

Analysis of Development Inequality and Economic Convergence in the Bodetabek Region 2018–2024

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Abstract: Economic development in the Bodetabek (Bogor, Depok, Tangerang, and Bekasi) region plays a strategic role in supporting national economic growth. The concentration of economic activity, investment, labor absorption, and infrastructure development is uneven. This leads to development inequality between regions. This study aims to analyze the level of development inequality, test for the occurrence of β -convergence and σ -convergence, and identify the influence of investment, labor, and infrastructure on economic growth in the Bodetabek region. The study uses quantitative secondary data from eight regencies/cities in the Bodetabek region during the 2018-2024 period. Data were obtained from the Central Statistics Agency (BPS) and various official government publications. The analytical methods used include the Williamson Index, β -convergence analysis, σ -convergence analysis, and panel data regression with the Fixed Effect Model (FEM) approach. The results show that the level of development inequality in the Bodetabek region is still relatively high. The β -convergence analysis shows that there is no economic convergence, as indicated by a positive and insignificant beta coefficient, thus indicating a tendency for economic divergence. The σ -convergence analysis also shows that inter-regional income disparities persist, as indicated by a very small decrease in sigma values over the study period. Panel data regression results indicate that investment has a positive and significant effect on economic growth, while labor and infrastructure have no significant effect.

Keywords : Development Inequality, Economic Convergence, Williamson Index

Abstrak: Pembangunan ekonomi di kawasan Bodetabek (Bogor, Depok, Tangerang, dan Bekasi) memiliki peran strategis dalam mendukung pertumbuhan ekonomi nasional. Namun, konsentrasi aktivitas ekonomi, investasi, penyerapan tenaga kerja, dan pembangunan infrastruktur masih belum merata. Kondisi ini menyebabkan ketimpangan pembangunan antarwilayah. Penelitian ini bertujuan untuk menganalisis tingkat ketimpangan pembangunan, menguji terjadinya konvergensi beta (β -konvergensi) dan konvergensi sigma (σ -konvergensi), serta mengidentifikasi pengaruh investasi, tenaga kerja, dan infrastruktur terhadap pertumbuhan ekonomi di kawasan Bodetabek.

Penelitian ini menggunakan data sekunder kuantitatif dari delapan kabupaten/kota di kawasan Bodetabek selama periode 2018–2024. Data diperoleh dari Badan Pusat Statistik (BPS) dan berbagai publikasi resmi pemerintah. Metode analisis yang digunakan meliputi Indeks Williamson, analisis β -konvergensi, analisis σ -konvergensi, serta regresi data panel dengan pendekatan Fixed Effect Model (FEM).

Hasil penelitian menunjukkan bahwa tingkat ketimpangan pembangunan di kawasan Bodetabek masih tergolong tinggi. Analisis β -konvergensi menunjukkan bahwa tidak terjadi konvergensi ekonomi, sebagaimana ditunjukkan oleh koefisien beta yang bernilai positif dan tidak signifikan. Temuan ini mengindikasikan adanya kecenderungan divergensi ekonomi. Analisis σ -konvergensi juga menunjukkan bahwa kesenjangan pendapatan antarwilayah masih berlangsung, yang ditandai oleh penurunan nilai sigma yang sangat kecil selama periode penelitian. Hasil regresi data panel menunjukkan bahwa investasi berpengaruh positif dan signifikan terhadap pertumbuhan ekonomi, sedangkan tenaga kerja dan infrastruktur tidak berpengaruh signifikan terhadap pertumbuhan ekonomi.

Kata kunci: Ketimpangan pembangunan; konvergensi ekonomi; Indeks Williamson.

INTRODUCTION

Economic development is an important pillar for national welfare and growth, but has not been fully able to reduce inequality between regions. (Alfaris, 2024) However, this growth has not fully reduced development disparities between regions. Data from the Central Statistics Agency (BPS, 2024) shows that inequality in the distribution of national expenditure remains in the moderate to high category, influenced by the concentration of economic activity in certain regions, particularly Java. (Damayanti, 2016). Regions with a strong economic base tend to attract investment and infrastructure more easily than weaker regions. (Simanjuntak & Widodo, 2025) In this context, the Bodetabek area, as a buffer zone for Jakarta, plays a significant role in national economic growth, but equitable development across regions remains a challenge.

The calculation of economic development inequality in the Bodetabek region for the 2018–2024 period uses the Williamson Index (IW) based on 2010 ADHK per capita GRDP data and population to measure disparities between regions and serve as a basis for formulating more equitable development policies. The calculation results show that the level of inequality in Bodetabek is moderate

and relatively stable. After declining in 2019 and increasing in 2020 due to the pandemic, the IW value tends to be stable until 2024, indicating a slow process of economic convergence. According to convergence theory, Solow (1956) and developed by Barro & Sala-i-Martin (1992) The gap should narrow as low-income areas grow, but in Indonesia this process is still influenced by factors such as industrial structure, infrastructure, accessibility, institutional capacity, and regional policies.(Wibisono, 2003).

