Al-Kharaj: Jurnal Ekonomi, Keuangan & Bisnis Syariah

Vol 8 No 7 (2026) 3031 – 3042 P-ISSN 2656-2871 E-ISSN 2656-4351
DOI: 10.47467/alkharaj.v8i7.12117

Determinants of Income Inequality in the Kalimantan Region

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ABSTRACT

Income inequality remains a critical issue in Indonesia, particularly in the Kalimantan region, where disparities in education, foreign direct investment (FDI), and economic growth significantly affect income distribution. This study examines the impact of education, FDI, and economic growth on income inequality using panel data regression analysis from 2015 to 2023. The results indicate that education significantly reduces income inequality, as higher education levels contribute to improved workforce quality and income distribution. Similarly, FDI negatively affects income inequality by creating job opportunities, increasing household incomes, and promoting economic growth. However, economic growth does not significantly influence income inequality, suggesting that other factors, such as inflation, purchasing power, and sectoral contributions, may play a more substantial role. The findings highlight the need for policy interventions, including improving education access, regulating FDI distribution, and ensuring inclusive economic policies to reduce income disparities. This study contributes to the ongoing discourse on income inequality by providing empirical evidence on the role of education and investment in fostering equitable economic development.

Keywords: Education; Economic Growth; Foreign Direct Investment; Income Inequality; Kalimantan Region

INTRODUCTION

Income inequality is one of the major challenges in economic development in developing countries, including Indonesia. This inequality reflects an uneven distribution of income within society and has the potential to cause broad social and economic impacts. High-income inequality can affect a country's economic and social stability, particularly in aspects of public welfare and economic justice (BPS, 2023).

As an archipelagic country, Indonesia has diverse economic development characteristics. Factors such as economic growth, investment, and education play a crucial role in determining the level of income inequality (Todaro & Smith, 2020). According to data from the Central Bureau of Statistics (BPS), Indonesia's Gini Ratio has fluctuated in recent years, with higher figures in urban areas than in rural areas. In 2023, the Gini Ratio in urban areas reached 0.409, whereas in rural areas, it was only 0.313 (Todaro & Smith, 2020). This indicates that income distribution remains uneven, particularly in urban areas, where significant differences in income levels exist among the population.

At the regional level, the island of Kalimantan also experiences significant income inequality. According to BPS data, the Gini Ratio in Kalimantan in 2023 ranged

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from 0.277 to 0.322. North Kalimantan Province recorded the lowest inequality level (0.277), while East Kalimantan and West Kalimantan had higher inequality levels (BPS, 2023). This disparity is influenced by various factors, including access to education, foreign direct investment (FDI), and economic growth in each region (UNCTAD, 2023).

Education is a crucial factor in improving human resource quality, which contributes to income equality. Based on the average years of schooling data, education levels in Kalimantan have improved but remain uneven across the region. East Kalimantan has the highest average years of schooling at 10.17 years, while West Kalimantan has the lowest at 8.17 years (Bank Indonesia, 2023). This indicates that there are still gaps in access to quality education, contributing to differences in income levels among communities.

Apart from education, foreign direct investment (FDI) also significantly influences income inequality. Data shows that FDI realization in Indonesia increased from USD 28,666.3 million in 2020 to USD 50,267.5 million in 2023 (OECD, 2023). However, this investment is not evenly distributed across Indonesia, causing disparities in economic growth and income levels. Regions with higher FDI concentration tend to experience faster economic growth, while areas with lower investment face economic stagnation.

Economic growth also plays an important role in determining the level of income inequality. At the national level, Indonesia's economic growth has shown a positive trend in recent years, with a growth rate of 5.05% in 2023 (Asian Development Bank, 2023). However, at the regional level, economic growth has fluctuated significantly. North Kalimantan had the highest economic growth rate of 6.22% in 2023, while other provinces showed lower growth rates. Price instability, differences in economic sector contributions, and infrastructure conditions in each region are key factors affecting these economic growth disparities (Kementerian Keuangan RI, 2023).

