International Journal of Emerging Research and Review
Homepage : https://ijoerar.net/index.php/ijoerar
p-ISSN : 3024-8825; e-ISSN : 3021-8950

The Role of the Human Development Index and Economic Growth in East Java 2015-2024

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DOI: https://doi.org/10.56707/ijoerar.v4i2.166

Sections Info

Article history:
Submitted: January 30, 2026
Final Revised: February 16, 2026
Accepted: February 18, 2026
Published: February 26, 2026

Keywords:
East Java
Economic Growth
Human Development Index
Income Inequality

ABSTRACT

Objective: *This study aims to examine the effect of the Human Development Index (HDI) and economic growth on income inequality in East Java Province over the period 2015–2024. Despite sustained regional economic growth, income inequality remains a persistent issue, indicating that economic progress may not be evenly distributed across society.* ***Method:*** *This research employs a quantitative approach using secondary time-series data obtained from the Central Statistics Agency of Indonesia. The data are analyzed using the Ordinary Least Squares (OLS) regression method to identify the partial and simultaneous effects of HDI and economic growth on income inequality, which is measured using the Gini ratio. Classical assumption tests are conducted to ensure the validity of the regression model.* ***Results:*** *The empirical findings indicate that both HDI and economic growth do not have a statistically significant effect on income inequality in East Java during the study period. The F-test shows significance (p = 0.010), but partial t-tests reveal insignificance for both HDI (p = 0.089) and economic growth (p = 0.308). This statistical pattern significant F-test with insignificant t-tests suggests potential model instability due to the limited sample size (N=10) and omitted variable bias, rather than meaningful economic relationships. Conversely, economic growth shows a positive coefficient, indicating a tendency to increase income inequality. These results suggest that economic growth in East Java has not yet been inclusive and that improvements in human development have not been sufficient to substantially mitigate inequality. Moreover, the HDI coefficient (-6.64E-05) is economically negligible: even a hypothetical 100-point increase in HDI would reduce the Gini ratio by only 0.00664, an effect too small to be policy-relevant.* ***Novelty:*** *This study tests inclusive growth propositions at the provincial level in Indonesia and shows that aggregate time-series models with limited observations are insufficient to capture the complex links between growth, human development, and inequality in East Java. The findings provide a diagnostic contribution by emphasizing the need for spatially disaggregated data and more advanced econometric approaches in future research.*

INTRODUCTION

Sustainable and inclusive economic development has become one of the main priorities for developing countries, as it is believed to improve the overall welfare of society. The inclusive growth approach emphasizes that the benefits of development must be accessible to all segments of the population (Roine, 2015). Recent research developing multidimensional frameworks for inclusive growth confirms that in developing country contexts, growth strategies must be deep and multidimensional, integrating poverty, inequality, and production participation to be effective (Farrag et al., 2025). However a central theoretical and empirical question remains unresolved: under what conditions does economic growth translate into reduced income inequality (Bandyopadhyay et al., 2025). Furthermore, recent optimization models treating both growth and inequality as policy objectives demonstrate that growth and inequality can coexist within controlled

bounds, with optimal strategies maximizing growth while minimizing inequality within observed ranges of GDP per capita (Duong, 2025). Economic progress should not only be reflected in output growth but also in income distribution and equal access to economic opportunities. In East Java Province, despite sustained regional economic growth contributing more than 14% to Indonesia's GDP (Ludiro et al., 2018), the Gini ratio has remained persistently between 0.38 and 0.40 over the past decade (BPS, 2025), with urban inequality reaching 0.403 compared to 0.332 in rural areas as of 2024. This urban rural gap indicates that aggregate growth has not been accompanied by equitable income distribution, making East Java a critical case for examining the determinants of persistent inequality despite strong economic performance.

The research gap addressed by this study emerges from three specific contradictions in the existing literature that remain unresolved. First, previous studies have produced conflicting findings regarding the growth inequality relationship. Helmy et al., (2024) found that economic growth significantly reduces inequality in South Sulawesi, attributing this to the province's agricultural sector employment structure that facilitates broader growth transmission. In contrast, Sari et al, (2025) reported statistically insignificant relationships across Indonesian provinces, suggesting that the growth inequality nexus is highly context dependent and may be obscured in aggregate national level analyses. Empirical research on income distribution shows that the impact of economic growth on inequality varies across contexts and methodologies (Miranda-lescano et al., 2024). Second, the role of HDI in mitigating inequality remains contested Azim et al., (2022) and Yoertiara et al., (2022) found significant inequality reducing effects of HDI across Java provinces, yet Sihite et al., (2023) demonstrated that HDI improvements in East Java are spatially concentrated in urban districts like Surabaya, while rural and peripheral regions experience slower progress. This spatial heterogeneity raises the question: can aggregate provincial HDI capture inequality dynamics when its improvements are unevenly distributed? Third, Carla et al., (2024) proposed that HDI moderates the growth inequality relationship, suggesting that human capital quality conditions whether growth becomes inclusive. However, this moderating hypothesis has not been rigorously tested at the provincial level in Indonesia, partly due to data limitations that constrain interaction model estimation.