Inequality occurs because opportunities and growth potential are not evenly distributed, so that developed regions are better able to attract investment, skilled labor, and quality infrastructure than other regions.(Harsono et al., 2025)This phenomenon is evident in the Bodetabek area, where development is concentrated in areas closer to Jakarta, leaving other regions facing limited access to investment and development barriers. (Parmadi et al., 2025). The Bodetabek area is a real example of this phenomenon, because even though the entire area is close to the national growth center, development is concentrated in certain areas, especially those closest to DKI Jakarta, causing other areas to face limited access to investment and development obstacles (Hidayadi & Niam (2022). The percentage distribution of Gross Regional Domestic Product (GRDP) at current prices for the 2018–2024 period provides an initial overview of each district/city's contribution to the Bodetabek regional economy. This data serves as the basis for analyzing development disparities, trends in economic convergence, and the dynamics of shifting economic roles between regions over time, thereby providing a more comprehensive picture of the development of regional economic structures.

Based on the displayed GRDP distribution, there are significant differences in economic contributions between regions in the Greater Jakarta (Bodetabek) area. Tangerang City, Tangerang Regency, and Bekasi Regency show relatively larger and more stable GRDP contributions compared to other regions, indicating a concentration of economic activity in areas with a strong industrial and service base. Meanwhile, regions such as Bogor City and Depok City have smaller contributions, reflecting the unequal distribution of economic development.

However, this relatively stable trend over time also opens up opportunities for a gradual process of economic convergence, along with equitable development and increased connectivity between regions.

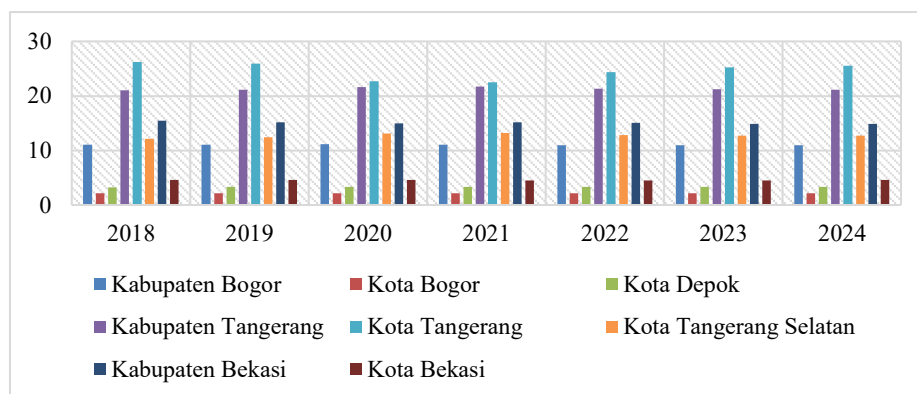


Figure 1. Percentage Distribution of GRDP Based on Current Prices (%) Bodetabek 2018-2024

Source: BPS Bodetabek 2018-2024

The urgency of studying inequality and economic convergence in the Greater Jakarta (Bodetabek) region has increased following the COVID-19 pandemic (2020–2022) because the crisis impacted labor mobility and investment, weakening more vulnerable regions. National studies indicate a decline in income variation between provinces in 2018–2023, but there is no strong evidence that underdeveloped regions grew faster than developed regions. (Kusumastuti et al., 2025) Therefore, it is important to conduct a convergence analysis in Bodetabek by comparing the per capita GRDP growth rate from 2018 to 2024 to assess whether convergence has occurred or whether persistent inequality remains.

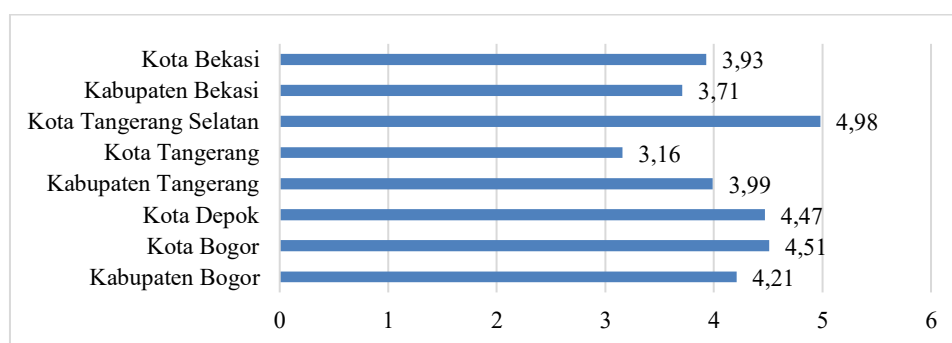


Figure 2. Average GRDP Growth Rate per Capita 2018–2024 (%)

Source: BPS Bodetabek 2018-2024

Based on Figure 2, the per capita GRDP growth rate in Bodetabek (Greater Jakarta) shows inter-regional variation, with South Tangerang City, Bogor City, and Depok City having the highest growth rates, while Tangerang City and Bekasi Regency have lower growth rates. This indicates uneven economic growth, influenced by differences in economic structure, industrial concentration, and limited infrastructure and accessibility, thus slowing equitable development across the Bodetabek region. The development inequality in the Greater Jakarta (Bodetabek) region is also reflected in the distribution of investment realization between regions, in line with differences in economic structure, infrastructure, and productivity. Investment tends to be concentrated in areas with high accessibility and a strong industrial base, thus strengthening the economic agglomeration process. Therefore, Bodetabek investment data for the 2018–2024 period is used to analyze capital flow patterns and their implications for inequality and the process of economic convergence between regions.

