

RESEARCH ARTICLE



Determinants of income inequality in Indonesia: The roles of economic growth, human development, poverty, wages, and investment

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ABSTRACT

This study examines the effects of economic growth, the Human Development Index (HDI), poverty rate, provincial minimum wage (PMW), and investment on income inequality across 34 provinces in Indonesia. Using a quantitative approach, the analysis employs panel data from 2015 to 2023, consisting of 306 observations. Panel regression with a Random Effect Model (REM), estimated through Panel EGLS (cross-section random effects), was applied to test the hypotheses. The findings reveal that the independent variables collectively have a significant effect on income inequality. Partially, the poverty rate and investment positively and significantly increase inequality, while the provincial minimum wage has a negative and significant effect, highlighting its role in reducing inequality. In contrast, economic growth and HDI show no significant impact on income inequality.

KEYWORDS

Income inequality, economic growth, human development, poverty, provincial minimum wage, investment

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1. Introduction

Income inequality remains a persistent challenge in many developing countries, including Indonesia. Despite various development initiatives, disparities continue to widen, as reflected in high poverty rates and significant income gaps across regions (Julihanza & Khoirudin, 2023). According to Todaro & Smith (2006), economic development should increase long-term real income while also reforming institutional systems. However, inequality persists, reflecting differences in welfare, lifestyles, and wages across regions. Variations in natural resources and

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geographical conditions also affect production capacity, giving resource-rich regions an advantage while resource-poor areas experience slower growth.

Income inequality is often measured by the Gini ratio, which ranges from 0 (perfect equality) to 1 (perfect inequality). As shown in [Figure 1](#), income inequality differs significantly across provinces. The highest inequality occurs in urbanized, service-oriented regions such as DI Yogyakarta, DKI Jakarta, and West Java, while provinces with lower Gini ratios generally exhibit more equitable income distribution but face limited economic growth (BPS, [2023](#)).

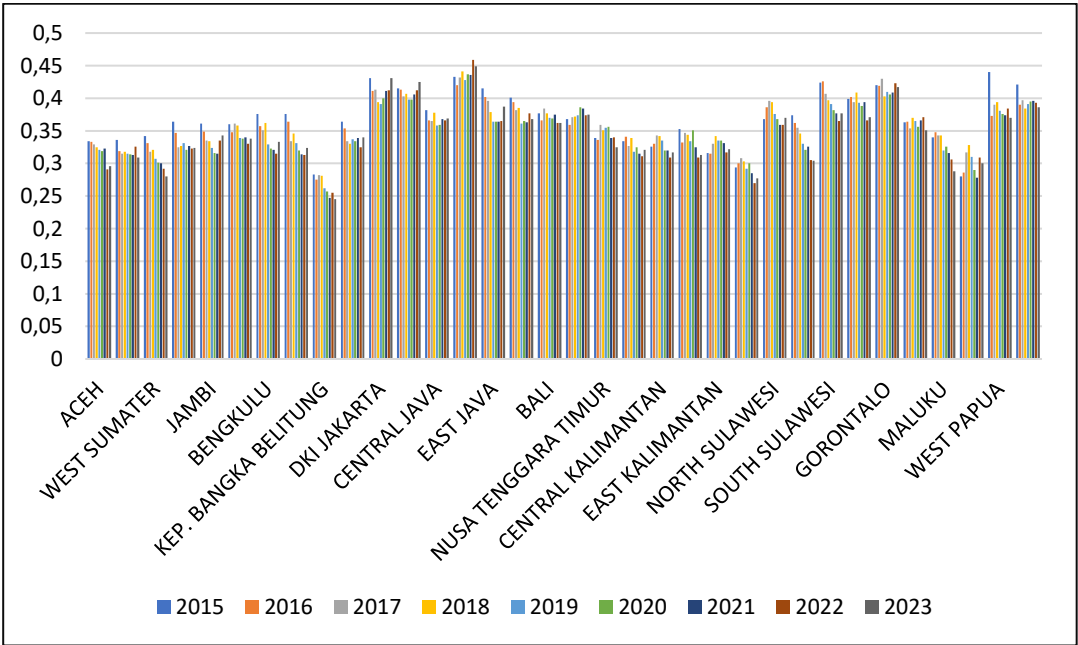


Figure 1. Gini ratio by provinces in 2015–2023. *Source:* BPS (2023)

Economic growth is one of the most widely used indicators of development. Yet, disparities remain evident among Indonesian provinces. As shown in [Figure 2](#), North Maluku recorded the highest growth, peaking at 22.94% in 2022, driven by manufacturing and mining. In contrast, Bali experienced a deep contraction of -9.34% in 2020 due to the COVID-19 pandemic but gradually recovered in subsequent years. Several provinces, including Central Sulawesi, also recorded strong growth above 10% in 2022–2023, while provinces in Java and Sumatra generally maintained stable growth between 4–6% (BPS, [2023](#)). These differences highlight structural disparities in regional economies and resilience to external shocks.

