue to grow (Easterly & Levine, 2003).

Gross regional domestic product (GRDP) per capita can indicate the level of regional welfare. Figure 1 shows the welfare of the South Kalimantan population, with Tabalong Re-

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gency having a higher GRDP and Tanah Laut Regency having a smaller GRDP. This is because there are more employment opportunities in urban areas. The government and the private sector need to work together to create a conducive economic climate so both government investment and private investment can grow, as well as the sectoral labour productivity, which will ultimately reduce the investment growth—income dispersion between regions in South Kalimantan.

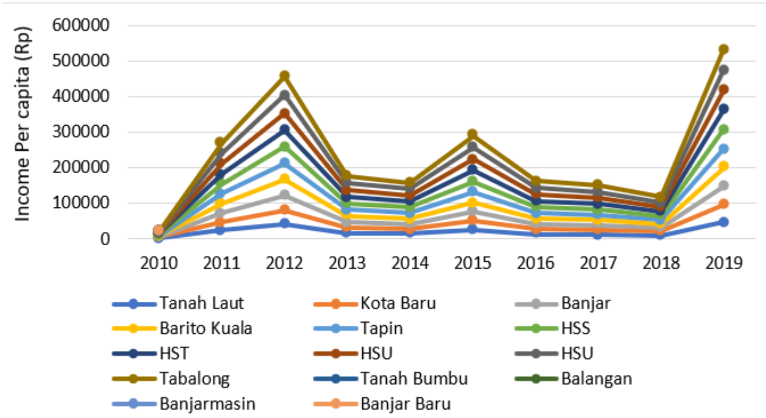

Figure 1: The Trend of Regional Income per Capita in South Kalimantan in 2010-2019

Based on the explanation above, this study aims to analyse the sigma convergence and beta convergence (absolute beta and conditional beta) in South Kalimantan from 2010 to 2019.

Literature Review

Income convergence was first explained using neoclassical growth models by Solow (1957) and Swan (1956). The Assumption of the model is a production function with constant returns to scale, diminishing returns for each input (capital and labour), and a constant saving ratio.

Another assumption is no technical progress, so the growth is entirely due to capital accumulation. In other words, if a rich country and a poor country are classified solely in terms of per capita income levels, then in their transition to long-run steady-state levels, the initial per capita income is inversely proportional to the subsequent per capita income growth. This is due to diminishing returns on capital resulting in identical per capita incomes for rich and poor countries in the long run. This implies that the implicit assumptions of the model result in income convergence.

However, this model has been tested empirically in many countries such as Barro (1991), Barro & Sala-i-Martin (199; 1997; 2004), Sala-i-Martin (1996), Quah (1996), and Rodrik (2018). The empirical results confirmed the prediction of income convergence based on the Solow-Swan model.

In the neoclassical growth model for a closed economy, such as Ramsey (1928), Solow (1957), Cass (1965), and Koopmans (1963), the per capita growth rate tends to be inversely proportional to the initial output level or individual income. If economies have similar preferences and technology, poorer regions will grow faster than rich regions. Some of the factors for convergence are production levels and per capita incomes.

In a neoclassical theory, per capita income growth negatively correlates with the initial level of per capita income. In this case, if a country or region has the same economic utility and production function, it can have a relatively faster economic growth rate than the richer countries or regions. This is often referred to as convergence (Kuncoro & Murbarani, 2016).

Convergence has two interrelated hypotheses. The first is proposed by Barro & Sala-i-martin (1992) using the neoclassical growth model, which analyses convergence empirically. In a closed economy, the per capita growth rate tends to be inversely related to the initial level of output or per capita income. In poor regions or countries, per capita income tends to grow faster than in rich regions or countries.

According to Abramovitz (1997), countries with low productivity have great potential to achieve high growth rates. However, the growth potential will weaken if the productivity growth rate is close to the benchmark countries' productivity level. This indicates the process of catching up. Poorer areas will grow faster than the richer areas, so they will eventually catch up so that growth and equity converge (Mankiw, 2003).