Investment in the Greater Jakarta (Bodetabek) region is concentrated in Bekasi Regency and Tangerang Regency/City, while areas like Bogor and Depok receive less and tend to fluctuate, indicating unequal capital accumulation that can exacerbate development disparities and hinder economic convergence. This condition is also related to labor distribution, as regions with high investment tend to absorb more labor and strengthen their economic advantages. Therefore, 2018–2024 labor data is used to complement the analysis of the relationship between investment and labor markets across regions. Areas with high investment levels, such as Bekasi Regency and Tangerang Regency and City, generally show a relatively larger and more stable labor force percentage compared to other regions. Conversely, some areas, such as South Tangerang City and Bogor Regency, exhibit more pronounced fluctuations in labor force percentages, particularly during the pandemic. This pattern indicates a close link between investment distribution and labor absorption capacity, where inequality in labor absorption has the potential to exacerbate regional differences in productivity and income, thus impacting the pace of economic convergence in the Greater Jakarta (Bodetabek) region.

Along with the distribution of investment and labor, infrastructure is also a crucial factor influencing development inequality and the dynamics of economic convergence between regions. The availability and quality of infrastructure play a key role in supporting economic activity, as they determine smooth mobility, regional accessibility, and production efficiency. Therefore, an analysis of district/city infrastructure in the Greater Jakarta (Bodetabek) region is necessary to determine the extent to which differences in physical facilities between regions contribute to variations in economic performance during the 2018–2024 period. There are quite clear disparities between regencies/cities in Greater Jakarta (Bodetabek). Bogor Regency, Depok City, and Bekasi Regency tend to have relatively higher and more stable infrastructure levels, while several other cities have shown significant fluctuations, particularly during the pandemic. This difference indicates that infrastructure disparities have the potential to exacerbate regional disparities in economic activity and productivity, thus contributing to the economic convergence process in the Greater Jakarta region.

Based on empirical conditions, an in-depth study of development inequality and economic convergence in the Bodetabek region for the 2018–2024 period is necessary, particularly given the limited specific research in this region. Previous empirical studies have generally been provincial or national in scale, such as Suryadimulyo and Kuncoro (2008), Wibisono (2003), Zega et al., (2022) While income inequality remains persistent, studies specifically analyzing inter-regional dynamics within the Bodetabek metropolitan area and the impact of the COVID-19 pandemic are still limited. This indicates a significant research gap regarding the interaction of inequality and economic convergence in the metropolitan areas surrounding the capital city before, during, and after the pandemic.

TINJAUAN PUSTAKA ATAU LANDASAN TEORI

National research related to Development Inequality and Economic Convergence can serve as a reference. Research by Lania, Canon, and Payu (2025) analyzed regional inequality between provinces in Indonesia for the 2022–2023 period using the Williamson Index and panel data regression. The variables studied

included regional inequality, economic growth (GRDP), and the Human Development Index (HDI). The results showed that economic growth and the HDI significantly influenced regional inequality. Despite national economic growth, interprovincial inequality remains high, particularly in Java, which exhibits a greater concentration of economic activity than other regions.

Research by Mevia (2023) analyzed economic growth and regional inequality in East Java during 2016–2021 using the Williamson Index and Klassen Typology. The findings revealed persistent regional disparities despite increasing per capita GRDP. Yudrianto (2023) examined income convergence across Central Java regencies/cities in 2018–2022 using β -convergence and σ -convergence models. The results indicated partial convergence, although differences in regional economic structures remained barriers. Dita (2024) investigated economic growth convergence in Eastern Indonesia during 2018–2022 using β -convergence and σ -convergence models. The findings showed slow convergence due to disparities in investment and infrastructure.

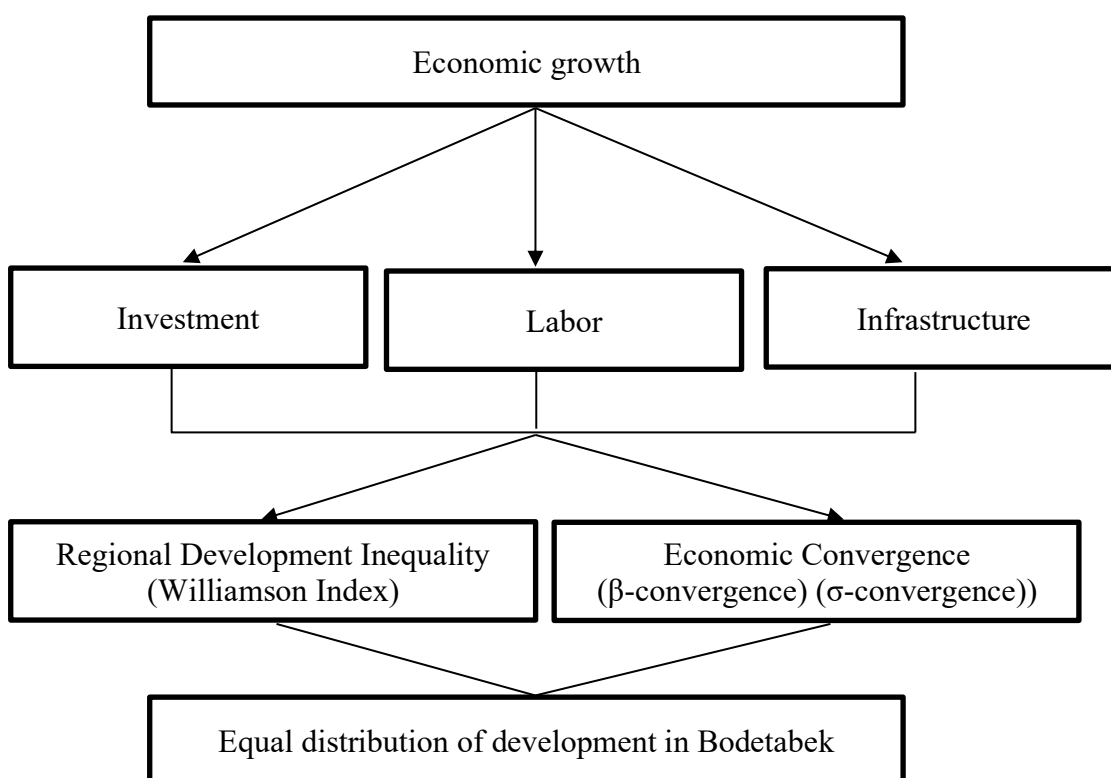
Lailatussubha and Nazer (2025) examined the effects of economic growth, investment, and the Human Development Index (HDI) on income inequality in Indonesia during 2015–2023. Economic growth and investment reduced inequality, while HDI played a significant mediating role. Zega et al. (2022) analyzed development inequality and income convergence in North Sumatra using the Williamson Index and panel regression. Despite high inequality, absolute and conditional convergence occurred, supported by capital formation, per capita income, education, and life expectancy.

