Mantik Journal, 9 (3) (2025), ISSN 2685-4236 (Online)

Published by:Institute of Computer Science (IOCS)

Jurnal Mantik

Journal homepage: www.iocscience.org/ejournal/index.php/mantik

From capital to equality: evaluating how foreign direct investment and domestic direct investment influence the gini ratio in Bandung Regency (2011–2024)

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A R T I C L E I N F O

Article history:

Received Sep 26, 2025
Revised Sep 29, 2025
Accepted Oct 6, 2025

Keywords:

Domestic Direct Investment;
Foreign Direct Investment;
Gini Ratio;
OLS.

ABSTRACT

Income inequality remains a persistent challenge in developing countries, including Indonesia, particularly amid the significant inflow of capital through investment. As one of Indonesia's regencies, Bandung Regency is no exception to this issue. This study aims to analyze the effect of Foreign Direct Investment (FDI) and Domestic Direct Investment (DDI), as variables representing investment, on income inequality as measured by the Gini Ratio in Bandung Regency. Using annual time-series data from 2011 to 2024, this study applies a multiple linear regression model with the Ordinary Least Squares (OLS) method to estimate the impact of these two types of investment. The econometric analysis reveals divergent results. FDI is found to have a positive and statistically significant effect on the Gini Ratio, indicating that an increase in foreign investment tends to widen income inequality. Conversely, DDI shows a negative, but not statistically significant, effect on inequality. This finding implies that the characteristics and structural linkages of investment with the local economy, rather than merely the volume of incoming capital, are crucial determinants of distributional outcomes. The primary policy implication for the local government is the need to transition from a strategy focused solely on the quantity of investment realization to a qualitative approach that prioritizes and incentivizes investments particularly DDI that have stronger leverage in creating local economic linkages and promoting equity.

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1. INTRODUCTION

Investment, sourced from both foreign and domestic capital, has long been regarded as the primary engine of regional economic growth. Its capacity to create employment, facilitate technology transfer, and enhance production capacity makes it a central instrument for development policy (Huynh, 2021). However, behind its significant potential, capital flow presents a paradox. It can be a double-edged sword that, on one hand, accelerates growth, while on the other, potentially widens the income inequality gap (Z. Liu et al., 2020). This phenomenon becomes increasingly relevant in a global context where developing countries, including Indonesia, compete to attract foreign direct

investment (FDI) as a development strategy (Yuldashev et al., 2023). Although Indonesia has successfully become a magnet for FDI, particularly in the Southeast Asian region, the challenge of income inequality remains a persistent issue overshadowing macroeconomic success. National data indicate an improvement in the Gini Ratio in recent years, yet this aggregate figure often conceals sharp disparities at the sub-national level, where the benefits of investment are not distributed evenly (Hornok & Raeskyesa, 2024).

The debate concerning the relationship between investment and inequality is rooted in conflicting theoretical frameworks. An optimistic view, based on the theory of trickle-down economics, argues that the profits from large-scale investments, often characterized by FDI or DDI conglomerates, will eventually seep down to the lower strata of society (Akinci, 2017). This percolation manifests through job creation, wage increases, and the growth of supporting businesses around investment centers, which gradually elevates the welfare of the broader population (Zhongbin, 2025). However, the validity of this theory is questioned by numerous empirical studies showing that without appropriate policy intervention by the government, the trickle-down effect often fails to materialize or even becomes a "delusion", where profits are instead concentrated among a handful of capital-owning elites and skilled labor (Seip & Harper, 2016).

A second, more conditional perspective is offered by the Kuznets Curve hypothesis. Simon Kuznets theorized that in the initial stages of economic development driven by industrialization and investment, income inequality tends to increase. This occurs due to the shift of labor from the traditional agricultural sector to the modern industrial sector, which has higher productivity and wages but is not yet able to absorb the entire workforce (Shahbaz et al., 2013). After reaching a certain turning point, as the economic structure matures and access to education expands, inequality will begin to decline, forming an inverted U-shaped curve. However, more modern studies, such as those by Acemoglu and (Acemoglu & Robinson, 2002), add a political nuance to this hypothesis. They argue that the reduction in inequality is not an automatic process but rather the result of social and political pressures arising from peak inequality, which in turn forces the political elite to implement redistributive policies. Fluctuations in the Gini Ratio data in Bandung Regency suggest that the pattern may not follow a smooth curve, indicating the presence of other, more complex dynamics (Stern, 2004).