Differences in GRDP per capita create gaps between regions. Mankiw (2003) argues that a neoclassical growth theory predicts that regions will grow simultaneously and move towards a steady-state economy, known as convergence. Convergence theory is a development of the growth theory of Harrod-Domar and Solow, which is based on neoclassical growth theory.

However, the neoclassic economic growth theory has some weaknesses (Barro & Sala-i-Martin, 1992; Romer, 1996); for example, technological change is considered exogenous. Therefore, endogenous growth theory emerged, stating that, in the long run, economic growth is determined by government policies and other factors inherent in growth analysis, such as technological change.

Two types of convergences are proposed by Barro & Salai-Martin (Barro, 1991; Barro & Salai-Martin, 1992). Beta convergence maintains that growth is negatively correlated with the initial real per capita income level. Thus, countries with low real per capita incomes will grow faster than countries with high real per capita incomes. Meanwhile, sigma-convergence measures whether real per capita income dispersion decreases over time. Quah (1995) and Sala-i-Martin (1996) argue that a necessary condition for the existence of sigma-convergence is the presence of beta-convergence. In other words, regional endogenous economic growth may or may not be achieved. Convergence occurs if the spill over effect mechanism works from one region to another.

Barro & Sala-i-Martin (2004) state that if income dispersion decreases, inequality between regions decreases; hence, income converges. Sigma convergence can be calculated by estimating the spread of GRDP per capita, measured as a coefficient of variation or standard deviation. Sigma convergence occurs if the coefficient of variation of a particular year is less than the coefficient of the previous year.

According to Paas et al. (2007), the absolute beta convergence hypothesis will be answered if per capita income merges in the long term regardless of the initial conditions. Poor regions grow faster than rich regions, which shows the negative relationship between average growth rates and initial income levels even if no other variables are included in the regression model as explanatory factors. If the entire economy is essentially the same, if there is no size of capital, then convergence is absolute (Acemoglu, 2008).

The procedure for testing conditional beta (β) convergence is first to determine whether there is absolute convergence. According to Baumol & Baumol (1986), the negative sign of beta (β) indicates that the growth rate of per capita income over a period of k years is negatively correlated with initial income.

Neoclassical Growth Theory

The key characteristic of the neoclassic model is in the production function, which assumes constant returns to scale—the law of increasing and decreasing returns for each additional input and a positive elasticity of substitution between inputs. Neoclassic is concerned with the role of labour, capital, and technology in producing output. Technological progress is treated as a residual in explaining long-run output growth and is assumed to be exogenous (independent of all existing factors). The neoclassical production function can be written as follows:

$$\hat{y} = f(\hat{k}) \tag{1}$$

where $\hat{y}$ and $\hat{k}$ are output and capital per unit of effective labor, Le^{xt}, L is labor (or population), and x is the level of exogenous technological progress augmenting the labor efficiency. In a closed economy, $\hat{k}$ will evolve in the following pattern:

$$\hat{y} = f(\hat{k}) - \hat{c} - (\delta + x + n)\hat{k} \tag{2}$$

where $\hat{c}$ = c/Le^{xt}, the level of consumption per capita, is the rate of depreciation, and n is the growth rate of L. A household with an infinite time horizon is assumed to maximise its utility function. The consumer household utility function is formulated as follows:

$$U = \int_0^\infty u(c) e^{nt} e^{-pt} dt \tag{3}$$

where c = C/L (per capita consumption), is the time preference level or discount rate, and

$$uc \frac{c^{1-\theta} - 1}{1-\theta} \tag{4}$$

with > 0, so that the marginal utility, u'(c), has a constant elasticity of – θ as a result of a change in c. The time preference level is assumed to be ρ > n + [1- θ]x in order to fill the transversality condition. The derivation of the first-order condition to maximise U in equation 3 results in the following equation:

$$\frac{\dot{c}}{c} = \frac{1}{\theta} x \left[f'(\hat{k}) - \delta - \rho \right] \tag{5}$$