Telaumbanua (2024) investigated economic growth convergence across Sumatra using panel regression. The results confirmed sigma and beta convergence, although regional inequality remained relatively high. Zainuri (2022) examined economic growth convergence in East Java following the 2008 global crisis using the Least Squares method. The findings indicated absolute sigma and beta convergence, with HDI and labor positively affecting economic growth.

Arsyanti and Nugrahadhi (2020) analyzed regional and national economic convergence using panel regression. The findings showed sigma convergence in Eastern Indonesia and nationally, alongside absolute and conditional beta convergence across Western Indonesia, Eastern Indonesia, and the national level. Production factors accelerated convergence. Panjaitan (2025) analyzed economic growth convergence in the Labuhanbatu border region using a fixed-effects model, with per capita GRDP and its lagged value as variables.

Framework of Thought

This study analyzes development inequality and examines the economic convergence of Bodetabek (Bodetabek) for the 2018–2024 period using quarterly data from the Central Statistics Agency (BPS), to provide an empirical basis for formulating policies for equitable regional development.



Figur 3. Framework of Thought

Hypothesis

1. H1: The greater the difference in GRDP per capita between regions in the Bodetabek area, the higher the level of economic development inequality between regions in the 2018–2024 period.
2. H2: The lower the initial income level (initial GRDP per capita) of a region in the Bodetabek area, the higher its economic growth rate, resulting in economic convergence (β -convergence) in the 2018–2024 period.
3. H3: The lower the variance (dispersion) in GRDP per capita between regions in the Bodetabek area from year to year, the greater the indication of economic convergence (σ -convergence) in the 2018–2024 period.
4. H4: Investment, labor, and infrastructure influence development inequality and economic convergence between regions in the Bodetabek area in the 2018–2024 period.
 - a. H4a: The greater the investment inflow into a region, the higher the rate of economic growth, thus accelerating economic convergence between regions in the Bodetabek area during the 2018–2024 period.
 - b. H4b: The higher the labor force participation rate in a region, the higher the economic activity, which can drive economic growth and accelerate convergence between regions in the Bodetabek area during the 2018–2024 period.
 - c. H4c: The better the infrastructure in a region, the lower the level of development inequality and the faster the process of economic convergence between regions in the Bodetabek area during the 2018–2024 period..

RESEARCH METHODS

This study uses a quantitative approach to analyze economic development inequality and inter-regional economic convergence in the Bodetabek area for the period 2018–2024. The dependent variables in this study are economic development inequality measured using the Williamson Index (IW) based on GRDP per capita and population, and economic convergence measured through the growth rate of GRDP per capita at constant 2010 prices.

The independent variables consist of initial income, measured by GRDP per capita in the initial year, investment represented by PMDN/PMA or PMTB, labor force, measured by the number of workers or TPAK, and infrastructure, measured by the length of roads in good condition. These variables are used to explain the dynamics of economic inequality and convergence between regions.

The study population covered eight regencies/cities in the Greater Jakarta (Bodetabek) region: Bogor City and Regency, Depok, Tangerang, South Tangerang, and Bekasi. The entire population was sampled using a saturated sampling technique. The data used was panel data covering eight regions and seven years of observation, resulting in 56 observations.

The research data consists of secondary quantitative data obtained from the Central Statistics Agency (BPS), the Investment Coordinating Board (BKPM/OSS), the Regional Development Planning Agency (Bappeda), and the Ministry of Finance. Data collection was conducted through documentation methods based on official publications.

Data analysis used descriptive statistics and panel data regression with the help of EViews 9. The estimation models used include Common Effect, Fixed Effect, and Random Effect, which were selected through the Chow, Hausman, and Lagrange Multiplier tests. Classical assumption tests were conducted to ensure model validity, including tests for normality, multicollinearity, autocorrelation, and heteroscedasticity.

The regression model used is:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + e$$

Hypothesis testing was carried out using the t-test, F-test, and coefficient of determination (Adjusted R²) to assess the partial and simultaneous effects and the model's ability to explain the dependent variable.

RESULTS AND DISCUSSION

Result

The data analysis used in this study consists of several stages to analyze the level of development inequality and economic convergence in the BODETABEK area in 2018–2024, namely as follows:

Williamson Index Analysis

The Williamson Index analysis is used to measure the level of development inequality between regions in the BODETABEK area. The Williamson Index ranges from 0 to 1, with values closer to 0 indicating low inequality, while values closer to 1 indicating high inequality.