This study is anchored in inclusive growth theory (Roine, 2015), which posits that economic growth reduces inequality only when accompanied by equitable access to opportunities and human capital development. Contemporary research defines inclusive growth as growth that generates new economic opportunities while ensuring equal access to those opportunities for all segments of society, encompassing not only equity in wealth distribution but also fairness in access to opportunities for wealth creation (Sawadogo et al., 2025). From this theoretical framework, we derive three testable propositions that guide our empirical analysis. Direct Effect Proposition, Improvements in the Human Development Index (HDI) should directly reduce income inequality by enhancing productive capabilities across populations, enabling broader participation in economic activities, and improving access to quality education and healthcare (Kaimuddin, 2024). This proposition posits a negative relationship between HDI and the Gini coefficient.

Growth Effect Proposition, Economic growth should be associated with lower income inequality when its benefits are broadly distributed across sectors and regions (Breunig et al., 2019). However, this relationship is contingent upon economic structure growth concentrated in capital intensive, urban based sectors may generate limited spillover effects for rural populations, potentially resulting in a positive or insignificant relationship between growth and inequality (Helmy et al., 2024;Sari et al., 2025). Conditional Proposition, building on Carla et al., (2024), human capital quality may moderate the growth inequality relationship. In regions with higher HDI, growth is expected to be more inclusive because better educated and healthier populations can more effectively participate in and benefit from economic expansion. Conversely, in regions with low HDI, growth may exacerbate inequality as benefits accrue primarily to those with existing human capital advantages.

Given the constraints of provincial-level time series data with only 10 annual observations (2015-2024), our objectives are necessarily circumscribed. This study does not claim to test interaction effects directly, as such tests would require larger samples and additional degrees of freedom that are not available. Test whether the predicted relationships from inclusive growth theory that HDI reduces inequality and that growth, when combined with human capital development, should be associated with lower inequality are detectable at the aggregate provincial level given these data limitations (Galor, 2021;Agita et al., 2024). Identify and explicitly acknowledge the methodological constraints that may explain contradictory findings in the literature small sample size reducing statistical power, aggregation bias masking spatial heterogeneity, and omitted variable bias from parsimonious model specification. Assess whether the pattern of results is consistent with more complex relationships such as moderation or interaction that cannot be directly estimated with the available data but should be investigated in future research with larger samples. Fourth, we provide diagnostic evidence on whether aggregate provincial models are adequate for testing inclusive growth propositions, thereby informing future research design choices.

The novelty of this study lies not in claiming the 2015-2024 period as inherently significant, but rather in its critical examination of whether standard time series methods applied to provincial aggregates can meaningfully test theoretically derived propositions about inequality. By explicitly confronting methodological limitations rather than glossing over them, this study contributes to the literature by demonstrating that the relationship between growth, human development, and inequality remains empirically elusive in the East Java context when analyzed at the provincial level, highlighting that spatial heterogeneity documented by Sihite et al., (2023) may render aggregate analyses insufficient, and providing specific guidance for future research to adopt panel data, spatial econometrics, and microdata approaches that can better capture the complex, spatially differentiated nature of inequality dynamics.

Theoretically, this study is anchored in inclusive growth theory (Roine, 2015), which posits that economic growth reduces inequality only when accompanied by equitable access to opportunities and human capital development. From this framework, we derive two testable propositions HDI improvements should directly reduce income inequality by enhancing productive capabilities across populations and economic growth should be

associated with lower inequality when human capital is broadly distributed. However, given the spatial concentration of economic activities and human development in East Java's urban centers documented by Ludiro et al., (2018) and Sihite et al., (2023), we hypothesize that these theoretical relationships may be weakened or obscured at the aggregate provincial level. This hypothesis does not indicate theoretical failure but rather reflects the possibility that provincial level aggregation averages out opposing within province dynamics HDI gains in urban areas may reinforce existing advantages while rural improvements lag, and urban based industrial growth may generate limited spillovers to agricultural regions. If these opposing effects cancel out at the aggregate level, provincial models will produce insignificant coefficients even when theoretically predicted relationships operate at lower geographic scales. Testing this aggregation hypothesis is a central diagnostic objective of this study.

Inclusive Growth and Income Inequality

Inclusive growth theory emphasizes that economic progress should be accompanied by equitable income distribution and improved access to economic opportunities for all social groups (Sjaf et al., 2025). The theoretical mechanism linking growth to inequality reduction operates through labor market absorption, productivity enhancements, and the diffusion of economic benefits across sectors and regions (Roine et al., 2015). However, this mechanism is contingent upon the structure of the economy growth concentrated in capital intensive, urban based sectors may generate limited spillover effects for rural populations, potentially exacerbating inequality even as aggregate output increases (Economia., 2016;Dey et al., 2024). Empirically, the relationship between growth and inequality remains inconclusive (Salah et al., 2026;Gordón, 2019). This structural contingency explains why empirical evidence on the growth-inequality relationship remains inconclusive. Helmy et al., (2024), found that growth significantly reduced inequality in South Sulawesi, attributing this to the province's agricultural sector employment structure that facilitates broader growth transmission. In contrast, studies examining regions with concentrated industrial growth often find that inequality persists or widens despite positive aggregate performance (Sari et al., 2025). Thus, whether growth is inclusive depends largely on the structure of the economy and the extent to which development benefits are shared across regions and income groups.

Human Development and Income Distribution

The Human Development Index (HDI) is a multidimensional indicator reflecting health, education, and living standards, serving as a proxy for human capital quality. Improvements in HDI are expected to enhance productivity, access to opportunities, and ultimately, income equality. Higher education levels and better health outcomes expand individuals' capabilities to participate in the economy, reducing the structural causes of inequality (Mahler et al., 2026). Several studies have confirmed the positive role of HDI in promoting equitable development. Kaimuddin (2024) found that HDI has a significant positive relationship with regional economic performance and welfare distribution. Similarly, Azim et al. (2022) and Yoertiara et al., (2022) concluded that HDI improvements

tend to reduce income disparities across provinces in Java. However, Sihite et al. (2023) highlighted that HDI in East Java remains unevenly distributed, with high human development concentrated in urban areas like Surabaya, while peripheral and rural regions lag behind. This uneven distribution of human capital limits HDI's potential to mitigate inequality effectively.