At equilibrium, the effective quantities $\hat{y}$, $\hat{k}$, and $\hat{c}$ do not change. The per capita quantities y, k, and c, grow at the rate x. The level of under equilibrium conditions will satisfy the equation:

$$f'(\hat{k}*) = -\delta + \rho + \theta x \tag{6}$$

If an economy starts from a value of $\hat{k}$, which is lower than the value of $\hat{k}$*, then k will monotonically approach the value of $\hat{k}$* (see Blanchard & Fisher, 1989: Chapter 2). Barro (1991) proved that the growth rate of capital per worker $\dot{k}/k$, would decrease monotonically towards the equilibrium value of x. In an aggregate production function that takes the Cobb-Douglas form, the growth rate of output per capita, $\dot{y}/y$, will be equal to:

$$\hat{y} = f(\hat{k}) = A\hat{k}^{\alpha} \tag{7}$$

with 0 < a < 1. Therefore, if two economies have the same preference and technology parameters, the consequence is that the poor economy with a lower initial value of k grows faster in terms of per capita income. The transitional dynamics in form (7) above can be quantified by using a log-linear approach to equations (2) and (5) around their equilibrium values. The solution for log [$\hat{y}$ (t)] using a log-linear approach to the model using Cobb-Douglas production function technology is:

$$\log[\hat{y}(t)] = \log[\hat{y}(0)].e^{-\beta t} + \log(\hat{y}*).(1-e^{-\beta t}) \tag{8}$$

The positive parameter indicating the speed of adjustment towards equilibrium can be determined by the following formula:

$$2\beta = \{\psi^2 + 4(\tfrac{1-\alpha}{\theta})(\rho+\delta+\theta x[\tfrac{\rho+\delta+\theta x}{\alpha} - n + \delta + x]\}^{1/2}.\psi \tag{9}$$

where $\psi = \rho - n - (1-\theta) > 0$. Next, the average growth rate y in the time interval between 0 and T is:

$$\tfrac{1}{T}.\log[\tfrac{y(T)}{y(0)}] = x + \tfrac{1-e^{-\beta t}}{T}.\log[\tfrac{\hat{y}*}{\hat{y}*(0)}] \tag{10}$$

Equation (10) shows that the higher the value of β, the greater the response of the average growth rate to the gap between the values of log [$\hat{y}$ *] and log [$\hat{y}$ *(0)]. This means that the convergence towards equilibrium is faster. In summary, (10) can be restated as:

$$\Delta y_t = f(y_{t-T}) \tag{11}$$

This last equation has been widely used to prove the convergence hypothesis. On this basis, if a negative convergence estimation coefficient is obtained with a magnitude between 0 and 1, then the convergence hypothesis is proven. Theoretically, less developed regions will grow faster in such a way that they can catch up with other regions, which was initially richer (Barro & Sala-i-Martin, 1992; 1995).

Endogenous Economic Growth Theory

Grounded in neoclassical thinking, the economic growth is:

$$Y=AK \tag{12}$$

where A is a positive constant reflecting the technology. Output per capita is $y=Ak$, and the average production and marginal production of capital are constant at the level A > 0. Substitution $f(k)/k = A$ is obtained using the following equation:

$$\tfrac{\dot{k}}{k} sA - (n+\delta) \tag{13}$$

where s is the saving rate, $0 < s < 1$, with $sA > (n+\delta)$ so that $\dot{k}/k > 0$. Given that they are parallel, then k/k· is a constant which is independent of k. In other words, k always grows at the equilibrium rate, $\dot{k}/k* = sA - (n+\delta)$. Since $y = Ak$, $k\ /k$ will also equal $\dot{k}/k*$ at any point in time.

since $c = (1-s)y$, the growth rate of c will be equal to $\dot{k}/k*$. Therefore, all per capita variables in the model will grow at the same rate, namely $sA - (n+\delta)$. Equation (13) above shows the case of x = 0 (without technological change), which means that per capita output growth can occur in the long run without exogenous technological changes.