High-income inequality can have various negative impacts on a country's economy. One of its consequences is an increased risk of social and political instability, which in turn can reduce investment attractiveness and slow down economic growth (Stiglitz, 2015). High inequality can also hinder efforts toward inclusive and sustainable development, as most economic resources tend to be concentrated among specific groups in society (Piketty, 2014). Therefore, appropriate policies are needed to address income inequality through increased access to education, equitable investment distribution, and economic policies that support inclusive growth.

Based on these issues, this study aims to analyze the impact of education, FDI, and economic growth on income inequality across all provinces in Kalimantan. Using a quantitative approach, this research will examine the relationships among these variables and identify key factors influencing income distribution in Kalimantan (Sen, 1999). The findings of this study are expected to provide insights for policymakers in

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formulating more inclusive and sustainable development strategies to reduce income inequality in Indonesia.

METHODE

This study covers all provinces in the Kalimantan region and utilizes secondary data obtained from various official sources, such as the Central Bureau of Statistics (BPS), government publications, and other academic literature (BPS, 2023). The research period spans nine years, from 2015 to 2023, to observe trends and dynamics in income inequality in the region (Bank Indonesia, 2023). The data used in this study include the average years of schooling, foreign direct investment (FDI) realization, economic growth, and the Gini ratio as an indicator of income inequality (UNCTAD, 2023).

The unit of analysis in this study comprises education, foreign direct investment, and economic growth, which are analyzed in relation to income inequality over the research period (Kementerian Pendidikan dan Kebudayaan RI, 2023). This study employs a quantitative approach using panel data regression analysis, which combines time series and cross-sectional data to obtain more accurate estimation results (Gujarati, 2021). Panel data has the advantage of handling individual heterogeneity and increasing degrees of freedom, making the estimation more efficient (Wooldridge, 2019).

The primary data sources for this research come from official BPS publications at both the national and regional levels, as well as relevant journals and books (Greene, 2020). The data include economic growth measured by the Gross Regional Domestic Product (GRDP) at constant 2010 prices per province from 2015 to 2023, the average years of schooling for individuals aged 25 and above, FDI realization per province in million US dollars, and the Gini ratio to measure income inequality (Kementerian Keuangan RI, 2023).

In this study, the independent variables consist of education, foreign direct investment, and economic growth, while the dependent variable is income inequality (Asian Development Bank, 2023). Education is measured based on the average years of schooling in years, foreign direct investment is expressed in million US dollars, while economic growth is analyzed using the GRDP growth rate in percentage (OECD, 2023). The Gini ratio is used as the primary indicator to measure the level of income inequality in each province in Kalimantan (Stiglitz, 2015).

The data collection method employs indirect observation by gathering secondary data from reliable sources (Piketty, 2014). The data analysis technique utilizes panel data regression with three main approaches: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM) (Sen, 1999). The selection of the most appropriate model is conducted through a series of statistical tests, including the Chow test to compare CEM and FEM, the Hausman test to choose between FEM and REM, and the Lagrange Multiplier test to determine between REM and CEM (Acemoglu & Robinson, 2012).

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To ensure the validity of the regression model, this study conducts classical assumption tests, including autocorrelation tests, multicollinearity tests, normality tests, and heteroscedasticity tests (Rodrik, 2018). The autocorrelation test is conducted using the Durbin-Watson method to detect correlations between residuals in the regression model, while the multicollinearity test uses the Variance Inflation Factor (VIF) to examine relationships among independent variables (Sachs, 2005). The normality test ensures that the residuals are normally distributed, while the heteroscedasticity test uses the White method to detect differences in residual variance (BPS, 2023).

In regression analysis, significance testing is conducted using the t-test to measure the partial effect of independent variables on the dependent variable and the F-test to assess the simultaneous influence of independent variables on the dependent variable (Breusch & Pagan, 1980). The coefficient of determination (R^2) is calculated to determine the extent to which variations in income inequality can be explained by education, foreign direct investment, and economic growth.