Economic development can be considered successful if a region is able to increase economic growth and improve living standards equitably, commonly measured by the HDI (Kusuma et al., 2019). The Human Development Index is one of the key indicators used to assess the success of a country or region in enhancing the quality of life of its people. HDI does not only measure economic aspects, but also encompasses health, education, and a decent standard of living, which together reflect overall societal well-being. The concept of HDI was introduced by the United Nations Development Programme (UNDP) in 1990.

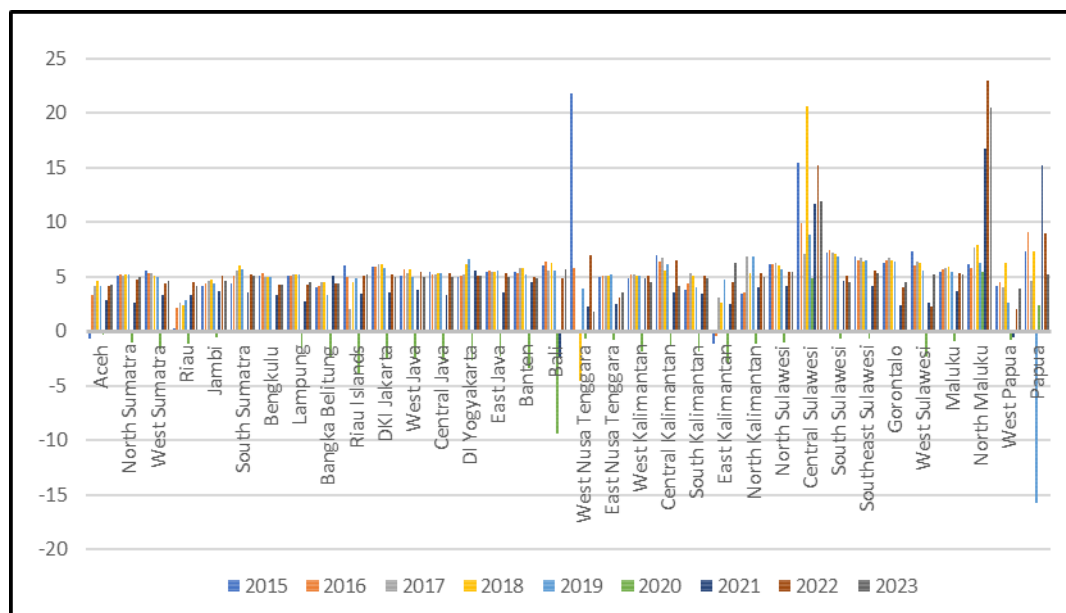


Figure 2. Economic growth among Provinces in Indonesia, 2015–2023. *Source:* BPS (2023).

The HDI provides a broader perspective, encompassing education, health, and living standards. Although Indonesia's HDI has generally improved, disparities persist. As illustrated in [Figure 3](#), DKI Jakarta consistently ranks in the "very high" category, while Papua remains at the bottom despite some progress. This persistent gap reflects unequal access to basic services and human capital development, which contributes to income inequality.

Poverty remains another key factor. During the COVID-19 pandemic, the poverty rate increased from 9.22% in 2019 to 10.19% in 2020 before gradually declining to 9.36% in 2023 (BPS, 2023). As shown in [Figure 4](#), provinces with the lowest poverty rates are generally concentrated in western and central Indonesia, such as DKI Jakarta, Bali, and Bangka Belitung, while the highest rates are found in eastern

regions such as Papua, West Papua, and East Nusa Tenggara. This highlights the importance of inclusive development and equitable access to education, healthcare, and infrastructure.