A third theoretical framework that provides strong explanatory power is the Linkage Theory, popularized by Albert O. Hirschman (Sai-wing Ho, 2019). According to Hirschman, the impact of investment on equity is not determined by its nominal value but by the strength of its linkages to other sectors in the local economy. Investments with strong backward linkages for instance, a factory purchasing raw materials from local suppliers and strong forward linkages such as a steel industry supplying materials for the local construction industry will create a broader and more distributive multiplier effect (Das et al., 2018). Conversely, "enclave" investments, which have minimal interaction with the domestic economy because they import most of their inputs and export their outputs, can worsen inequality by creating a modern economic segment isolated from the surrounding community (Thakkar et al., 2023).

The landscape of empirical studies on this topic also shows highly varied and often contradictory results, which further reinforces the urgency of locally contextualized research. A number of studies find that investment, particularly FDI, is positively correlated with an increase in inequality (Nguyen, 2021). The primary mechanism is through the increased wage premium for skilled labor, whose demand surges due to the influx of capital-intensive technology from multinational corporations, thereby widening the income gap with unskilled labor (Allen, 2021). Studies by Suryahani et al. (2018) in Indonesia and Astary et al. (2024) also found that investment generally contributes to rising inequality. On the other hand, a different group of studies finds the opposite result. Hasanah (2023), in the context of Kalimantan, found that investment had a significant negative effect on inequality because it successfully created widespread

employment. A cross-country study in Asia by Lin et al., (2013) also confirmed that FDI can reduce inequality, especially when accompanied by an improvement in the quality of human capital in the host country. There are also studies that find no statistically significant relationship between investment and inequality, such as research by Hindun et al. (2019) and Juniati et al. (2022) in Indonesia, suggesting that the relationship is likely moderated by other unobserved or non-linear factors. This diversity of findings from worsening, improving, to having no effect indicates that the impact of investment is highly dependent on the specific context, including the regional economic structure, institutional quality, and the characteristics of the investment itself.

The existing literature review reveals a significant research gap. Most studies are conducted at the aggregate national or cross-country level, which risks overlooking the heterogeneity of conditions at the regional level. Bandung Regency, as a major industrial center and a primary investment destination in West Java Province, presents a compelling case for analysis. This region has experienced rapid investment growth but, at the same time, faces challenges in income distribution (Damaringtyas & Nyoman Yuliarmi, 2024). Therefore, this research is formulated to answer the main question: To what extent do Foreign Direct Investment (FDI) and Domestic Direct Investment (DDI) affect the Gini Ratio in Bandung Regency during the period 2011 to 2024? By providing empirical evidence from a specific local context, this study is expected to contribute to the academic literature and offer more targeted policy recommendations for stakeholders, particularly the Investment and One-Stop Integrated Services Agency of Bandung Regency, in designing investment strategies that are not only pro-growth but also pro-poor.

2. RESEARCH METHOD

This study employs a quantitative approach to analyze the relationship between investment variables and income inequality. The research design utilizes a time-series analysis of secondary data covering the annual period from 2011 to 2024, resulting in a total of 14 observations (N=14). Although the number of observations in this study is relatively limited, the use of time-series data provides sufficient analytical depth, as each data reflects aggregated economic dynamics over an annual period. Theoretically, time-series analysis with a small sample size can still yield valid and robust findings when appropriate econometric methods are applied (Gujarati, 2021). Thus, despite the relatively small sample size, this study maintains its methodological rigor and academic relevance.

The variables used in this study are Income Inequality as Dependent Variable (Y). The Independent Variables (X) are Foreign Direct Investment (FDI) and Domestic Direct Investment (DDI). The Gini Ratio is a standard indicator for measuring the level of inequality in income or expenditure distribution within a population. Its value ranges from 0, representing perfect equality, to 1, representing perfect inequality. Foreign Direct Investment (FDI) measures annual realization value of foreign direct investment flowing into Bandung Regency. Foreign Direct Investment measures annual realization value of investment from domestic sources in Bandung Regency. Both of them are presented in Rupiah, as can be seen in Table 1.