Thus, Equation (13) shows that the growth of output per capita is influenced by the behavioural parameters of the endogenous variables in the model, such as the saving rate and population growth. Unlike the neoclassic model, the formulation of the AK model in Equation (12) does not predict convergence for all y levels. Suppose a group of economies with the same structural parameters, A, n, and δ; each economy differs only in its initial per capita capital stock, k(0), and its initial per capita consumption, c(0).

Referring to the model above that the economy will grow at the same per capita rate regardless of its initial conditions, the concept of endogenous economic growth theory predicts that all economies will grow at the same per capita rate. By taking the form of the Cobb-Douglas production function with $\alpha = 1$, the speed of convergence can be indicated by $(1-\alpha)(x+n+\delta)$, which means if $\alpha = 1$, then the speed of convergence = 0 (Barro & Sala-i -martin, 1992).

Previous Studies

Sun et al. (2020) researched environmental performance assessment in global economic growth using the Malmquist total factor productivity index. The study evaluates the use of inputs and technology to increase environmental performance productivity using a panel model of 104 countries from 1980 to 2016. The absolute and conditional beta findings show that the average global environmental efficiency growth is 1.3 per cent. There is a conditional convergence of environmental growth in industrial structure, globalisation, and energy prices.

Jena & Barua (2020) examine the role of trade (within-EU and EU versus world) and government spending in explaining the convergence of per capita income in the EU throughout 1995–2017 using panel data. The main finding shows that policy interventions in trade openness and government spending contribute to the convergence of per capita income in the EU. Government spending allows poorer countries to increase their per capita income more significantly than richer countries, narrowing the gap in EU countries.

Cabral & Castellanos-Sosa, (2019) explained that when there was a global crisis, the level of convergence between countries in Europe decreased. Blížkovský (2012) shows that the EU takes a long time intending to reduce disparities.

Agarwalla & Pangotra (2011) show that convergent trends in regional income depend on economic growth and technological progress. The convergence speed was faster from 1992-2006 when the Indian economy began to undergo structural reforms. In Africa, Djennas & Ferouani (2014) explain using data from 1980-2011 in 52 countries in Africa. Based on the decomposition of the Gini coefficient, the level of convergent sigma and convergent beta takes a long time to converge. It can be concluded that convergence is still needed to reduce regional disparities between rich and poor regions.

Aginta et al. (2020) re-examine the hypothesis of regional convergence of income in Indonesia from 2000 to 2017. The results show that there are five significant convergence groups at the district level in Indonesia. Districts in the same province cluster and districts with special characteristics (large cities, rich regions, or naturally rich regions) had the highest income.

Heckelman (2013) conducted a convergence test in the US for per capita income from 1930 to 2009. The results show that about half of the states show stochastic convergence to convergence. Probit regression reveals that the probability of a country converging is a function of changes in the capital to labour ratio, the size of the agricultural sector, and the level of taxation and tax revenues. Regional gaps in a convergence between the southern and midwestern states remain. Meanwhile, Ganong & Shoag (2016) use the variables of labour productivity, education level, land, house prices, number of migrations and income per capita from 1940 to 2010 using panel data. The results show a convergence of income across the US prior to 2000. This study analysed absolute convergence in different years in 47 countries and 48 states in the US in 1880-1988 and 1963-1986, respectively (Barro & Sala-Martin, 1992). Still, there has been absolute convergence in the US, where productivity levels have occurred in 16 industrialised countries from 1870-1979 (Baumol & Baumol, 1986). Absolute convergence of GDP per capita also occurred in Italy significantly in 1951-1970, but not significantly in 1971-2000 (Arbia et al., 2003).