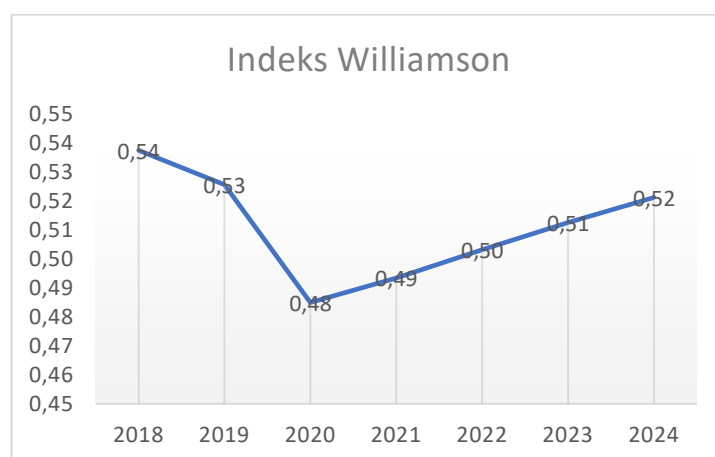


Figure 4. Williamson Index for Bodetabek Region 2018–2024

Based on Figure 3, development inequality in the Greater Jakarta (Bodetabek) region for the 2018–2024 period is relatively high, with fluctuations in the Williamson Index value. The highest value occurred in 2018 (0.5373) and the lowest in 2020 (0.4849), indicating a temporary decline in inequality. However, after 2020, the index increased again until 2024 (0.5210), indicating that inter-regional inequality remains relatively high and has not yet demonstrated optimal equality.

Beta Convergence Analysis (β -Convergence)

β -convergence analysis was used to test whether regions with lower initial income grew faster than regions with higher income. Based on the OLS regression results, the equation $g_i = -0.003045 + 0.001192 \ln(\text{GRDP}2018)$ was obtained, with a positive coefficient of 0.001192 and a p-value of 0.1715. This result indicates that regions with higher initial GRDP actually tend to grow faster, thus indicating a tendency for economic divergence, although not statistically significant. The R^2 value of 0.2866 indicates that 28.66% of the variation in growth can be explained by initial GRDP, while the remainder is influenced by other factors such as investment, infrastructure, labor, and regional policies. Thus, there is no evidence of β -convergence in the Bodetabek area during the 2018–2024 period.

Sigma Convergence Analysis (σ -Convergence)

Sigma convergence analysis was used to determine whether there was a decrease in income disparities between regions during the study period. This measurement was performed by calculating the variance or standard deviation of the logarithm of each region's per capita GRDP each year. A decrease in the variance or standard deviation over time indicates economic convergence.

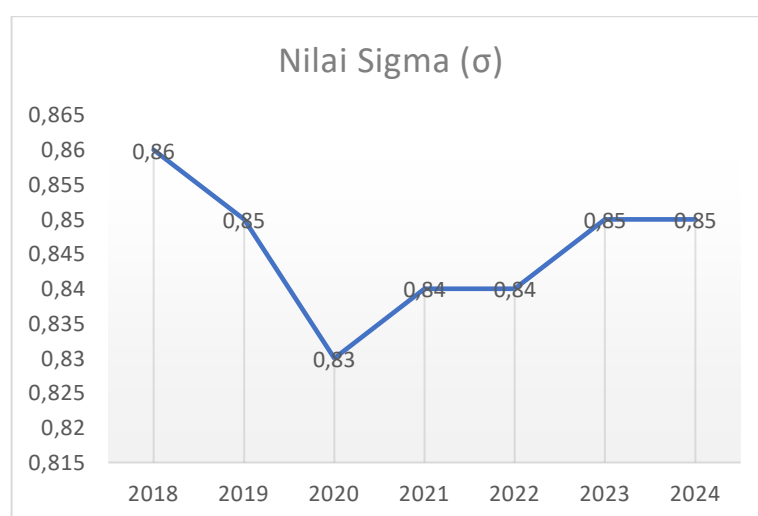


Figure 5. Sigma Convergence in the Bodetabek Region 2018–2024

Based on Figure 4, the σ -convergence value in the Bodetabek area fluctuated during 2018–2024, decreasing from 0.86 (2018) to 0.83 (2020), indicating a decrease in inequality. It then increased again to 0.85 in 2024. This pattern indicates that the process of narrowing the gap is not consistent. Overall, the very small change in value indicates that development inequality between regions is still relatively high and economic convergence has not yet occurred strongly in the Bodetabek area.

Panel Data Regression Analysis

Panel data regression analysis was used to examine the influence of investment, labor, and infrastructure on economic growth in the BODETABEK region. The panel data regression model was chosen because the study used combined cross-sectional (district/city) and time series data (2018–2024). The best model was selected using the Chow and Hausman tests to determine whether the Common Effect, Fixed Effect, or Random Effect model was most appropriate.