RESULTS AND DISCUSSION

The average Gini Ratio in the Kalimantan Region exhibited a fluctuating trend from 2015 to 2023. Central Kalimantan and South Kalimantan experienced a decline in the Gini Ratio, reflecting a reduction in income inequality. West Kalimantan began to show a decline in 2018, while East Kalimantan displayed a fluctuating trend. North Kalimantan saw a decrease from 2018 to 2022, but in 2023, the Gini Ratio increased slightly by 0.005. Among the provinces, South Kalimantan recorded the highest average Gini Ratio of 0.334, whereas North Kalimantan had the lowest at 0.293, indicating disparities in income inequality across the region.

Education is a key factor in national development as it enhances knowledge, skills, productivity, and income levels. The average years of schooling in the Kalimantan Region showed an increasing trend from 2015 to 2023. East Kalimantan recorded the highest growth, with an average of 9.61 years of schooling, while West Kalimantan had the lowest at 7.28 years. This overall improvement in education reflects the success of government policies and growing public awareness of the importance of education. The increase in educational attainment is expected to contribute to higher income levels and a reduction in economic inequality.

Foreign Direct Investment (FDI) also plays a significant role in regional development, though it can exacerbate inequality if concentrated in specific areas. FDI realization in East Kalimantan and North Kalimantan increased during 2021–2023, while Central Kalimantan and South Kalimantan experienced growth in 2022–2023. In contrast, West Kalimantan showed a fluctuating trend over the past nine years. The highest average investment growth was observed in East Kalimantan, reaching 1,108.53 million USD, while North Kalimantan recorded the lowest at 288.24 million USD. The rapid investment growth in East Kalimantan is believed to be influenced by the development of the new capital city (IKN). However, the concentration of

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investment in certain areas raises concerns about widening income inequality within the region.

Economic growth in the Kalimantan Region is measured through the Gross Regional Domestic Product (GRDP) growth rate. The region experienced a decline in economic growth during 2022–2023, except for East Kalimantan, which showed continuous growth since 2021. In general, economic growth in Kalimantan has been highly variable, largely influenced by the mining sector, which benefits specific groups while providing limited advantages to the local community. The highest average economic growth from 2015 to 2023 was recorded in Central Kalimantan at 4.95%, followed by North Kalimantan at 4.35%, West Kalimantan at 4.21%, South Kalimantan at 3.81%, and the lowest in East Kalimantan at 2.14%.

To determine the appropriate panel data model, several model specification tests were conducted. These tests were performed to identify the best panel regression model among the three available models: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The model testing process includes three tests: the Chow Test, the Hausman Test, and the Lagrange Multiplier (LM) Test. These tests help in selecting the most suitable model. The hypotheses for each test are presented in Table 1.

Table 1 Hypotheses for Chow Test, Hausman Test, and Lagrange Multiplier Test

Source: Panel Data Regression Ebook (processed)

Testing Tool	Hypothesis	Condition	Description
Chow Test	H0 = Uses Common Effect Model	If p-value > α, then H0 is accepted	The model used is the Common Effect Model
	H1 = Uses Fixed Effect Model	If p-value < α, then H1 is accepted	The model used is the Fixed Effect Model
Hausman Test	H0 = Uses Random Effect Model	If p-value > α, then H0 is accepted	The model used is the Random Effect Model
	H1 = Uses Fixed Effect Model	If p-value < α, then H1 is accepted	The model used is the Fixed Effect Model
Lagrange Multiplier Test	H0 = Uses Common Effect Model	If p-value > α, then H0 is accepted	The model used is the Common Effect Model
	H1 = Uses Random Effect Model	If p-value < α, then H1 is accepted	The model used is the Random Effect Model

The research findings on the selection of the Common Effect Model, Fixed Effect Model, and Random Effect Model are summarized in Table 2, which presents the estimation model results.