Research on absolute convergence has been conducted in APEC and East Asian countries but not in ASEAN (Michelis & Neaime, 2004). Unconditional income convergence is also found in 28 countries of the Organization for Economic Cooperation and Development (OECD), 123 oil-producing countries and 23 developing countries (Hu, 2009). Jayanthakumaran & Lee (2013) conducted research on the convergence of income per capita by comparing the founding members of ASEAN and SAARC (Bangladesh, India, Nepal, Pakistan and Sri Lanka) from 1976 to 2005. The results show a convergence of income in the five founding countries of ASEAN while the divergent in SAARC.

This research by Mulder & Groot (2007) investigates the development of cross-country differences in energy and labour productivity. The analysis was conducted at the sectoral level of 14 OECD countries, covering the period of 1970-1997. convergence analysis reveals that cross-country variations in productivity performance differ from time to time, followed by cross-sectoral and across different levels of aggregation. Both convergence and divergence patterns are found in the convergent sigma analysis.

In the literature on economic growth theory, there are two views on convergence, the first according to Barro (1984), Baumol & Baumol (1986), De Long (1988), Barro (1991) and Barro & Sala-i-Martin (1992; 1995) explaining convergence occurs when the poor economy grows faster than the rich economy. Second, according to Easterlin (1960), Borts, & Stein (1964), Streissler (1979), Barro (1984), Baumol & Baumol (1986), Dowrick, & Nguyen (1989), Barro (1991) and Barro & Sala-i-Martin (1992; 1995) explains that convergence occurs when the dispersion as measured by the standard deviation of the log GRDP per capita between regions decreases.

This study provides further evidence of the relationship between government spending and economic growth in the case of Malaysia. The government spending is disaggregated into operating and developing government spending using the OLS technique. This aims to find the steady effect of government spending on economic growth over the last 45 years, using time series data from 1970 to 2014. The results show that there has been a negative correlation between government spending and economic growth in Malaysia over the past 45 years. These findings can provide an overview of the policy implications of the Malaysian government's need to optimise the impact of government spending on economic growth (Hasnul, 2015).

Lee (2020) analyze the economic growth of middle-income countries during the period 1960-to 2014 with a focus on two groups of countries. Converged groups include middle-income economies that moved their status to high income or achieved rapid convergence progress. Meanwhile, the unsuccessful group experienced a growth slowdown and failed to become a high-income country. The results differ from the hypothesis showing that successful convergence maintains strong human capital, a high working-age population ratio, the effective rule of law, low-priced investment goods, and high exports and high-tech patents. Unfavourable demographic, trade, and technological factors, rapid investment expansion, hasty deregulation, and rushed financial bookkeeping can push the middle-income group to the bottom line. The article aims to identify changes in the growth rates of rich and poor countries through the increasing demand for agricultural resources. In terms of trade policy, growth in developing countries could lead to a convergence of agricultural policies with the mentoring pattern seen in developed countries today, raising concerns about the future need to address issues with collective actions, particularly those that increase world price volatility (Martin, 2019).

McErlean & Wu (2003) examine the convergence of China's regional agricultural labour productivity (ALP). The analysis shows that ALP diverged between 1985 and 1992 but converged between 1992 and 2000. This finding shows a shift in the agricultural sector in two periods.

Kijek et al. (2020) studied the convergence of labour productivity in the agricultural industry of 28 EU countries between 2005 to 2018. The countries were divided into three homogeneous groups regarding the level of development in the agricultural sector. The existence of convergence in the group was verified by using the panel data model. The study considers the role of structural change in examining the convergence of labour productivity and its speed at the country and industrial estate levels simultaneously. The results show that conditional convergence exists at the country level. However, the speed of convergence differs at different levels of aggregation. The convergence speed at the regional level is faster than at the next level of country and industry. The finding indicates that if it does not include structural changes, then the speed of convergence may be overestimated or underestimated (Naveed & Ahmad, 2016).