Descriptive Analysis

Descriptive analysis is used to provide a general overview of the development of regional economic conditions in the BODETABEK area during the study period. The results of descriptive statistics show that during the 2018–2024 period, the average GRDP ADHK of regencies/cities in the Bodetabek area was 40,018.73 billion rupiah with a minimum value of 19,731 billion rupiah and a maximum of 89,700 billion rupiah. The investment variable has an average of Rp13.9 trillion with the highest value reaching Rp61.2 trillion and the lowest Rp618 billion. Meanwhile, the average labor force participation rate (TPAK) was 63.91 percent with a minimum value of 58.13 percent and a maximum of 67.35 percent. The infrastructure variable has an average of 943.39 km with a minimum value of 32 km and a maximum of 2,019 km. These results indicate differences in economic characteristics between regencies/cities in the Bodetabek area as reflected in variations in the value of GRDP, investment, labor, and infrastructure during the study period.

Chow Test

The Chow test is used to determine the best model between the Common Effect Model (CEM) and the Fixed Effect Model (FEM). If the Cross-section F probability value is less than 0.05, then the selected model is the Fixed Effect Model. Conversely, if the probability value is greater than 0.05, then the selected model is the Common Effect Model. The results of the Chow test show a Cross-section F probability value of 0.0000 which is smaller than the 0.05 significance level. These results indicate that H_0 is rejected and H_1 is accepted, so the more appropriate model to use is the Fixed Effect Model (FEM) compared to the Common Effect Model (CEM). Thus, there are differences in characteristics between districts/cities in the Bodetabek area that affect the relationship between investment, labor, and infrastructure to the ADHK GRDP so that the Fixed Effect model is better able to capture the heterogeneity of each region.

Hausman test

The Hausman test was used to determine the best model between the Fixed Effect Model (FEM) and the Random Effect Model (REM). This test was conducted after obtaining the Fixed Effect Model results from the Chow Test. The Hausman test results showed a probability value of 0.0476, which is smaller than the 0.05 significance level. These results indicate that H_0 is rejected and H_1 is accepted, so the most appropriate model used in this study is the Fixed Effect Model (FEM) compared to the Random Effect Model (REM). Thus, the analysis of the influence of investment, labor, and infrastructure on the ADHK GRDP in the Bodetabek area was conducted using the Fixed Effect Model approach because it is able to provide more consistent estimates and is in accordance with the characteristics of the research data.

Multicollinearity Test

The multicollinearity test aims to determine whether there is a strong relationship between the independent variables in a research model. This test is conducted using a correlation matrix between the independent variables.

Table0 1. Results of Multicollinearity Test Between Independent Variables

	GRDP ADHK Y_	INVESTMENT X1_	LABOR X2_	INFRASTRUCTURE X3_
GRDP ADHK Y	1,000,000	0.713999	0.038922	-0.220025
INVESTMENT X1_	0.713999	1,000,000	0.288613	0.114491
LABOR X2_	0.038922	0.288613	1,000,000	-0.029441
INFRASTRUCTURE X3_	-0.220025	0.114491	-0.029441	1,000,000

Based on Table 1, the correlation values between the independent variables indicate that there is not a very strong relationship between investment, labor, and infrastructure. The highest correlation value occurs between investment and labor at 0.288613, while all other correlation values are well below the 0.80 threshold. Therefore, it can be concluded that the regression model does not experience multicollinearity issues, making the independent variables used in this study suitable for further analysis.

Hypothesis Testing

t-test (Partial)

The t-test is used to determine the influence of each independent variable, namely investment, labor, and infrastructure on economic growth partially.

Table0 2. Results of the t-Test (Partial) Panel Data Regression

Dependent Variable: GRDP_ADHK_Y_				
Variable	Coefficint	Std. Error	t-Statistic	Prob.
C	-14284.53	31369.33	-0.455366	0.6510
INVESTMENT_X1_	3.14E-10	1.32E-10	2.377975	0.0217
LABOR_X2_	772.3764	488.1480	1.582259	0.1206
INFRASTRUCTURE_X3	0.591877	1.883701	0.314210	0.7548

Based on the Table 2, the t-test results show that the investment variable has a probability value of 0.0217, which is smaller than 0.05, so it has a positive and significant effect on the ADHK GRDP in the Bodetabek area. This indicates that increased investment can encourage increased regional economic activity. Meanwhile, the labor variable has a probability value of 0.1206 and the infrastructure variable is 0.7548, both of which are greater than 0.05. Thus, labor

and infrastructure do not have a significant effect on the ADHK GRDP during the study period. These results indicate that the economic growth of the Bodetabek area is more influenced by increased investment than labor and infrastructure factors.

F Test (Simultaneous)

The F-test was used to determine the joint influence of investment, labor, and infrastructure on economic growth. The F-test results showed an F-statistic value of 82.52155 with a probability value of 0.0000, which is smaller than the 0.05 significance level. These results indicate that investment, labor, and infrastructure simultaneously have a significant effect on the ADHK GRDP in the Bodetabek area. Thus, the regression model used in this study is suitable for explaining the relationship between the independent variables and the dependent variable.

Coefficient of Determination (R^2)

The coefficient of determination (R^2) is used to measure the ability of independent variables to explain variations in dependent variables. The R^2 value ranges from 0 to 1. The greater the R^2 value, the greater the ability of investment, labor, and infrastructure variables to explain variations in economic growth in the Bodetabek area. The R-squared value of 0.948289 indicates that 94.83 percent of the variation in GRDP ADHK in the Bodetabek area can be explained by the investment, labor, and infrastructure variables in the research model. Meanwhile, the remaining 5.17 percent is explained by other factors outside the model that were not studied. The Adjusted R-squared value of 0.936797 also indicates the model's excellent ability to explain variations in GRDP ADHK, so that the regression model used has a high level of accuracy.