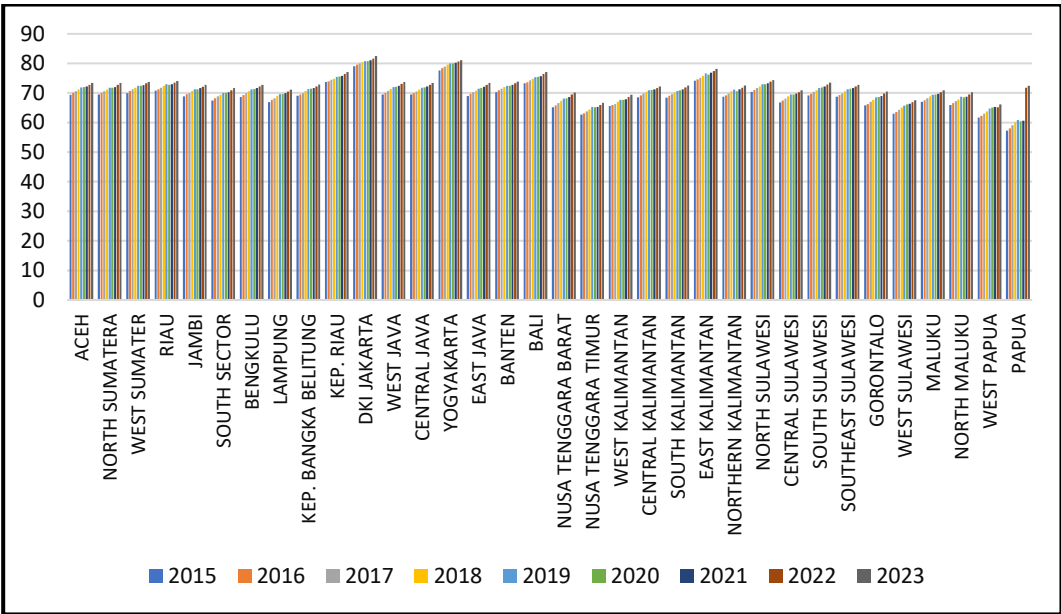


Figure 3. Human Development Index among provinces in Indonesia, 2015–2023. *Source:* BPS (2023)

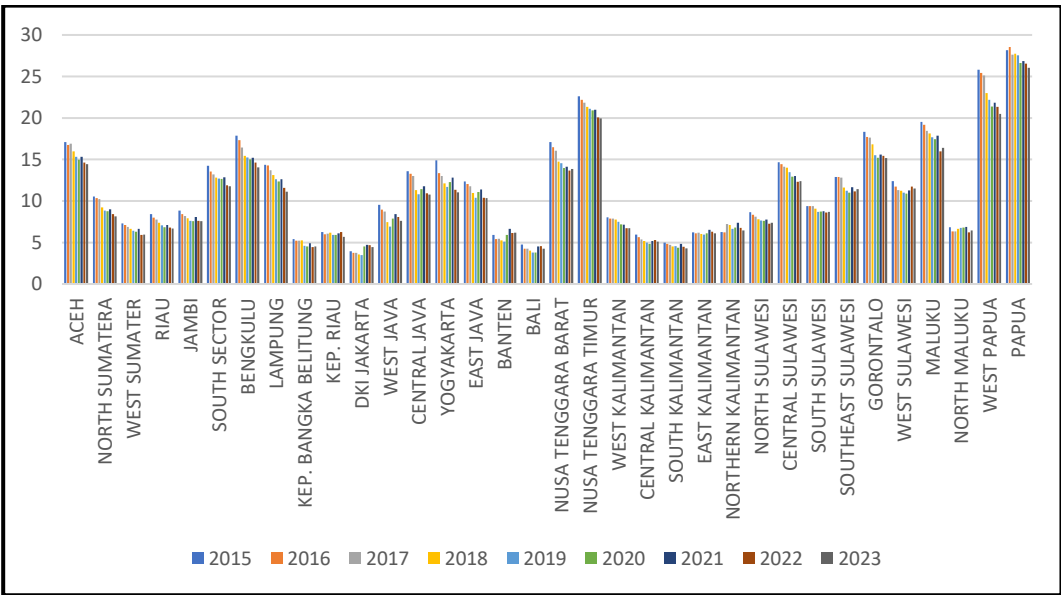


Figure 4. Percentage of Poor Population (P0) among provinces in Indonesia, 2015–2023. *Source:* BPS (2023)

The PMW is a key policy instrument to ensure fair compensation and reduce inequality. However, large disparities remain between provinces. As depicted in [Figure 5](#), provinces such as Yogyakarta, Central Java, and East Java have among the lowest PMWs, reflecting their labor-intensive economic structures and lower cost of living. Conversely, DKI Jakarta and Papua report the highest PMWs, driven by higher living costs and wage demands (BPS, 2023). Theoretical debates persist, with neoclassical economists viewing minimum wages as distortionary, while institutional economists emphasize their redistributive effects.