Doyle & Leary (1999) analyze the level of convergence of aggregate and sectoral labour productivity between 11 European Union countries between 1970 and 1990. In the middle of the year, the results found that there was a convergence of sigma in the coefficient of variation from the initial data analysis to the middle of the research period. Then it diverged from the middle of the research year to the last year of the study. This is due to structural changes and a decline in labour productivity in the agricultural sector. The low level of aggregate productivity has benefited the most from these structural changes.

Li et al. (2018) examines economic development and a new type of urbanisation in China with a cluster of economic growth convergence at the district level. The results show that the clusters at the district level produce six groups converging gradually, where per capita fixed assets, population density, and industrialisation have driven convergence in varying degrees. The variation in productivity levels across countries is usually greater in energy than in labour. The convergent analysis supports the hypothesis that lagging countries tend to catch up with technology, particularly energy productivity in most sectors.

In addition, the results show that there is conditional convergence, which means that the level of productivity converges in developed countries. Energy prices and wages have been shown to influence energy growth and labour productivity positively. Economies of scale explain cross-country variations in energy growth rates and labour productivity more than investment, openness and specialization play only modest roles (Mulder & Groot, 2007).

Recently, there has been a significant increase in growth in developing countries. Derviş (2012) identifies a new convergence starting around 1990, where economic growth is faster in developing countries than in developed economies. Baldwin (2016) argues convergence occurred as the production took place in developed countries and the labour-intensive production was moved to low-wage countries. In this scenario, developing countries industrialise without having to start from scratch.

Methodology

The type of data used in this study is secondary data, using panel data from 13 districts/cities in South Kalimantan from 2010 to 2019, with the data sourced from the Central Statistics Bureau of South Kalimantan and the Bank of Indonesia (BI). There are several models applied in this study, as follows:

Sigma Convergence Model

Convergence occurs when the dispersion of income per capita across regions decreases over time. This convergence is usually measured using the coefficient of variation of per capita income for several periods. The following is the formula for the coefficient of variation (CV).

$$D_t = \frac{1}{N} . \sum_{i=1}^{n} [\log(y_{it}) - \mu_t]^2 \quad (14)$$

where:

$\frac{1}{N}$ = is a large number of N observations, the sample variance is close to the variance population

y_{it} = PDRB is the ith district/city

μ_t = is the sample mean of log (y_{it})

The higher the CV value, the greater the per capita income inequality in an area.

Absolute Beta Convergence Model

The model below is used to estimate absolute beta convergence. The absolute beta convergence hypothesis tests whether poor regions can grow faster than rich regions. The relationship between the level of per capita income at the beginning of the period and the average growth rate of per capita income over several periods or the speed of convergence (β) is negative. The absolute beta convergence hypothesis is accepted if the estimate of β is statistically significant and negative. The following is a model equation for estimating absolute beta convergence.

$$\frac{1}{t} \log\left(\frac{y_{i,t}}{y_{i,t-1}}\right) = \alpha + \beta \log(y_{i,t-1}) + \varepsilon_i \quad (15)$$

where:

$\frac{1}{t} \log\left(\frac{y_{i,t}}{y_{i,t-1}}\right)$ = PDRB per capita for district/city *i* in period *t*

$y_{i.0}$ = is the initial per capita income in district/city *i*,

t = is the number of years in the observation period,

α, β = the estimated parameter, *i* distributed error normally and independently.

ε_{it} = error term

Next, calculations were also carried out by lowering two indicators that reflect the convergence of *β*, namely the speed of convergence and half-life. The speed of convergence measures how quickly an economy reaches convergence to a steady-state position and can be calculated using the following formula:

$$s = \frac{-\log(1+\beta)}{T} \quad (16)$$

$$s = \frac{-\log(1-\beta)}{T} \qquad (17)$$

Equation (17) is calculated if the coefficient value is less than 1. Meanwhile, T is the number of per capita GDP growth data periods. The data used is based on the time series unit, 2010-2019, then T = 10 years.