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Table 1 Estimation Model Results

Source: Processed Primary Data, 2024

Variable	Common Effect Model		Fixed Effect Model		Random Effect Model	
	t-Statistic	Prob.	t-Statistic	Prob.	t-Statistic	Prob.
C	13.13425	0.0000	13.08157	0.0000	12.66407	0.0000
X1	-2.247802	0.0300	-4.969026	0.0000	-4.804845	0.0000
X2	1.096161	0.2794	-2.858024	0.0070	-2.689636	0.0103
X3	-0.142635	0.8873	1.708168	0.0960	1.639045	0.1089

After conducting tests on the selected model, it was determined that the Fixed Effect Model was the most suitable. The next step was to perform the Chow test as an initial stage in model selection. The test results showed that the probability value was 0.0000, which is less than 0.05, leading to the rejection of H0 and the acceptance of H1. This indicates that the Fixed Effect Model is superior to the Common Effect Model. Since the Chow test results confirmed the selection of the Fixed Effect Model, the next step was to conduct the Hausman test to determine the best model between the Random Effect Model and the Fixed Effect Model.

The Hausman test was conducted using the results from the Random Effect Model to determine the most appropriate model for analysis. The test results indicated a probability value of 0.5049, which is greater than 0.05, leading to the acceptance of H0 and the rejection of H1. This outcome confirms that the Random Effect Model is superior to the Fixed Effect Model. Consequently, the best estimation model selected for this study is the Random Effect Model. Before performing panel regression analysis, a classical assumption test was carried out to ensure that the data met the necessary analytical conditions. Since the Random Effect Model utilizes the Generalized Least Squares (GLS) method, heteroskedasticity and autocorrelation tests were not required. However, normality and multicollinearity tests were still conducted.

The normality test was conducted to ensure that the residuals follow a normal distribution, using the Jarque-Bera (J-B) test with a significance level of 0.05. The test results indicated a probability value of 0.220024, which is greater than 0.05. This confirms that the data is normally distributed.

The multicollinearity test results are presented in Table 3, which shows that all correlation values between variables are below 0.8, indicating no multicollinearity in the regression model.

Table 2. Multicollinearity Test Results

Source: Processed Primary Data, 2024

	X1	X2	X3
X1	1.000000	0.189002	-0.208819
X2	0.189002	1.000000	-0.118539

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X3	**-0.208819**	**-0.118539**	**1.000000**

Based on the Pairwise Correlation test results, all correlation values between variables are below 0.8, indicating that there is no multicollinearity in the regression model used.

Hypothesis testing in this study is conducted using the partial significance test (t-test) to determine the effect of independent variables (X) on the dependent variable (Y). This test aims to examine the significance of the relationship between each independent variable and the dependent variable individually. If the probability value of $t < 0.05$, then the independent variable X has a partial effect on the dependent variable Y. Conversely, if the probability value of $t > 0.05$, then the independent variable X does not have a partial effect on the dependent variable Y. The results of the t-test are provided in Table 4.

Table 3. t-Test Results

Source: Processed Primary Data, 2024

Variable	t-Statistic	Prob.
C	**12.66407**	**0.0000**
X1	**-4.804845**	**0.0000**
X2	**-2.689636**	**0.0103**
X3	**1.639045**	**0.1089**

Based on the t-test results in Table 4, it can be concluded that the Education variable (X1) has a probability value of 0.0000, which is less than 0.05, indicating a significant effect on Income Inequality (Y). Furthermore, the Foreign Direct Investment variable (X2) has a probability value of 0.0103, which is also less than 0.05, suggesting that this variable significantly affects Income Inequality (Y). Meanwhile, the Economic Growth variable (X3) has a probability value of 0.1089, which is greater than 0.05, indicating that this variable does not have a significant effect on Income Inequality (Y).

The simultaneous significance test (F-test) is conducted to determine whether the independent variables collectively influence the dependent variable in the regression model. This test assesses the linear relationship between the dependent variable (Y) and the independent variables (X). If the F probability value is below 0.05, it indicates a significant simultaneous effect of the independent variables on the dependent variable. Conversely, if the value exceeds 0.05, the independent variables do not have a significant collective impact. The test results show an F probability value of 0.0000, which is below the 0.05 threshold, confirming that the independent variables (X) collectively influence the dependent variable (Y).