The Human Development Index (HDI) is a multidimensional indicator reflecting health, education, and living standards, serving as a proxy for human capital quality (Kumar et al., 2025). Improvements in HDI are expected to enhance productivity, access to opportunities, and ultimately, income equality. Higher education levels and better health outcomes expand individuals' capabilities to participate in the economy, reducing the structural causes of inequality. Several studies have confirmed the positive role of HDI in promoting equitable development. Kaimuddin (2024) found that HDI has a significant positive relationship with regional economic performance and welfare distribution. Similarly, Azim et al. (2022) and Yoertiara et al., (2022) concluded that HDI improvements tend to reduce income disparities across provinces in Java. However, Sihite et al. (2023) highlighted that HDI in East Java remains unevenly distributed, with high human development concentrated in urban areas like Surabaya, while peripheral and rural regions lag behind. This uneven distribution of human capital limits HDI's potential to mitigate inequality effectively (Farrag et al., 2025).

Regional Economic Growth and Structural Gaps

Regional economic disparities in Indonesia are also influenced by differences in sectoral structure and spatial distribution of economic activities (Azis, 2026). Ludiro et al. (2018) noted that East Java's economy is dominated by industrial and service sectors, primarily located in urban centers, while rural areas depend on agriculture and informal sectors with low productivity. This spatial economic structure creates a theoretical tension, aggregate growth may be positive, but its distributional consequences depend on sectoral composition and regional connectivity (Badriah, 2024;Bhattacharyya et al., 2015). Lumenta (2024) emphasized that persistent inequality in Indonesia arises from access to education, infrastructure, and productive assets factors that are spatially determined and cannot be captured in aggregate time-series models. Furthermore, in Indonesia economic sectors are notably concentrated in Jakarta and Java, with transport costs and market access creating spatial configurations that concentrate upstream and downstream activities in core regions while peripheral areas lag behind (Ping et al., 2025). The policy implication is significant if inequality is driven by spatial disparities in access to quality education, healthcare, and economic opportunities, then provincial-level policies focusing solely on aggregate growth or average HDI improvements may miss the mark. Targeted interventions addressing spatial inequalities become necessary, but diagnosing these requires data at district or subdistrict levels (Revenues et al., 2026).

Previous Empirical Findings

The empirical literature on growth, human development, and inequality in Indonesia reveals three unresolved puzzles that motivate this study. First, the sign and significance of the growth-inequality relationship vary substantially across studies and geographic

scales. Helmy et al. (2024) found a negative correlation between economic growth and inequality in South Sulawesi, suggesting that growth benefits were broadly distributed. Conversely, Sari et al. (2025) reported no significant relationship between growth and inequality across Indonesian provinces. This scale dependence suggests that aggregation may obscure important subnational variation a hypothesis directly relevant to our provincial level analysis of East Java (Syam et al., 2025;Zulfia et al., 2024).

Azim et al., (2022) and Yoertiara et al., (2022) found significant inequality reducing effects of HDI in cross provincial analyses, yet Sihite et al., (2023) demonstrated that within East Java, HDI improvements are highly spatially concentrated. This contrast between cross provincial and within province evidence suggests that the inequality reducing potential of HDI may operate primarily through between province convergence, while within-province spatial disparities persist or even widen. If true, provincial level analyses like ours may fail to detect HDI effects because within province spatial heterogeneity cancels out at the aggregate level (Zulfia et al., 2024).

Carla et al. (2024) proposed that HDI moderates the growth inequality relationship, suggesting that growth becomes more inclusive in regions with higher human capital. This moderating hypothesis implies that the growth inequality relationship is conditional rather than universal a proposition that requires interaction models and sufficiently large samples to estimate reliably. With only 10 observations, our study cannot test this moderation hypothesis directly, but we can assess whether the predicted additive relationships are detectable, and if not, consider whether the conditional nature of the relationship might explain null findings.

This study addresses these gaps by explicitly acknowledging that provincial level time series analysis with limited observations cannot definitively resolve these theoretical debates. Instead, we position this research as a diagnostic exercise that tests whether aggregate relationships predicted by theory are detectable given data constraints. The findings will inform whether more sophisticated approaches such as district-level panel data with spatial econometric methods or microdata decomposition using household surveys are necessary to understand inequality dynamics in East Java. This diagnostic orientation represents a shift from claiming definitive causal estimates toward providing methodological guidance for future research.

RESEARCH METHOD

This study employed a quantitative approach with a multiple linear regression design to examine the influence of the Human Development Index (HDI) and economic growth on income inequality in East Java Province from 2015 to 2024. The analysis aimed to identify the extent to which variations in human development and economic performance contribute to disparities in income distribution. The research utilized secondary time series data obtained from the official publications of the Central Statistics Agency of East Java. The data set includes annual information on the Human Development Index, economic growth, and income inequality measured by the Gini ratio. The HDI serves as a proxy for human capital quality, encompassing three key dimensions health, education, and standard of living while economic growth is represented by the annual percentage change in the regional Gross Domestic Product (GRDP) at constant prices. Income

inequality is measured through the Gini coefficient, which captures the degree of disparity in income distribution among the population.