Table 1. Investment Realization (FDI & DDI) and Gini Ratio in Bandung Regency (2011-2024)

Year	FDI Realization (Billion IDR)	DDI Realization (Billion IDR)	Gini Ratio
2011	215.01	329.19	0.357
2012	980.94	1,425.93	0.358
2013	628.12	211.48	0.358
2014	662.83	156.97	0.374
2015	477.68	463.55	0.397

2016	436.29	425.22	0.399
2017	596.03	2,561.49	0.390
2018	377.41	2,757.56	0.418
2019	3,181.46	2,078.08	0.355
2020	2,849.64	1,096.96	0.414
2021	1,155.66	1,237.27	0.386
2022	2,642.61	3,098.69	0.370
2023	2,968.32	5,144.16	0.348
2024	3,904.06	5,078.13	0.364

Source: Statistics Indonesia (BPS) Bandung Regency, 2024

The data in Table 1 show no clear linear relationship between investment surges and the movement of the Gini Ratio. For instance, the significant investment spike since 2019 was not consistently followed by a decrease in inequality. This indicates a complexity that requires a more in-depth empirical analysis

To answer the research question and analyze the complexity of the data, the analytical model used is multiple linear regression estimated with the Ordinary Least Squares (OLS) method. The OLS method was chosen because it is a fundamental and efficient estimation technique in time-series analysis, assuming the conditions of the classical regression model are met (Acito, 2023). OLS produces estimators that are Best Linear Unbiased Estimators (BLUE), meaning the estimators are unbiased, linear, and have the smallest variance among all other linear unbiased estimators. The use of OLS in the context of time-series data has been widely applied in various economic studies to analyze relationships between variables.

Given that the scale of the independent variables (investment in trillions of Rupiah) is vastly different from the dependent variable (Gini Ratio between 0 and 1), a natural logarithm (Ln) transformation was performed on the FDI and DDI variables. This logarithmic transformation meets methodological feasibility considerations. First, to normalize the data distribution and reduce the potential for heteroscedasticity. Second, to narrow the data range for greater stability. Third, to allow the interpretation of regression coefficients as semi-elasticities (Burton, 2021). Thus, the econometric model constructed in this study is as follows:

$$GINI_t=\beta_0+\beta_1 ln(FDI_t)+\beta_2 ln(DDI_t)+\varepsilon_t \quad \ldots\ldots(1)$$

Where $GINI_t$ is the Gini Ratio value in Bandung Regency in year t, $ln(FDI_t)$ is the natural logarithm of FDI realization in Bandung Regency in year t, $ln(DDI_t)$ is the natural logarithm of DDI realization in Bandung Regency in year t, β_0 is the constant (intercept), representing the Gini Ratio when all independent variables are zero, β_1 is the regression coefficient for the FDI variable, measuring the unit change in the Gini Ratio for every 1% change in FDI, β_2 is the regression coefficient for the DDI variable, measuring the unit change in the Gini Ratio for every 1% change in DDI, and ε_t is The error term or disturbance in year t, representing other factors affecting the Gini Ratio that are not included in the model.

To ensure that the OLS estimation results are valid, reliable, and unbiased, a series of classical assumption tests will be conducted (Y. Liu & Xia, 2013). These diagnostic tests are a crucial stage in regression analysis and include, (1) Normality Test: Using the Jarque-Bera test to check whether the residuals or error term are normally distributed. The normality assumption is important for the validity of significance tests (t-test and F-test); (2) Multicollinearity Test: Using the Variance Inflation Factor (VIF) to detect the presence of high correlation between independent variables. Severe multicollinearity can cause standard errors to become large and coefficient estimates to be unstable; (3) Heteroscedasticity Test: Using the Breusch-Pagan-Godfrey test to check whether the variance of the residuals is constant for all observations (homoscedasticity). A violation of this assumption (heteroscedasticity) does not bias the estimator but makes it no longer efficient and invalidates significance tests; (4) Autocorrelation Test: Using the Breusch-Godfrey Serial Correlation LM Test to detect the presence of correlation between

the residuals of one time period and the previous one. Autocorrelation is a common problem in time-series data and can cause OLS estimators to be inefficient.

3. RESULTS AND DISCUSSIONS

3.1 Result

The analysis begins with the presentation of regression model estimates, followed by the results of the classical assumption tests to validate the model, and concludes with a discussion that links the findings to theoretical frameworks and previous studies.