The coefficient of determination (R^2) is a measure used to assess how well a model explains the dependent variable. However, because R^2 tends to be biased due to the number of independent variables included, this study employs the adjusted R^2 for a more accurate evaluation. The calculation results from the Random Effect Model

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indicate that the adjusted R^2 value is 0.371152, meaning that the independent variables, namely Education, Foreign Direct Investment, and Economic Growth, account for 37.11% of the variation in Income Inequality in the Kalimantan Region. The remaining 62.89% is influenced by other factors not considered in this study.

Based on the estimation results of the panel data model, the best model selected is the Random Effect Model. After determining the best estimation model, the next step is to conduct a panel data regression analysis. The panel data regression estimation results show that the constant in the regression equation is 0.503946, which means that if all independent variables—education (X1), foreign direct investment (X2), and economic growth (X3)—are considered constant, the resulting income inequality (Y) is 0.503946.

Furthermore, the education variable (X1) has a regression coefficient of -0.021240, indicating a negative relationship with income inequality. This means that an increase of one unit in the education variable will reduce the percentage of income inequality by 0.021240, assuming other variables remain constant. Meanwhile, the foreign direct investment (X2) variable has a regression coefficient of -9.600006, also showing a negative relationship with income inequality. This implies that every one-unit increase in foreign direct investment will reduce the percentage of income inequality by 9.600006, assuming other variables remain constant.

On the other hand, the economic growth variable (X3) has a regression coefficient of 0.000852, indicating a positive relationship with income inequality. Thus, for every one-unit increase in economic growth, the percentage of income inequality will increase by 0.000852, assuming other variables remain constant. These findings suggest that education and foreign direct investment contribute to reducing income inequality, while economic growth may potentially increase income inequality.

Education has a significant influence on income inequality, as indicated by the negative coefficient of -0.021240 found in the random effect model. This means that an increase in education can reduce income inequality. This finding aligns with the study by Oksamulya and Anis, which concluded that higher education levels lead to lower income inequality in Indonesia (Oksamulya & Anis, 2020).

Education plays a crucial role in improving workforce quality, ultimately impacting economic growth and reducing income inequality, in line with the human capital theory by Becker and Schultz (Becker & Schultz, 1992). Education is not merely consumption but an investment in the future that enhances a person's skills and productive capabilities.

The government plays an essential role in improving access to and quality of education, such as through the PSDKU program, which expands access to higher education. Additionally, technological advancements enable self-learning; however, policies are still needed to ensure that all citizens participate in the 12-year compulsory education program as mandated by Indonesian Law No. 20 of 2003. Public support is also necessary in the planning, implementation, and evaluation of education to ensure its inclusive and high-quality sustainability.

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The research findings using the Random Effect Model indicate that Foreign Direct Investment (FDI) significantly affects income inequality, with a negative coefficient of -9.600006. This means that each one-unit increase in FDI will reduce income inequality by that amount, assuming other variables remain constant. This finding aligns with the study by Wairooy and Haryono, which found that FDI can reduce income inequality by expanding job opportunities and increasing household incomes (Wairooy & Haryono, 2023).

FDI provides benefits such as additional capital in critical sectors, job creation, increased national income through taxes, and opening export and collaboration opportunities for MSMEs. The Harrod-Domar theory supports the idea that increased investment drives economic growth and per capita income, thereby helping to reduce income inequality (Harrod & Domar, 1957).

In the Kalimantan region, the increase in FDI has contributed to more balanced economic growth, particularly in the industrial and mining sectors. FDI companies such as Hyundai and Freeport McMoRan also bring new technology and knowledge that local industries can adopt. In line with the Buckley-Casson and Aliber theories, Indonesia remains an attractive investment destination due to its competitive currency value and abundant natural resources (Buckley & Casson, 1976; Aliber, 1970). Government policies are needed to ensure that FDI does not overly dominate the market but continues to provide benefits to the national economy.