The data were collected using documentation techniques from official and publicly accessible BPS reports to ensure reliability and accuracy. The analysis was conducted using EViews and SPSS 24 software. Descriptive statistics were first used to summarize the data, followed by inferential statistical analysis to test the research hypotheses. The Ordinary Least Squares (OLS) method was applied to estimate the regression model, which is formulated as $II = \mathrm{a} + \beta_1 HDI + \beta_2 E\mathrm{G} + e$ where income inequality (II) is explained by HDI and economic growth. Before hypothesis testing, a series of classical assumption tests were carried out to verify the validity of the model, including tests for normality (Jarque Bera), multicollinearity (Variance Inflation Factor), heteroskedasticity (White test), autocorrelation (Durbin Watson and LM test), and linearity (Ramsey test). These diagnostic tests were used to ensure that the model satisfied the BLUE (Best Linear Unbiased Estimator) criteria (Castle et al., 2023).

Hypothesis testing consisted of the *t*-test to determine the partial effect of each independent variable and the F-test to assess their simultaneous influence on income inequality. It is important to note a potential statistical phenomenon that may arise in small sample regression, the possibility of a significant F-test accompanied by insignificant t-tests. This pattern can occur for several reasons, including low statistical power due to limited degrees of freedom, moderate correlation among independent variables or the presence of complex relationships that are not captured by the additive linear model. In this study, with only 10 observations and 2 predictors, the model has limited power to detect individual effects even when the joint explanatory power is statistically significant. Therefore, if such a pattern emerges in the results, it should be interpreted with caution, as it may reflect model instability or omitted variable bias rather than meaningful economic relationships. This diagnostic awareness is incorporated into the interpretation of findings. The coefficient of determination (Adjusted R^2) was also calculated to measure how much of the variation in income inequality could be explained by HDI and economic growth collectively. This comprehensive analytical procedure was designed to ensure the statistical robustness and interpretive clarity of the findings, allowing the study to provide credible empirical evidence on how human development and economic growth interact in shaping income inequality across East Java Province.

RESULTS AND DISCUSSION

Results

The descriptive analysis provides an overview of the main variables used in this study, namely the Human Development Index (HDI), Economic Growth (EG), and Income Inequality (II). The statistical summary is presented in Table 1.

Table 1. Descriptive Statistics of Human Development Index, Economic Growth, and Income Inequality (2015–2024)

	Human Development Index (HDI)	Economic Growth (EG)	Income Inequality (II)
N	10	10	10
Mean	71.23	4.39	0.381
Std Error Mean	0.52	0.74	0.006

Median	71.11	5.44	0.374
Std. Deviasi	1.65	2.34	0.018
Variance	2.73	5.48	0.00033
Range	5.14	7.90	0.051
Minimum	68.95	-2.33	0.364
Maximum	74.09	5.57	0.415

During the period 2015–2024, income inequality in East Java, measured by the Gini ratio, had an average value of 0.381 with a standard deviation of 0.018. The lowest inequality occurred in 2015 (0.364), while the highest was in 2024 (0.415). This indicates moderate but persistent inequality throughout the decade. The Human Development Index showed a consistent upward trend, with an average value of 71.23, rising from 68.95 in 2015 to 74.09 in 2024. Meanwhile, economic growth averaged 4.39 percent, fluctuating significantly with the lowest point (-2.33 percent) in 2020 due to the COVID-19 pandemic, and the highest (5.57 percent) in 2016. These variations suggest that while human development in East Java steadily improved, economic performance was more volatile.

Table 2. F-Test and T-Test

Variable	**T-statistic**	***Prob.***
C	3.485492	0.010
HDI	-1.972976	0.089
EG	1.097335	0.308

The F-test results in Table 1 indicate a probability value of 0.010, which is below the 0.05 significance level. This finding shows that HDI and economic growth jointly do not have a statistically significant effect on income inequality in East Java Province during the 2015–2024 period. The partial t-tests also show that neither HDI ($p = 0.089$) nor economic growth ($p = 0.308$) has a statistically significant individual effect at the conventional significance level ($\alpha = 0.05$). Both probability values exceed 0.05, indicating that the individual coefficients are not statistically distinguishable from zero. With a small sample size of only 10 observations and limited degrees of freedom ($df = 7$), the model has low statistical power. This increases the risk of failing to detect true effects that may exist in the population. Given the statistical insignificance of both the joint F-test and the partial t-tests, we cannot draw any conclusions about the relationship between HDI, economic growth, and income inequality based on this provincial level time series analysis.

Regarding the HDI coefficient (-6.64E-05), even if we consider its magnitude, it is economically very small. A one-point increase in HDI is associated with a Gini reduction of only 0.0000664. A hypothetical 100-point increase in HDI would reduce the Gini coefficient by only 0.00664, which is less than the observed year-to-year variation in East Java's Gini (range of 0.051 over the decade).

Table 3. Coefficient of Determination

Variable	**Coefficient**

R-squared	0,299294

Table 3 shows an Adjusted R^2 value of 0.299 implies that approximately 29.9% of the variation in income inequality can be explained by HDI and economic growth, while the remaining 70.1% is influenced by other factors not included in this model. These may include regional investment, labor market characteristics, infrastructure distribution, and institutional quality, which often play crucial roles in determining income distribution patterns across regions.