Finding and Discussions

Economic growth is assessed using a comparison of components that can represent the state of a country's economy against the previous year. The data show that the value of GRDP in South Kalimantan in 2010-2019 tends to decline. The highest growth occurred in 2011 with a figure of 6.97 per cent, and the lowest in 2015 when growth was only 3.83 per cent. From 2010-2019, the total growth has decreased by 1.51 per cent, with an average annual growth of 5.14 per cent.

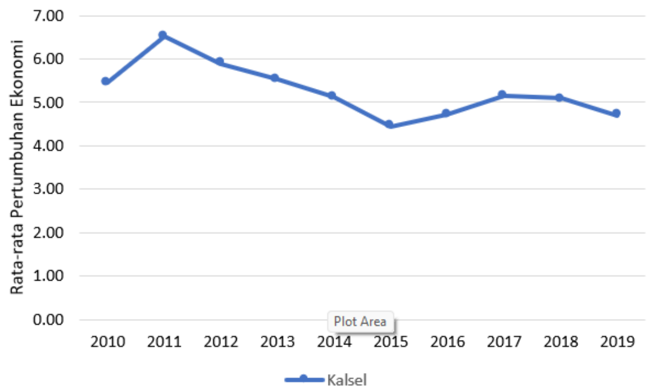

Figure 2: Average Economic Growth in South Kalimantan in 2010-2019

Convergence and Determinants of Economic Growth in South Kalimantan

Sigma Convergence (σ)

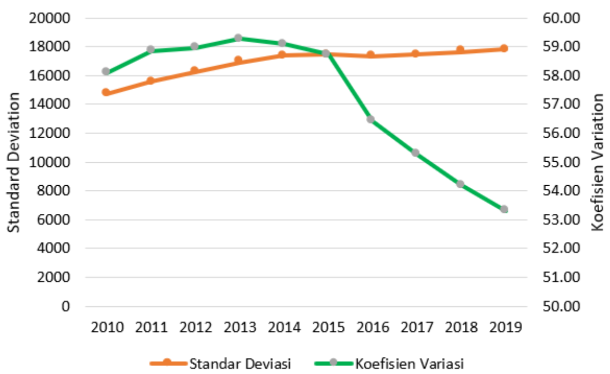

Figure 3: The Dispersion Rate of Economic Growth Between Regencies and Cities in South Kalimantan in 2010-2019

Figure 3 shows an average economic growth from the total per capita income of districts/cities in a certain year and then divided by the number of districts/cities. The average standard deviation increased from year to year, with a continuous increase from 2010 to 2019. This is not a good sign because it shows a far distribution and indicates a widening gap. From these data, it can also be seen that the coefficient of variation of economic growth is decreasing from year to year. In 2013, the coefficient of variation was 59.27 per cent , and in 2019 it was 53.32 per cent.

The study results show convergence in South Kalimantan, where poorer regions grew faster than rich regions. This result is in line with the convergence theory of Barro (1991) and Barro & Sala-i-Martin (1992), namely, the growth rate of per capita income between regions tends to decrease over time (sigma convergence), where the growth rate of per capita income between regions can be seen from the calculation of the coefficient of variation. The mining activities in three regions, namely Kotabaru, Tabalong, and Balangan, may have helped the convergence. Solow (1957) and Barro & Sala-i-martin (1992) explain convergence as a tendency for lagging regions to catch up with the rich regions.

This is based on the assumption that developed countries will experience steady conditions when income levels cannot increase anymore because additional investment does not increase income. This can happen because existing investments have covered all production costs, so additional savings in the country cannot be used as an additional investment.