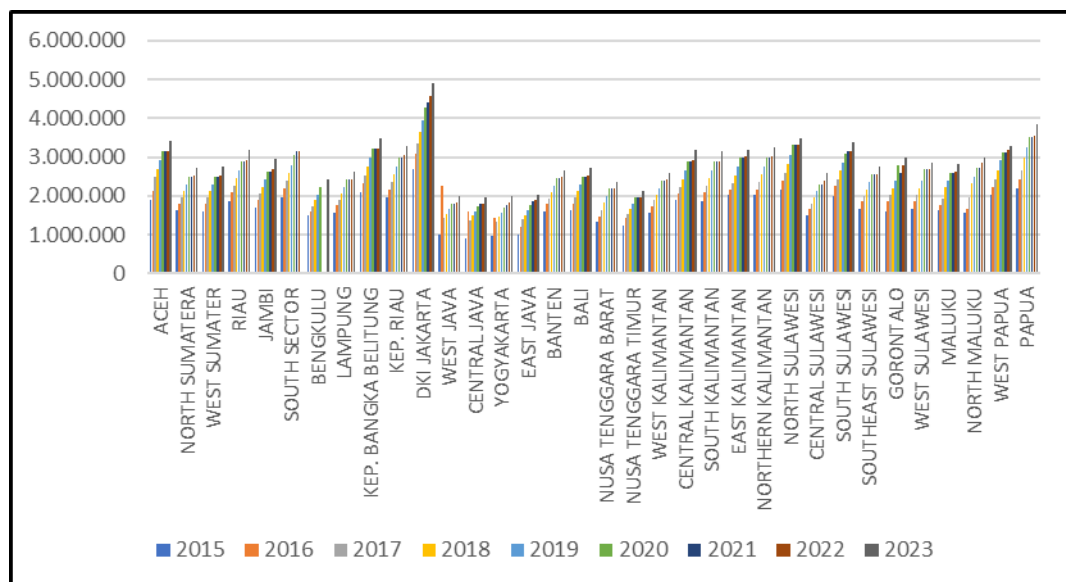


Figure 5. Minimum wage between provinces in Indonesia, 2015–2023. *Source:* BPS (2023)

This gap highlights the importance of adjusting the PMW not only to account for inflation and economic growth but also for the cost of living in each region. Local governments are expected to continuously monitor the implementation of the PMW to ensure that it truly provides protection and welfare for workers. Taking these factors into consideration, the government seeks to establish a fair UMP that reflects the conditions of each province, thereby safeguarding workers' rights while also supporting local economic growth (Anshari et al., 2019).

From the perspective of institutional economists, minimum wages also help reduce inequality. They argue that minimum wages redistribute income by lowering corporate profits while raising wages for low-income workers. As a result, the establishment of minimum wages leads to higher wage standards and fosters a more equitable distribution of wages and income (Saputra & Zulham, 2023).

Investment refers to the allocation of capital into specific businesses, sourced from both domestic and foreign investors. Increased investment from these sources enhances labor absorption because the production of goods and services expands, thereby generating more employment opportunities. In turn, workers earn wages and gain purchasing power. As more investment flows into the production process, labor absorption rises, contributing to greater per capita income equality power (Hakim, 2018). In line with this, Fleisher & Bensoussan (2007) highlight that the determinants of regional disparities include physical capital investment, human capital, and infrastructure capital.

According to Jhingan (2004), and consistent with Harrod-Domar’s growth theory, investment plays a central role in economic growth by generating income and expanding the productive capacity of the economy through capital accumulation. Conversely, a decline in investment reduces national income below its potential level. Conversely, increased regional investment stimulates higher economic growth. This is also reflected in the statistics published by the Central Statistics Agency regarding investment levels in Indonesia.

Figure 6, most investment flows to Java and resource-rich provinces such as Riau, supported by infrastructure and market access, while eastern provinces face barriers including limited infrastructure and institutional challenges (BPS, 2023). Balanced investment is therefore essential to promote inclusive growth.