The research findings using the Random Effect Model indicate that economic growth does not significantly affect income inequality, contradicting the research hypothesis. The positive coefficient of 0.000852 suggests a slight increase in inequality when economic growth rises, but this effect is not statistically significant.

This study does not align with several previous studies, which found a relationship between economic growth and income inequality (Kunenengan, 2023; Lala, 2023; Noorachmadan, 2022; Zainudin, 2022; Febriyani & Anis, 2021). However, these findings support the study by Berliana and Dwi, which showed that economic growth does not affect income distribution in Java, particularly in Jakarta, due to the high-growth, less-job phenomenon (Berliana & Dwi, 2022).

In Kalimantan, income inequality is not directly influenced by economic growth but rather by other variables such as inflation, purchasing power, exchange rates, and consumption. A strong rupiah exchange rate reduces inflation and increases purchasing power, which can help balance income distribution. Additionally, the Kuznets theory and Lewis model explain that in the early stages of development, inequality rises before eventually improving. The dominance of the mining sector in Kalimantan, which drives the economy but does not involve much local labor, is one reason why inequality remains high despite economic growth.

The Random Effect Model results indicate that education, foreign direct investment (FDI), and economic growth significantly influence income inequality. The relationships among these variables are interconnected in reducing inequality.

Education serves as an investment in human resources. The 12-year compulsory education program increases the average years of schooling, improving

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workforce quality and individual income, thereby reducing income inequality. Additionally, education fosters economic growth, and conversely, economic growth facilitates better access to education.

Stable economic growth also attracts foreign investment (FDI) into Indonesia, contributing to the establishment of businesses, factories, and the purchase of capital goods and raw materials. FDI promotes economic growth and creates job opportunities for educated workers, leading to increased income and reduced income inequality. Thus, a positive cycle exists between education, FDI, and economic growth in reducing income inequality.

These policy recommendations aim to reduce income inequality in the Kalimantan region through education, foreign direct investment (FDI), and economic growth. In the education sector, the construction of pre-school learning facilities, equal distribution of the zoning system, infrastructure improvement, and enhancement of teacher quality—including incentives for teachers in remote areas—are needed. Furthermore, access to technology and the internet should be expanded, and skill development programs for students should be enhanced to increase competitiveness in the job market.

Regarding FDI, the government needs to regulate and supervise foreign investment policies, maintain political and economic stability, and increase funding for specialized skill training, particularly in technology-related fields. Additionally, expanding job opportunities for educated unemployed individuals is a strategic step to maximize the positive impact of foreign investment.

To drive economic growth, the development of industrial zones and local flagship products should be accelerated, along with equitable infrastructure development. Strengthening exports and reducing dependency on imports are also crucial steps in reinforcing the regional economy.

In addressing income inequality, the government must promote inclusive economic growth, improve access to education and healthcare, create decent employment opportunities, and support MSME development. Furthermore, expanding access to public services is vital to ensuring that the benefits of economic development are equitably distributed across society.

CONCLUSION

Based on the research findings on the Determinants of Income Inequality in the Kalimantan Region from 2015 to 2023, it can be concluded that education has a significant and negative effect on income inequality. Increased investment in human resources and the promotion of compulsory education programs contribute to improving the quality of education and, ultimately, public income. Foreign Direct Investment (FDI) also has a significant and negative impact on income inequality, as the continuous inflow of foreign investment helps drive economic growth and reduce income disparity. However, economic growth does not have a significant effect on income inequality, as other variables such as inflation, purchasing power, exchange rates, and leading economic sectors such as mining also play a role in shaping

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inequality. Simultaneously, education, FDI, and economic growth together influence income inequality. The interaction between these variables indicates that foreign investment can enhance economic growth, which in turn facilitates access to education and improves workforce skills, thereby driving an increase in public income.

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