Classical assumption tests are a prerequisite in analytical procedures that must be met for multiple linear regression analysis based on the Ordinary Least Squares (OLS) method (Ferre, 2009;Bandyopadhyay et al., 2025). This study conducted several diagnostic tests to ensure the validity of the regression model, namely the Multicollinearity Test, Normality Test, Heteroscedasticity Test, Autocorrelation Test, and Linearity Test.

The Multicollinearity Test is performed to evaluate the relationship between the independent variables in the regression model. In this study, we compare the value of the Coefficient of Determination ($R^{2)}$ from the auxiliary regression model with the R^2 value of the overall model. If the R^2 of the auxiliary regression is greater than the R^2 of the overall model, the data exhibits multicollinearity. Conversely, if the R^2 of the auxiliary regression is lower than the R^2 of the overall model, the relationship between the independent variables is non-significant, and the data is considered free from multicollinearity.The Multicollinearity Test also utilizes the Variance Inflation Factor (VIF) value to ensure calculation accuracy, thereby minimizing significant errors and avoiding the symptom of correlation between the independent variables (Williams et al., 2013).

Table 4. Multicollinearity Test

Variable	Centered VIF
HDI	1.021310
EG	1.021310

Table 4 shows that the Variance Inflation Factor (VIF) value for the poverty variable is 1,021310 and for the EG variable is 1,021310. Since the VIF values for both independent variables in this study are less than 10.00 (VIF < 10.00), it can be concluded that the data passes the multicollinearity test, indicating the absence of severe multicollinearity among the independent variables in the regression model.

The normality test aims to examine whether the residuals generated from the regression model follow a normal distribution, which constitutes a fundamental assumption in regression analysis to ensure the reliability of the estimation results (Schmidt et al., 2018). In this research, residual normality was evaluated through a histogram analysis. The residuals are deemed to be normally distributed when the probability value (p-value) exceeds the significance threshold of 0.05.

Table 5. Normality Test

Normality test	Probability
Jarque-Bera	0.530741

In this study, the normality of the residuals was tested using the Jarque–Bera method at a 0.05 level of significance. Based on the results presented in Table 5, the probability value of the Jarque–Bera statistic is 0.530741, which is higher than the specified significance level. Therefore, it can be concluded that the residuals of the regression model are normally distributed.

Furthermore, a heteroscedasticity test was performed to assess the consistency of the residual variance across observations. Heteroscedasticity refers to a condition in which the variance of the error terms varies and may compromise the reliability of regression estimates (Schmidt et al., 2018). A regression model is considered robust when it does not exhibit heteroscedasticity. In this analysis, the absence of heteroscedasticity is confirmed when the probability value of the Chi-square statistic exceeds the 0.05 significance level.

Table 6. Heteroscedasticity Test

Heteroskedasticity test	Probability
Obs *R-square	0.3978

Based on the results presented in Table 6, the probability value of the Chi-Square statistic is 0.3978, which exceeds the 0.05 significance level, indicating that the regression model does not exhibit heteroscedasticity. This suggests that the variance of the residuals remains constant across observations.

In addition, an autocorrelation test was conducted to examine whether the residuals are correlated across different observations, as such correlation represents a violation of the classical regression assumptions and may reduce the efficiency of parameter (Yin, 2020). The absence of autocorrelation in this study is determined when the probability value of the Chi-Square statistic is greater than 0.05. The test results show that the probability value of the ObsR-squared statistic is 0.3978, which is higher than the specified significance level. This finding indicates that the residuals are free from autocorrelation.

Overall, the results of the heteroscedasticity and autocorrelation tests confirm that the regression model satisfies the BLUE (Best Linear Unbiased Estimator) criteria. Consequently, the estimated regression coefficients can be considered efficient, unbiased, and reliable for further interpretation.

Table 7. Autocorrelation Test

Autocorrelation test	Probability
Prob. Chi-square	0.3060

Based on the autocorrelation test results summarized in Table 7, the probability value of the Chi-Square statistic is 0.3060, which exceeds the 0.05 level of significance. This finding indicates that there is no autocorrelation among the residuals, and thus the regression model meets the classical assumption related to error independence.

Furthermore, a linearity test was conducted as the fifth diagnostic procedure. In regression analysis, linearity refers to the extent to which the relationship between the independent variables and the dependent variable can be appropriately modeled using

a linear function (Schmidt et al., 2018). This assumption implies that changes in the independent variables lead to proportional and consistent changes in the dependent variable.

Table 8. Linearity test

Linearity test	Probability
F-statistic	0.1836

As presented in Table 8, the probability value of the F-statistic is 0.8151, which exceeds the 0.05 significance threshold. This result indicates that the relationship among the variables in the regression model can be appropriately characterized as linear.

Based on the overall results of the diagnostic tests, all classical regression assumptions have been fulfilled. This confirms that the estimated model meets the criteria of the Best Linear Unbiased Estimator (BLUE), indicating that the regression coefficients are unbiased, efficient, and possess minimum variance. With these assumptions satisfied, the regression model is deemed reliable for subsequent statistical inference and predictive analysis.

To examine the effect of the human development index and economic growth on the income inequality, a multiple linear regression approach was applied. The general specification of the regression model is expressed as:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + e$$

In this model, the Human Development Index (X_1) and Economic Growth (X_2) serve as independent variables, while the Income Inequality (Y) is the dependent variable. The estimation results yield the following regression equation:

$$II = 0.844904 + -6.64E\text{-}05(HDI) + 0.002469(EG) + e$$

Table 9. Regression Analysis

Variable	Coefficient
C	0.844904
HDI	-6.64E-05
EG	0.002469

Based on the regression results presented in Table 9, the constant value of 0.844904 represents the expected level of income inequality when the Human Development Index (HDI) and economic growth (EG) are assumed to be zero. Although this condition is not realistic in practical terms, the constant serves as a baseline reference for the model.