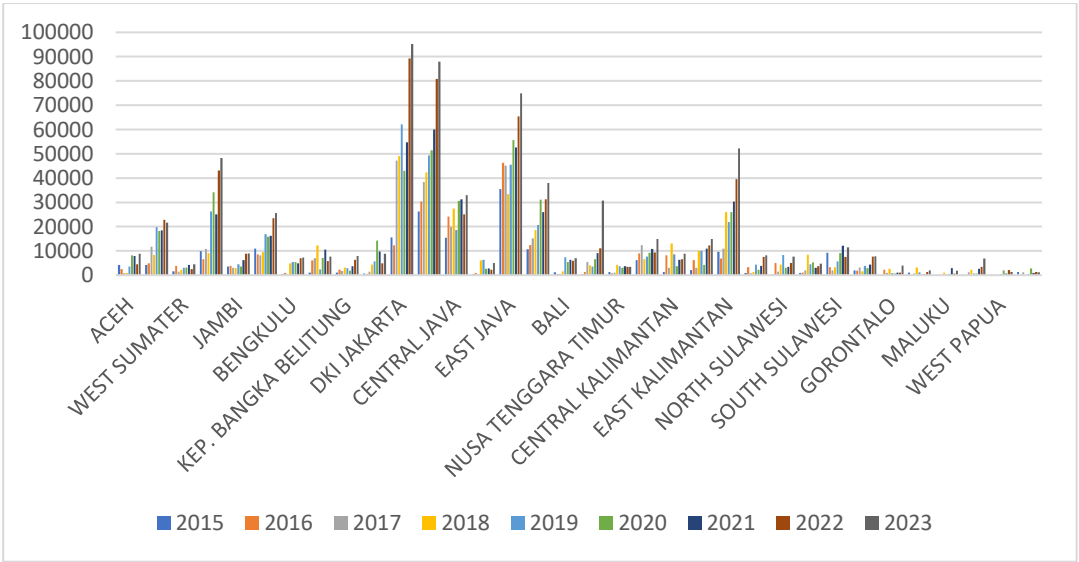


Figure 6. Investment between Provinces in Indonesia, 2015–2023. *Source:* BPS (2023).

From the discussion above, a research gap is evident regarding the simultaneous and partial effects of economic growth, HDI, poverty, minimum wage, and investment on income inequality across Indonesian provinces. Previous studies often had limited scope or variables. This study addresses the gap by analyzing panel data from 34 provinces during 2015–2023. Newly established provinces in Papua are excluded due to data limitations, ensuring balanced panel analysis.

Therefore, this research aims to comprehensively examine the simultaneous and individual impacts of economic growth, HDI, poverty, provincial minimum wage, and investment on income inequality in Indonesia. The findings are expected to provide insights for policy formulation toward more equitable and sustainable development.

2. Literature review

2.1. Relationship between economic growth and income inequality

Economic growth is theoretically expected to improve people's welfare equally, thereby reducing income inequality. However, empirical research shows a mixed relationship between economic growth and income inequality. According to Todaro & Smith (2015), the ideal economic development is one that is able to accelerate growth while reducing inequality and poverty. However, in practice, high economic growth is not always followed by income equality. Research using panel data from 34 provinces in Indonesia in the 2010–2016 period found that an increase in economic growth actually contributed to an increase in income inequality and the number of poor people in Indonesia. This shows that economic growth has not succeeded in reaching all levels of society equally.

Another study also found that economic growth has a positive and significant effect on income inequality in Indonesia (Rambey, 2018). This means that the higher the economic growth, the more income inequality tends to increase. This is in line with the findings of Lundberg & Squire (2003) who state that in the early stages of development, economic growth tends to increase income inequality. However, there are also studies that show a negative relationship between economic growth and inequality, Cingano (2014) proves that economic growth can reduce income inequality, especially in low-income countries (Amri, 2017). This phenomenon is consistent with the Kuznets hypothesis which states that the relationship between economic growth and inequality is an inverted U-shape curve, where in the early

stages of growth inequality increases, but after reaching a certain point, inequality begins to decline.

H1: Economic growth negatively affects the level of income inequality in Indonesia.

2.2. Relationship between HDI and income inequality

The HDI is an indicator that measures the quality of human development through three main dimensions, namely health, education, and decent living standards. The relationship between HDI and income inequality has been widely studied with mixed results, depending on the regional context and the analysis method used. Some studies show that HDI has a significant negative effect on income inequality, meaning that an increase in HDI can reduce income inequality between regions. For example, research in Java Island found that HDI has a negative and significant effect on regional inequality, which means that the higher the quality of human development, the smaller the income disparity between regions (Zusanti et al., 2020). This is supported by Hartini, (2017) which states that an increase in formal education reflected in HDI increases labor productivity thereby reducing income inequality.