Discussion

Level of Development Inequality in the BODETABEK Region in 2018–2024 Based on the Williamson Index

Based on the Williamson Index calculation results, the level of development inequality in the BODETABEK area during the 2018–2024 period tends to be in

the high category. This is indicated by the Williamson Index value being above 0.50 in most of the research years, namely 0.5373 in 2018, 0.5255 in 2019, 0.5031 in 2022, 0.5125 in 2023, and 0.5210 in 2024. Meanwhile, in 2020 and 2021, the Williamson Index value was in the moderate category, at 0.4849 and 0.4934, respectively. This condition may be influenced by the slowdown in economic activity during the COVID-19 pandemic, which caused economic growth in high-income areas to decline, thus narrowing the gap between regions relatively. On the other hand, regions with lower economic capacity have not been able to catch up with the growth of more developed regions so that the development gap still exists.

The results of this study align with those of Lania, Canon, and Payu (2025), which showed that development inequality between provinces in Indonesia remains high despite continued economic growth. Mevia's (2023) study also found that development inequality in East Java persists because economic growth has not been fully accompanied by equitable development across regions. Furthermore, research by Zega et al. (2022) states that development inequality between regencies/cities in North Sumatra Province remains high despite economic convergence. Therefore, the results of this study indicate that equitable development in the BODETABEK region during the 2018–2024 period has not been optimal, necessitating development policies capable of encouraging more equitable economic growth across regions.

Beta Convergence Analysis (β -Convergence) in the BODETABEK Region 2018–2024

Based on the β -convergence estimation results, the coefficient of the initial GRDP per capita logarithm variable is 0.001192 with a probability value of 0.1715. A positive coefficient value indicates that regions with higher initial income levels tend to experience higher economic growth than regions with lower initial income levels. Furthermore, a probability value greater than 0.05 indicates that the relationship is not statistically significant. These results indicate that during the 2018–2024 period, there was no economic convergence in the BODETABEK region. Instead, there is a tendency for economic divergence,

namely that regions with high income levels continue to grow faster than regions with low income levels.

The results of this study differ from those of Zega et al. (2022), who found both absolute and conditional convergence in North Sumatra Province. Telaumbanua's (2024) study also showed that island-based regions in Sumatra experienced both absolute and conditional beta convergence. Furthermore, Zainuri et al.'s (2022) study found absolute beta convergence in East Java Province. These differences indicate that the economic characteristics of the BODETABEK region, which is dominated by metropolitan areas, make the process of equitable economic growth more difficult than in other regions. Therefore, the results of this study indicate that the economic development gap in the BODETABEK region remains relatively persistent, necessitating development policies capable of boosting economic growth in underdeveloped regions.

Sigma Convergence Analysis (σ -Convergence) in the BODETABEK Region 2018–2024

Based on the σ -convergence calculation, the sigma value fluctuated during the study period. It decreased from 0.86 in 2018 to 0.83 in 2020, then increased again to 0.85 in 2024. This indicates that inter-regional income disparities in the BODETABEK region remain relatively high and have not experienced significant changes during the study period. These results reinforce the findings of the β -convergence analysis, which also indicated the absence of economic convergence.

The results of this study differ from those of Arsyanti and Nugrahadhi (2020), who found sigma convergence in Eastern Indonesia and at the national level. Telaumbanua's (2024) study also showed sigma convergence in the island-like region of Sumatra, while Zainuri et al. (2022) found that East Java Province experienced sigma convergence after the global crisis. These differences indicate that the characteristics of economic development in the Greater Jakarta (BODETABEK) region are still dominated by the concentration of economic activity in certain areas, resulting in a relatively slow process of narrowing the gap.

Based on these results, equitable distribution of economic development in the BODETABEK region remains a challenge that requires more equitable development policies, particularly through increased investment, equitable distribution of infrastructure, and development of human resource quality in areas where economic growth is still lagging behind.

The Impact of Investment on the GRDP ADHK in the Bodetabek Area 2018-2024

Based on the results of panel data regression using the Fixed Effect Model (FEM), the investment variable has a coefficient value of 0.000000000314 with a probability value of 0.0217. This probability value is smaller than the 0.05 significance level, indicating that investment has a positive and significant effect on the ADHK GRDP in the Bodetabek area in 2018–2024. These results indicate that the higher the investment entering a region, the greater the economic activity generated.

The results of this study also align with research by Yudrianto (2023), who identified investment as one of the factors influencing GRDP per capita in an analysis of economic convergence between regencies/cities in Central Java Province. This study demonstrated that investment contributes to increasing economic activity, thus accelerating the process of income convergence between regions. Dita (2024) also demonstrated that investment is a factor influencing economic growth in Eastern Indonesia. Furthermore, Lailatussubha and Nazer (2025) found that investment impacts economic conditions by reducing inequality in income distribution.

In line with previous research, this finding indicates that the influence of investment on GRDP has a path coefficient of 0.544. Furthermore, the results of the t-statistical test show a calculated t-value of 11.307, which is greater than the t-table of 1.977961, and the significance value is at <0.001 , less than 0.05. These results can be concluded that investment has a positive and significant effect on GRDP.