Absolute Beta Convergence Analysis

The second objective is to test and analyse the absolute beta where poorer regions' economic growth overtakes the richer regions, as stated by Kuncoro (2013), Todaro & Smith, (2012), Barro and Sala-i-Martin (1992), Abramovitz (1997), Mankiw (2003), Schmitt & Starke (2011), Korotayev et al. (2011), Harodd-Domar in Tarasov and Tarasova (2019), Solow-Swan in Alexiadis (2013).

Table 1: Results of Absolute Beta Convergence Estimation in Districts/Cities of South Kalimantan 2010-2019

Model	*Common Effect Model*			*Fixed Effect Model*			*Random Effect Model*		
Variable	Coefficient	t-Stat	*ρ-Value*	Coefficient	t-Stat	*ρ-Value*	Coefficient	t-Stat	*ρ-Value*
C	11,544	5,697	0,000*	39,475	4,032	0,000*	13,188	4,433	0,000*
LOG(PDRBYT_1)	-0,621	-3,105	0,002*	-3,381	-3,495	0,000*	-0,783	-2.668	0,008
R-Squared	0,070052			0,303667			0,050132		
Adj R-Squared	0,062787			0,225630			0,042711		
F-Stat	964,2133			389,1313			675,5601		
Prob. (F-stat)	0,002342			0,000032			0,010443		
Hausman Test = 0,0048				Chow Test Cross section F = 0.000					
ρ-Value < 0,0				Cross section Chi-square = 0,0002					

significance at α = 1%

To analyze absolute convergence, an equation estimates the GRDP per capita of 13 districts/cities in South Kalimantan and the previous year. Based on the above equation, the coefficient of GRDP per capita of 13 regencies/cities in South Kalimantan in the previous year was -3.381. This means that the increase/decrease in GRDP per capita of 13 regencies/cities in South Kalimantan Province from the previous year was 1 percent chave an impact on the GRDP per capita of 13 districts/cities in South Kalimantan by 3.381 per cent. The influence of GRDP per capita in 13 districts/cities in South Kalimantan in the previous year was negative and significant, as indicated by a significance level of 0.000 (< 0.05).

From the data processing results, it can be seen that the coefficient of income per capita in the previous year was negative. In other words, absolute convergence occurred. The poor regions grew faster than the rich regions so they caught up. Therefore, the initial hypothesis stating that absolute convergence occurs is accepted.

Convergence Speed Measurement

The speed of convergence shows the magnitude of the velocity produced by each coefficient of absolute and conditional convergence in the province of South Kalimantan in 2010-2019. The table shows the results of beta convergence and the speed of convergence between districts/cities in South Kalimantan.

Table 2: Absolute Beta Convergence Speed in South Kalimantan in 2010-2019

Results	Absolute Beta Convergence
Beta (β)	0,086
Rate Of Convergence (%)	8,67
Half-Life Convergence (year)	7,94

The speed of convergence of per capita income is 0.0867, which indicates that the per capita income of districts/cities, especially low-income areas, grew at least 8.67 per cent per year so that the economy can reach a steady state. From the absolute beta convergence value of 0.0867, it can be concluded that the half-life convergence is 7.94 years, which means it takes 7.94 years to half-close the gap. Therefore, to cover the overall income inequality per capita, it will take 15.89 years with the condition that per capita income must increase by at least 8.67 per cent per year.

Conclusion

There has been economic growth convergence in South Kalimantan as the income per capita growth rate between regions tends to decrease over time (sigma convergence). The conditional beta convergence estimation based on the coefficient results of the previous year's per capita income shows a negative sign. It is significant, which means that regions with low per capita incomes can catch up with regions with higher per capita incomes. The coefficient of income per capita in the previous year showed a negative value, so it can be said that there was absolute convergence.

The beta convergence value of 0.0867 shows that the half-life convergence time required to close half of the initial gap was 7.94 years. Therefore, to cover the overall income inequality per capita, it will take 15.89 years with the condition that per capita income must increase by at least 8.67 per cent per year.

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