However, there are also studies that find different results, in East Java Province, HDI actually has a positive effect on income distribution inequality, which indicates that even though HDI has increased, income inequality remains high because human development has not been evenly distributed throughout the region (Banowati, 2020). This shows that an uneven increase in HDI can increase the gap between regions.

H2: HDI negatively affects the level of income inequality in Indonesia.

2.3. Relationship between Poverty rate and income inequality

Poverty rates and income inequality have a close relationship and influence each other in the context of economic and social development. High poverty is often one of the main causes of rising income inequality in a region. Research conducted in Indonesia during the 2017-2021 period shows that poverty has a positive and significant effect on income inequality. This means that if the poverty rate increases by 1%, income inequality will also increase. This is due to the unequal distribution

of income, where the poor have expenditures below the poverty line, widening the gap between the rich and the poor (Huriah et al., 2025; Kunenengan et al., 2022)

In addition, quantitative research with panel data from 24 provinces in Indonesia also corroborates this finding, where income inequality has a significant positive effect on poverty. High inequality causes most of the income to be controlled by a small group of people, making it difficult for the poor to improve their living standards and worsening poverty conditions (Maskur et al., 2023). However, there are also studies that find that partially poverty does not have a significant effect on income inequality, because inequality is also influenced by other factors such as economic growth, labor productivity, investment, and development inequality between regions (Ersad et al., 2022). Nevertheless, the general positive relationship between poverty and inequality remains a consensus in various studies.

H3: Poverty rate has a positive influence on income inequality in Indonesia.

2.4. Relationship between provincial minimum wage and income inequality

The PMW is a government policy that sets the lower limit of wages that companies must pay to workers. This policy is designed to protect low-income workers from earning a decent income and is expected to reduce poverty and income inequality. However, the relationship between provincial minimum wages and income inequality is not always simple and can vary depending on the economic context, labor market structure, and other supporting policies.

Neoclassical economic theory argues that the implementation of minimum wages tends to widen income inequality rather than reduce it. Minimum wages serve as a lower limit set outside the market mechanism, which in turn increases the price of labor, this increase in the price of labor results in a decrease in the demand for labor, so that some workers potentially become unemployed. On the other hand, institutional economists argue that setting a minimum wage can reduce inequality, as the minimum wage serves to redistribute income by reducing corporate profits and increasing salaries for the lowest paid workers. Therefore, with a minimum wage, salary standards will increase and result in a fairer distribution of wages and income (Sungkar et al., 2015).

H4: PMW policy has a negative effect on the level of income inequality in Indonesia.

2.5. Relationship between investment and income inequality

Investment is one of the main drivers of economic growth that plays a role in increasing production capacity, creating jobs, and improving people's welfare. However, the effect of investment on income inequality is not always linear and may vary depending on the distribution of investment, the sector receiving the investment, and the economic and social conditions of a region.

Investments made by the government and the private sector can be one of the causes of income inequality, both through domestic investment (DDI) and foreign investment (FDI). This phenomenon occurs because most private investment is concentrated in certain regions, while there are other regions that experience very low levels of investment. Investors, both domestic and international, tend to choose areas that have attractive potential or advantages to be used as investment locations (Hidayat, 2014). Research in North Sulawesi Province reveals that investment has a positive and significant effect on interregional income inequality. Investment is concentrated in developing cities such as Manado, while other regions with slower economic development receive less investment, thus increasing inequality. Increased investment in developed regions increases income and demand, while underdeveloped regions experience the opposite, widening the income gap between regions (Nurfifah et al., 2022). Another study using Indonesian national time series data (2007-2022) shows that investment has a negative but insignificant effect on income inequality. However, in the short and long run, ARDL analysis shows that investment has a positive and significant effect on inequality, indicating different time horizon dynamics in the effect of investment on inequality (Huda, 2023).

The relationship between investment and income inequality is contextual and complex. Investment that is evenly distributed and absorbs labor can reduce income inequality by increasing the income of low-income groups. Conversely, investment that is concentrated in certain regions or sectors may increase inequality. Therefore, policies that encourage equitable distribution of investment and improve the quality of human resources need to be prioritized so that investment can be an effective instrument in reducing income inequality.