The coefficient of HDI is −6.64E−05, indicating a negative relationship between human development and income inequality. This suggests that improvements in HDI tend to reduce income inequality, implying that better access to education, health services, and living standards contributes to a more equitable income distribution. However, the magnitude of this coefficient is very small, and the effect is statistically insignificant, indicating that improvements in human development during the study period have not been sufficient to generate a meaningful reduction in income inequality.

Meanwhile, the coefficient of economic growth is 0.002469, which shows a positive relationship between economic growth and income inequality. This finding implies that

higher economic growth is associated with a tendency toward widening income disparities. Such a result may reflect the unequal distribution of growth benefits, where economic expansion is concentrated in certain sectors or regions. Nevertheless, similar to HDI, the effect of economic growth on income inequality is also statistically insignificant, suggesting that economic growth alone does not play a decisive role in explaining income inequality in the observed period.

Overall, these results indicate that both human development and economic growth have not had a significant impact on income inequality in the study area. This finding reinforces the argument that economic growth in the region has not been inclusive and that improvements in human development have yet to effectively translate into more equitable income distribution.

Discussion

The central finding of this study is that, in a provincial level time series analysis of East Java from 2015-2024 with 10 annual observations, neither HDI nor economic growth demonstrates a statistically significant effect on income inequality either jointly or partially. This finding must be understood not as evidence that these factors are irrelevant to inequality, but rather as a diagnostic result that raises important questions about measurement, methodology, and theory. The most plausible explanation for these insignificant results is the limited sample size (N=10) and correspondingly low statistical power. With only 10 annual observations and two independent variables, the model has insufficient power to detect anything other than very large effects.

Comparing these findings with prior empirical studies reveals important insights about context dependence and methodological sensitivity. Helmy et al., (2024) found that economic growth significantly reduced inequality in South Sulawesi using district level panel data with a much larger sample. The contrast between their significant findings and our insignificant results likely reflects differences in sample size and geographic scale rather than genuine differences in economic relationships. With panel data across multiple districts and years, Helmy et al., (2024) had substantially greater statistical power to detect effects.

Similarly, Azim et al. (2022) and Yoertiara et al., (2022) who reported significant inequality reducing effects in cross provincial analyses. Their analyses included many more observations across multiple provinces, providing greater statistical power. Our provincial level time series analysis with only 10 observations simply cannot match that level of statistical precision. The spatial heterogeneity documented by Sihite et al., (2023) provides an additional explanation. They demonstrated that HDI improvements in East Java are spatially concentrated in urban districts, while rural areas lag. This spatial heterogeneity may be obscured in aggregate provincial level analysis. Even if HDI improvements reduce inequality within specific districts, these effects may cancel out at the provincial level when some districts improve while others lag. Capturing these dynamics requires district level panel data, not provincial time series aggregates.

The spatial mismatch between the empirical model and the theoretical phenomenon deserves explicit acknowledgment. The discussion emphasizes urban rural disparities and interregional inequality within East Java, yet the empirical model uses province level aggregates that cannot capture these spatial dynamics. This aggregation bias means that

even if meaningful relationships exist at the district level, they may not be detectable at the provincial level.

From a policy perspective, the findings do not support any claims about growth being non inclusive or HDI failing to reduce inequality. Such causal language would be completely unwarranted given the statistical insignificance. Rather, the results indicate that with the available data and methodology, we cannot detect statistically reliable relationships. This could mean the sample size is too small to detect true effects, effects are heterogeneous and cancel out at the aggregate level, the parsimonious model omits key variables, or the relationships are nonlinear or interactive. We simply cannot determine which explanation is correct with the current analysis.

Methodologically, this study highlights the severe limitations of provincial level time series analysis with only 10 observations for understanding inequality dynamics. From a policy perspective, the findings must be interpreted with extreme caution given the statistical insignificance of all coefficients. The results do not support any direct policy recommendations about growth being non inclusive or HDI being ineffective. Rather, the appropriate policy relevant conclusions emerge from the diagnostic nature of the analysis. The insignificant results suggest that provincial-level aggregate indicators may be insufficient for monitoring inequality dynamics and designing targeted interventions. If policymakers in East Java rely solely on provincial level relationships between HDI, growth, and the Gini coefficient, they may miss important spatial heterogeneity that requires district-level attention. For example, Sihite et al., (2023) documented that HDI improvements are concentrated in urban districts a pattern that would be invisible in provincial aggregates but has clear implications for where educational and health interventions should be targeted.

The spatial mismatch between where growth occurs (urban industrial centers) and where inequality persists (rural areas) suggests that policy coordination across levels of government is essential. Provincial level policies that promote industrial growth in Surabaya may have limited impact on rural poverty and inequality without complementary district level investments in infrastructure, education, and labor market linkages that enable rural populations to access urban economic opportunities. The pattern of result significant joint F-test with insignificant t-tests is consistent with the possibility that the relationships are more complex than additive linear models can capture. This suggests that policy analysis should move beyond simple correlations and consider how HDI and growth interact, how effects vary across regions, and how lagged adjustments occur over time. However, testing these more complex relationships requires data and methods beyond those available in this study. The key policy implication is methodological rather than substantive inequality diagnostics in East Java should employ disaggregated data and multi-level analysis before drawing conclusions about policy effectiveness. Provincial level time series analysis with small samples is insufficient for this purpose. Policymakers should invest in district level data systems and support research that can capture the spatial complexity documented in qualitative studies.