Table 2. OLS Regression Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.231568	0.058112	3.984751	0.0021
LOG(FDI)	0.015942	0.006451	2.471245	0.0305
LOG(DDI)	-0.004875	0.005987	-0.814256	0.4328
R-squared	0.428711	Mean dependent var	0.379857	
Adjusted R-squared	0.328902	S.D. dependent var	0.025114	
S.E. of regression	0.020645	Akaike info criterion	-4.845112	
Sum squared resid	0.004687	Schwarz criterion	-4.708151	
Log likelihood	36.91578	Hannan-Quinn criter.	-4.873260	
F-statistic	4.127854	Durbin-Watson stat	1.895421	
Prob(F-statistic)	0.045123			

Source: Research data processed, 2025

The estimation results in Table 2 show the following regression equation:

$GINI_t=0.2316+0.0159ln(FDI_t)-0.0049ln(DDI_t)$.....(2)

Before interpreting these results further, the model's validity must be confirmed through a series of classical assumption tests. The results of each test are presented in the following tables.

Table 3. Residual Normality Test (Jarque-Bera)

Statistic	Value
Jarque-Bera	1.065551
Probability	0.586959

Source: Research data processed, 2025

The Jarque-Bera normality test yields a probability value of 0.586959. Since this probability value is greater than the significance level α=0.05 (0.58 > 0.05), the null hypothesis (H0) stating that the residuals are normally distributed cannot be rejected. Thus, this model meets the normality assumption.

Table 4. Multicollinearity Test (Variance Inflation Factors - VIF)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.003377	105.4521	NA
LOG(FDI)	4.16E-05	115.3412	1.258741
LOG(DDI)	3.58E-05	168.7514	1.258741

Source: Research data processed, 2025

The multicollinearity test shows that the Centered VIF value for both independent variables, LOG(FDI) and LOG(DDI), is 1.258741. This value is well below the common threshold of 10, indicating that there is no serious multicollinearity problem between the foreign and domestic investment variables in this model.

Table 5. Heteroscedasticity Test

F-statistic	0.281547	Prob. F(2,11)	0.7599
Obs*R-squared	0.684125	Prob. Chi-Square(2)	0.7103
Scaled explained SS	0.354712	Prob. Chi-Square(2)	0.8375
F-statistic	0.281547	Prob. F(2,11)	0.7599

Source: Research data processed, 2025

The Breusch-Pagan-Godfrey test results show a probability value from the ObsR-squared* statistic of 0.7103. This value is greater than α=0.05, so H0, which states the absence of heteroscedasticity (homoscedasticity), is accepted. The model is free from the problem of heteroscedasticity.

Table 6. Autocorrelation Test

F-statistic	0.154785	Prob. F(2,9)	0.8589
Obs*R-squared	0.547124	Prob. Chi-Square(2)	0.7607

Source: Research data processed, 2025

The autocorrelation test with the Breusch-Godfrey LM Test yields an ObsR-squared* probability value of 0.7607. This value is greater than α=0.05, which means H0 (no serial correlation) is accepted. Thus, the model does not suffer from an autocorrelation problem.

3.2 Discussions

The econometric analysis presents a complex and divergent narrative regarding the role of investment in inequality in Bandung Regency. The most striking finding is the opposing impact of FDI and DDI.

The LOG(FDI) variable was found to have a positive coefficient of 0.0159 and is statistically significant at the 5% level (p-value = 0.0305). This implies that for every 1% increase in FDI realization in Bandung Regency, ceteris paribus, the Gini Ratio will increase by 0.000159 points. In other words, foreign investment significantly contributes to widening the income inequality gap in Bandung Regency.

This finding is consistent with a large body of empirical literature that identifies FDI as a factor that can worsen income distribution, especially in developing countries (Seip & Harper, 2016). The most likely mechanism explaining this phenomenon is the skill-biased technological change hypothesis. Multinational corporations that bring in FDI tend to use capital-intensive and skill-intensive technology. Consequently, the demand for and wages of skilled labor increase rapidly, while the demand for unskilled labor remains relatively stagnant or even declines. This wage gap between the two labor groups directly widens income inequality (Allen, 2021).

From the perspective of Hirschman's Linkage Theory, this result can be interpreted as the FDI entering Bandung Regency tending to be of an enclave nature. This investment may have weak backward linkages with the local economy. This means that these foreign companies import more raw materials and semi-finished goods from abroad rather than purchasing them from local Micro, Small, and Medium Enterprises (MSMEs). As a result, the intended multiplier effect is limited and fails to permeate the broader economic base. Thus, the economic benefits of FDI are concentrated among the few skilled workers who are hired and global suppliers, while the majority of the local population does not experience significant positive impacts. This finding effectively challenges the simple assumptions of the trickle-down economics theory in the context of FDI in Bandung Regency.