H5: Investment has a negative effect on the level of income inequality in Indonesia.

Based on the previous studies, still uncertainty regarding the connections between income inequality and economic growth, HDI, poverty, PMW, and investment, with results differing depending on the context and methodology. This study attempts to fill these gaps by thoroughly investigating and evaluating how they affect income inequality in Indonesia. [Figure 7](#) displays the conceptual framework that directs this investigation.

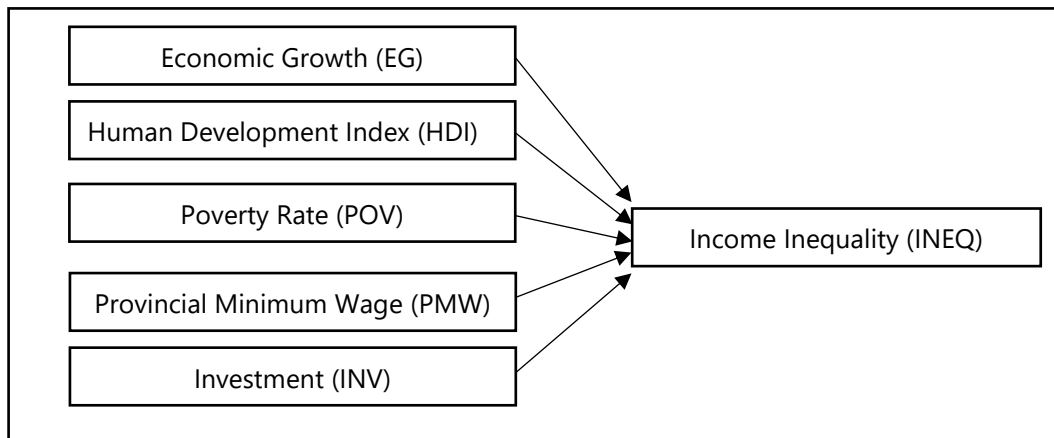


Figure 7. Research framework

3. Methods

3.1. Data

The type of data used in this study is secondary quantitative data in the form of panel data, which is a combination of time series data from 2015 - 2023 with cross-section data from 34 provinces in Indonesia. All data is obtained from official publications of trusted government institutions. Specifically, data for income inequality variables (Gini Ratio), economic growth (based on Gross Regional Domestic Product at Constant Prices or GRDP). HDI, poverty rate, and PMW are sourced from the Statistics Indonesia (BPS). Meanwhile, data on investment variables that include the realization of Domestic investment (DDI) are obtained from official reports published by the Ministry of Investment/Investment Coordinating Board (BKPM).

3.2. Data Analysis

This study uses multiple linear regression analysis models in the form of panel data (pooled data) which is a combination of time series data with cross section data.

Time series data includes one object, while cross section data consists of several objects.

The model in this study is formulated in Equation (1) as follows:

$$Y_{it} = \alpha_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \varepsilon_{it} \quad (1)$$

Furthermore, the model is specified econometrically into a multiple linear regression form, as presented in Equation (2):

$$INEQ_{it} = \alpha_0 + \beta_1 EC_{1it} + \beta_2 HDI_{(2it)} + \beta_3 KMS_{it} + \beta_4 PMW_{(4it)} + \beta_5 INV_{it} + \varepsilon_{it} \quad (2)$$

Equation (2) outlines the empirical model employed to examine the determinants of income inequality (*INEQ*), measured by the gini ratio. The explanatory variables include Economic Growth (*EC*), Human Development Index (*HDI*), Poverty Rate (*PR*), Provincial Minimum Wage (*PMW*), and Investment (*INV*). In this specification, α_0 denotes the intercept, β_1 – β_5 represent the estimated parameters, i identifies the province, and t indicates the time period. The disturbance term (ε_{it}) captures unobserved influences on income inequality and is assumed to be homoskedastic, normally distributed, and independent.

There are three basic approaches commonly used in panel data analysis, namely:

1. Common Effect (CEM) or Pooled Least Square Model.

The CEM is the most basic regression approach for estimating panel data by combining time-series and cross-sectional data. This technique does not account for variations across time or individuals, making it similar to the Ordinary Least Squares (OLS) method since both rely on the least squares approach. It assumes that the behavior of data across cross-sections is consistent over time. In practice, this model is rarely used as the main estimation method because it ignores differences in data behavior, which can lead to biased results. However, it is often applied as a baseline model for comparison with more advanced approaches (Usman, 2006).