The Influence of Labor on the GRDP ADHK in the Bodetabek Area 2018-2024

Based on the results of panel data regression using the Fixed Effect Model (FEM), the labor variable has a coefficient value of 772.3764 with a probability value of 0.1206. This probability value is greater than the 0.05 significance level, indicating that labor does not have a significant effect on the GRDP ADHK in the Bodetabek area in 2018–2024. The results of this study differ from the research of Zainuri et al. (2022) which showed that labor has a positive effect on economic growth so that an increase in the number of productive workers can increase economic output in East Java Province. In addition, Yudrianto (2023) also included labor as one of the factors influencing GRDP per capita in the economic convergence analysis. The difference in research results is thought to be caused by the characteristics of the study area, where the BODETABEK area has a more complex economic structure and is dominated by the industrial and service sectors.

This finding is in line with previous research which shows that the labor variable (X2) has a value smaller than the t-table ($0.080 < 2.179$), meaning that H_0 is accepted and H_a is rejected. This indicates that the labor force (X2) during the 2010-2023 period does not have a significant effect on economic growth (Y) in Merangin Regency. Or seen from the sig value obtained for the labor variable (X2) (β_2) whose value is greater than alpha ($0.937 > 0.05$) meaning that H_0 is accepted and H_a is rejected. This indicates that the labor force (X2) during the 2010-2023 period does not have a significant effect on economic growth (Y) in Merangin Regency. This is because the labor force in Merangin Regency is dominated by low-skilled workers, productivity also tends to be low. Lack of education, training, and access to technology hinders the ability of the workforce to significantly increase economic output. Most of the workforce may work in the informal sector whose contribution to GRDP is often unrecorded or less significant. Jobs in the informal sector generally have low productivity and do not make a large contribution to economic growth. (Mainita et al., 2025)

The Influence of Infrastructure on the GRDP ADHK in the Bodetabek Area 2018-2024

Based on the results of panel data regression using the Fixed Effect Model (FEM), the infrastructure variable has a coefficient value of 0.591877 with a probability value of 0.7548. This probability value is greater than the 0.05 significance level, indicating that infrastructure does not have a significant effect on the GRDP ADHK in the Bodetabek area in 2018–2024. The results of this study are inconsistent with Dita's (2024) research, which shows that infrastructure is one of the factors influencing economic growth in Eastern Indonesia. The study explains that infrastructure disparities between regions cause the economic convergence process to take place relatively slowly. Telaumbanua's (2024) research also found that infrastructure, together with investment, labor, and PMTB, contribute to accelerating the convergence of economic growth in areas characterized by the Sumatran regional archipelago. In addition, Arsyanti and Nugrahadi (2020) stated that road length as an infrastructure indicator is one of the factors accelerating the economic convergence process at the regional and national levels.

These findings align with previous research showing that road infrastructure has no effect on economic growth in Palu City. This finding contrasts with the findings of Atmaja and Mahalli (2015) who found that road infrastructure had a positive effect on economic growth in Sibolga City. Research by Almismary and Wahyono (2020) also found that road infrastructure had no significant effect on economic growth in Banda Aceh City. Road infrastructure partially impacted economic growth in Palu City, possibly due to the lack of road network expansion in Palu City between 2016 and 2019. Changes occurred only between 2010 and 2015, with no further expansion since then. This is despite the fact that Palu City has been designated a Special Economic Zone, which requires smooth mobility to boost economic growth.(Ajrina & Meraldha, 2025)

The Influence of Investment, Labor, and Infrastructure on the GRDP ADHK in the Bodetabek Area 2018-2024

Based on the F-test results, the F-statistic value was 82.52155 with a probability value of 0.0000. This value is smaller than the significance level of 0.05, indicating that investment, labor, and infrastructure simultaneously have a significant effect on the ADHK GRDP in the Bodetabek area in 2018–2024. These results indicate that regional economic growth is not only influenced by one factor, but is the result of the interaction of various production and development factors. Investment plays a role in capital formation, labor plays a role as a production factor, while infrastructure functions as a supporter of economic activity. Together, these three variables are able to explain changes in the ADHK GRDP in the Bodetabek area during the study period.

CONCLUSION

Based on the results of the analysis of development inequality and economic convergence in the Bodetabek area for the 2018–2024 period, the following conclusions were obtained:

1. The Williamson Index calculation results indicate that the level of development inequality in the Greater Jakarta (Bodetabek) region during the 2018–2024 period tended to be high. Although inequality decreased in the 2018–2020 period, the index value increased again in subsequent years. This indicates that equitable development across regions in the Greater Jakarta (Bodetabek) region has not been optimal.
2. The results of the beta convergence analysis indicate that there was no economic convergence in the Bodetabek region during the 2018–2024 period. Regions with higher initial income levels tended to experience higher growth than regions with lower initial income levels, resulting in a tendency for economic divergence between regions.
3. The results of the sigma convergence analysis indicate that there was no strong economic convergence in the Bodetabek region during the study

period. Inter-regional income disparities remain relatively high, and the process of equitable development has not been consistent.

4. Investment has a positive and significant impact on the ADHK GRDP in the Bodetabek area. Meanwhile, labor and infrastructure have no significant impact on the ADHK GRDP. Simultaneously, investment, labor, and infrastructure have a significant impact on the ADHK GRDP.

Future research should further investigate the factors underlying the persistence of regional inequality and the absence of economic convergence in the Bodetabek region. In particular, further studies could examine the quality and sectoral distribution of investment, the quality of labor rather than merely its quantity, and the effectiveness and connectivity of infrastructure. The use of conditional convergence models and spatial panel approaches is also recommended to account for differences in regional characteristics and economic spillovers among neighboring regions. Extending the observation period may further provide a more robust understanding of long-term regional inequality and convergence dynamics.

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