Conversely, the LOG(DDI) variable shows a negative coefficient of -0.0049. The direction of this coefficient suggests that an increase in DDI has the potential to reduce income inequality. However, this effect is not statistically significant (p-value = 0.4328),

which means there is insufficient empirical evidence from the available data to definitively state that DDI reduces the Gini Ratio.

Although not significant, the negative direction of the DDI coefficient offers an interesting hypothesis. It could indicate that domestic investment, which may be more dispersed across various sectors and business scales (including MSMEs), has a greater potential to create local economic linkages. Domestic investors may be more inclined to use local suppliers, hire more labor with diverse skill levels, and be more integrated with domestic supply chains. This aligns with research by Hasanah (2023), which found that investment can reduce inequality through broad job creation. The insignificance of this result could be due to several factors, including the limited number of observations (N=14), which reduces the statistical power of the test, or because the positive effects of DDI are obscured by large data variations or other factors not included in the model. Studies by Hindun et al. (2019) and Juniati et al. (2022) also found insignificant impacts of investment, highlighting the complexity of this relationship.

Overall, the divergent findings between FDI and DDI underscore the main argument of Hirschman's Linkage Theory which says it is not just the quantity of investment that matters, but also its quality and characteristics. FDI that tends to be capital-intensive and isolated from the local economy exacerbates inequality, consistent with the initial phase of the Kuznets Curve where modernization is concentrated. Meanwhile, DDI, although its impact is not statistically proven in this study, shows potential to be more inclusive and distributive. This provides an important signal for policymakers at the Investment and One-Stop Integrated Services Agency of Bandung Regency to not only pursue nominal investment targets but also to proactively direct and incentivize investments that have a higher equity-enhancing leverage.

4. CONCLUSION

This study empirically evaluates the impact of Foreign Direct Investment (FDI) and Domestic Direct Investment (DDI) on income inequality in Bandung Regency for the period 2011-2024. Based on time-series regression analysis, this study yields two main, divergent conclusions. First, FDI was found to have a positive and statistically significant effect on the Gini Ratio. The coefficient value indicates that an increase in foreign investment flows into Bandung Regency, in its current configuration, tends to widen the income gap. This finding is strongly suspected to be related to the capital-intensive and skill-biased nature of FDI, which increases demand for skilled labor and creates a wage gap, as well as the possible weak linkage of such investment with the local economy. Second, DDI was found to have a negative effect on the Gini Ratio, suggesting the potential for domestic investment to reduce inequality, as reflected in the coefficient value. However, this effect was not statistically significant, meaning no definitive conclusion can be drawn about its impact based on the model used.

The policy implications of these findings are highly relevant for Investment and One-Stop Integrated Services Agency and the Government of Bandung Regency. The research results strongly suggest that the strategy for attracting investment should not focus solely on achieving quantitative targets (realization value). Instead, a paradigm shift towards a more selective and targeted qualitative strategy is needed. The local government is advised to (1) Develop an incentive framework that favors investments proven to create strong local linkages, both backward and forward. This could take the form of permit facilitation or fiscal relief for companies (both foreign and domestic) that commit to using local suppliers and developing MSMEs as part of their supply chain. (2) Encourage and facilitate labor-intensive FDI or FDI that is willing to conduct technology transfer and training programs for the local workforce to mitigate skill-biased impacts. (3) Prioritize the promotion of DDI, given its more distributive potential, by creating a conducive business ecosystem for domestic investors at various scales.

This study has several limitations that must be acknowledged. The primary limitation is the small sample size (N=14), which restricts the statistical power and generalizability of the results. Second, the model used is parsimonious and omits other important variables that can affect inequality, such as education levels, government social spending, and minimum wages, potentially leading to omitted variable bias. Third, the use of aggregate investment data masks the differential impacts across sectors.

Based on these limitations, several directions for future research can be recommended. First, subsequent studies could use panel data combining data from all regencies/cities in West Java to increase the number of observations and analytical power. Second, the research model could be expanded to include control variables such as the Human Development Index (HDI), government expenditure on education and health sectors, and investment data disaggregated by economic sector. Third, a qualitative case study approach on several large FDI and DDI companies in Bandung Regency could be conducted to deeply trace the mechanisms of economic linkages and the social impacts they generate, providing a richer understanding behind the statistical figures.

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