Future research must employ more appropriate data and methods panel data across 38 districts in East Java over multiple years would provide substantially greater statistical power ($N > 300$ with 10 years of data), spatial econometric techniques could capture interregional spillovers and spatial dependence and microdata from household surveys

(Susenas, Sakernas, IFLS) would enable analysis of individual level determinants. The findings serve an important diagnostic function they demonstrate that provincial level time series analysis with limited observations is inadequate for testing theories about inequality in contexts characterized by spatial heterogeneity. Future research should abandon this approach in favor of more appropriate methods that can match the complexity of the phenomenon.

CONCLUSION

Fundamental Finding: This study concludes that the Human Development Index (HDI) and economic growth do not have a significant effect on income inequality in East Java Province during the 2015-2024 period. Despite continuous improvements in human development and positive economic growth, these advances have not translated into a more equitable income distribution. This finding critically indicates that inequality in East Java is driven by structural and spatial disparities that cannot be addressed solely through aggregate improvements in human capital and economic performance. **Implication:** The findings imply that development policies in East Java remain insufficiently inclusive. Emphasis on economic growth and HDI improvement without parallel distribution-oriented interventions risks reinforcing existing inequalities. Therefore, policymakers should shift toward equity-focused strategies, including reducing interregional development gaps, promoting labor-intensive and inclusive industries, and strengthening education and vocational programs in lagging regions. Without such targeted interventions, growth and human development are likely to continue benefiting specific regions and groups disproportionately. **Limitation:** This study is limited by its reliance on provincial-level time series data, which may conceal inequality variations across districts and cities. In addition, the restricted set of explanatory variables limits the ability of the model to capture the complex and multidimensional determinants of income inequality. **Future Research:** Future research should employ district or city level panel data to better capture spatial inequality dynamics and include broader determinants such as infrastructure, investment, labor market conditions, and institutional quality. The use of micro-level household data, such as Sakernas or IFLS, is also recommended to provide deeper insights into inequality mechanisms and to support more precise and effective policy formulation.

REFERENCES

Agita, V., & Ralitza, S. (2024). The Decline and Levelling Off of Earnings Inequality : Boon or Bane for a Growing Economy ? *The European Journal of Development Research*, *36*(6), 1448–1470. https://doi.org/10.1057/s41287-024-00646-9

Azim A, Sutjipto H, & Ginanjar R. (2022). Determinan Ketimpangan Pembangunan Ekonomi Antar Provinsi di Indonesia. *Jurnal Riset Ilmu Ekonomi*, *2*(1), 1–16.

Azis, I. J. (2026). *Monetary Whispers Across Space*.

Badriah, L. S. (2024). *THE DYNAMICS MODEL OF CROSS-REGIONAL TO ENHANCE ECONOMIC GROWTH : NEW EMPIRICAL*. *12*(3), 379–395. https://doi.org/10.2478/eoik-2024-0046

Bandyopadhyay, S., & Sun, R. (2025). *China Economic Review Size matters : Measuring the effects of inequality and growth shocks $*. *93*(July 2024), 1–29.

Bhattacharyya, S., & Resosudarmo, B. P. (2015). *Growth , Growth Accelerations , and the Poor : Lessons from Indonesia*. *66*, 154–165.

BPS. (2025). *Indonesian Expenditure Inequality Rate in March 2025*. *08*, 1.

Breunig, R., Majeed, O., & Economics, I. (2019). *Inequality , poverty and economic growth*.

Carla, L. M., Andani, W., & Fakhrunnisa, A. (2024). Analisis Pengaruh Indeks Pembangunan Manusia (IPM), Ketersediaan Infrastruktur Listrik, dan Sanitasi terhadap Ketimpangan Pendapatan Antar Daerah di Kalimantan Barat. *Jurnal Forum Analisis Statistik (FORMASI)*, *3*(2), 100–119. https://doi.org/10.57059/formasi.v3i2.57

Castle, J. L., Doornik, J. A., & Hendry, D. F. (2023). *Econometrics and Statistics Robust Discovery of Regression Models*. *26*, 31–51.

Dey, S., Ray, J., & Majumder, R. (2024). *Spatial inequality in sub-national human development index : A case study of West Bengal districts*. *8*(September).

Duong, K. (2025). *If inequality is an economic choice , what is the relationship between inequality and growth ? 74*(March), 116–128.

Economia, F. De, & Economia, F. De. (2016). *A Meta-Analytic Reassessment of the Effects of Inequality on Growth*. *78*, 386–400.

Farrag, E., Mohamad, E., Fekery, Y., Elkhodary, Y., Gowfal, M., Ahmed, A., Al, B., & Al, B. (2025). *Developing a multidimensional sustainable framework for measuring inclusive Growth : Evidence from Egypt*. *7*, 420–429.

Ferre, J. (2009). 3 . 02 Regression Diagnostics. *Chemical and Biochemical Data Analysis*, 33–89.

Galor, O. (2021). *Inequality, Human Capital Formation, and the Process of Development* (Vol. 4). https://doi.org/10.1016/B978-0-444-53444-6.00005-5

Gordón, I. G. (2019). *A sectoral growth - income inequality nexus in Indonesia*. *April 2018*, 123–139. https://doi.org/10.1111/rsp3.12125

Helmy, A., Nujum, S., & Selong, A. (2024). SEIKO : Journal of Management & Business Analisis Pengaruh Pertumbuhan Ekonomi, Upah Minimum dan Indeks Pembangunan Manusia terhadap Ketimpangan Pendapatan di Provinsi Sulawesi Selatan. *SEIKO : Journal of Management & Business*, *7*(1), 2024–2907.

Kaimuddin, A. M. (2024). DETERMINAN KETIMPANGAN ANTAR WILAYAH JAWA TIMUR. *Cita Ekonomika: Jurnal Ilmu Ekonomi*, *18*(2), 99–106. https://doi.org/https://doi.org/10.51125/citaekonomika.v18i2.12170

Kumar, P., Kaur, R., Radulescu, M., Kalaš, B., & Hagiu, A. (2025). *Drivers of Environmental Sustainability , Economic Growth , and Inequality : A Study of Economic Complexity , FDI , and Human Development Role in BRICS + Nations*. 1–28.

Ludiro, Heru, K., & Bagus, J. (2018). *KAJIAN FISKAL REGIONAL Provinsi Jawa Timur*.

Lumenta, R. P. (2024). Model Pembangunan Indonesia dari Perspektif Pembangunan Manusia. *Jurnal Administrasi Publik*, *5*(4), 331–337.

Mahler, D. G., Schoch, M., Lakner, C., & Nguyen, M. C. (2026). *A parsimonious approach to predicting income distributions ☆*. *180*(November 2025).

Miranda-lescano, R., Muinelo-gallo, L., & Roca-sagales, O. (2024). *Human development and inequalities : The importance of social public spending*. *69*(July 2023), 363–377.

Ping, J., & Hu, Y. (2025). *Transport costs and the locations of upstream-downstream sectors in China and Indonesia ☆*. *183*(June).

Revenues, R., Empirical, A. N., & From, E. (2026). *REGIONAL REVENUES AND HUMAN DEVELOPMENT INDEX : AN EMPIRICAL EVIDENCE FROM*.

Roine, J. (2015). *Long-Run Trends in the Distribution of Income and Wealth*.

Roine, J., & Waldenström, D. (2015). Long-run trends in the distribution of income and wealth. In *Handbook of Income Distribution* (Vol. 2). https://doi.org/10.1016/B978-0-444-59428-0.00008-4

Salah, G., Le, A. H., Hasan, B., Beirne, J., & Park, D. (2026). *Journal of International Money and Finance Public spending and inclusive growth : A cross-country*. *162*(January).

Sari, P. H., & Santoso, R. P. (2025). Pertumbuhan ekonomi dan ketimpangan di Indonesia periode

2012-2023. *Jurnal Kebijakan Ekonomi Dan Keuangan*, *3*(2), 220–226. https://doi.org/10.20885/jkek.vol3.iss2.art12

Sawadogo, A., Thiombiano, N., & Sawadogo, R. (2025). *Can inclusive growth reduce multidimensional poverty in Sub-Saharan Africa ? xxxx*.

Schmidt, A. F., & Finan, C. (2018). Linear regression and the normality assumption. *Journal of Clinical Epidemiology*, *98*, 146–151. https://doi.org/10.1016/j.jclinepi.2017.12.006

Sihite, K., Fatimah, F., Sagala, S. M., Asnidar, A., & Ridha, A. (2023). Analisis Faktor-Faktor yang Mempengaruhi Indeks Pembangunan Manusia di Provinsi Jawa Timur. *Jurnal Ekonomi Dan Keuangan Islam*, *2*. https://doi.org/https://doi.org/10.61132/santri.v2i1.188

Sjaf, S., Malik, A., Harits, A., Al, S., Maulana, B., Hakim, L., Aulia, A., Gandi, R., Ardinal, Z., Muhammad, B., Elson, L., & Cakrawinata, F. (2025). *Wellbeing , Space and Society Analysis of spatial inequality and rural development in the supporting region for nusantara capital city , Indonesia*. *9*(June).

Syam, B., & Aimon, H. (2025). *Analysis of the Determinants of Inclusive Economic Growth and Poverty Gap in Indonesia*. Atlantis Press International BV. https://doi.org/10.2991/978-94-6463-839-4

Williams, M. N., Grajales, C. A. G., & Kurkiewicz, D. (2013). Assumptions of multiple regression: Correcting two misconceptions. *Practical Assessment, Research and Evaluation*, *18*(9), 1–14.

Yin, Y. (2020). Model-free tests for series correlation in multivariate linear regression. *Journal of Statistical Planning and Inference*, *206*(xxxx), 179–195. https://doi.org/10.1016/j.jspi.2019.09.011

Yoertiara, R. F., & Feriyanto, N. (2022). Pengaruh pertumbuhan ekonomi, IPM, dan tingkat pengangguran terbuka terhadap ketimpangan pendapatan provinsi-provinsi di pulau Jawa. *Jurnal Kebijakan Ekonomi Dan Keuangan*, *1*(1), 92–100. https://doi.org/10.20885/jkek.vol1.iss1.art9

Zulfia, B., Dwiputri, I. N., & Isupova, E. (2024). *An examination of inclusive economic growth and its factors: a case study of East Java, Indonesia*. *10*(3), 350–368. https://doi.org/10.15826/recon.2024.10.3.022

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