This model, also called Common Effect, treats panel data as if it were a simple combination of time-series and cross-sectional observations without distinguishing differences between them. Like OLS, it assumes uniform behavior across data and time. Due to this limitation, the model is seldom applied as the

primary estimation technique. Instead, it is more commonly used as a benchmark for evaluating the performance of other models.

The CEM assumes uniformity of data behavior across both space and time. Because of its inability to account for variations, this approach may result in biased outcomes. Nonetheless, it is still useful as a reference point when comparing results with more sophisticated models, such as Fixed Effect and Random Effect (Usman, 2006).

2. Fixed Effect Model (FEM) or Fixed Effect Approach Model

This model applies dummy variables, known as the Fixed Effect Model or Least Square Dummy Variable (LSDV), which is also referred to as the Covariance Model. In the Fixed Effect method, estimation can be performed either without weights (ratio weighted) or with weights (cross-section weighted) through Generalized Least Squares (GLS). The purpose of using weights is to reduce heterogeneity among cross-sectional units.

The FEM is effective for capturing changes in the behavior of each variable, making the data more dynamic in interpretation. Model selection between the Common Effect and Fixed Effect approaches can be conducted using the Likelihood Ratio Test. If the resulting probability value is significant at the specified alpha level, the Fixed Effect Model should be chosen.

3. Random Effect Model (REM) or Random Effect Approach Model

The third panel data model is the Random Effect Model. In this approach, parameters that differ across regions and time are incorporated into the error component, which is why it is often referred to as the Error Component Model. By applying the Random Effect Model, the degrees of freedom can be preserved—unlike in the Fixed Effect Model where they are reduced—thus making parameter estimation more efficient (Usman, 2006).

The Random Effect Model assumes that differences between units are random and uncorrelated with the independent variables in the model. In this case, individual or group variables are treated as random components rather than fixed ones. The decision to use a Fixed Effect or Random Effect approach is typically based on the Hausman Test: if the resulting probability is significant at a given alpha level, the Fixed Effect Model is preferred; if not, the Random Effect Model is considered more appropriate.

4. Results

4.1. Descriptive statistics

This study uses secondary data in the form of panel data starting from 2015 to 2023 in 34 provinces in Indonesia, the dependent variable in this study uses the Gini Ratio while the independent variables are EG, HDI, POV, PMW, and INV. Research data obtained from the official BPS website and processed using an analytical tool in the form of Eviews.

Table 1. Descriptive statistics

Description	EG	HDI	POV	PMW	INV	INEQ
Mean	4,540850	70,72395	10,82928	2382165	11303,95	0,352948
Median	5,050000	70,75000	9,035000	2364931	4969,500	0,352000
Maximum	22,94000	82,46000	28,54000	4901798	95202,10	0,459000
Minimum	-15,74000	57,25000	3,470000	910000,0	8,800000	0,245000
Std, Dev	3,722448	4,072426	5,650557	627763,0	16326,42	0,040814
Sum	1389,500	21641,53	3313,760	7,29E+08	3459010	108,0020
SumSq,Dev	4226,270	5058,320	9738,283	1,20E+14	8,13E+10	0,508057
Observations	306	306	306	306	306	306

Source: Authors calculation

Based on [Table 1](#), we can see an overview of the data to be studied, this data comes from 34 provinces during 2015–2023, so there is a total of 306 data, The main variable studied is *INEQ*. The mean value is 0.352948, which means that in general the level of inequality in Indonesia is not very high. However, there are regions with very low inequality (0.245000) and some are quite high (0.459000), indicating that the conditions in each region are different.

For the other variables, the data is very diverse, *EG* averaged 4.54%, but this figure is very unstable. It is evident that there are regions whose economy has grown very high (22.94%), but there are also those that have been minus or dropped to -15.74%, possibly during the pandemic. Meanwhile, the *HDI* data is more stable, meaning that the level of development progress in various regions is not too unequal, on the contrary. The *POV* shows a very clear difference, where there are provinces with a very low poverty rate (3.47%) and a very high one (28.54%).

The difference in economic conditions is also clearly visible in the data on *PMW* and *INV*. The average *PMW* is around Rp 2.38 million, but in fact there are regions where the wage is only Rp 910 thousand and some reach Rp 4.9 million. The most

extreme difference is seen in the *INV* data, where the distribution is very uneven. This can be seen from the standard deviation value (16326.42) which is greater than the average (11303.95), which confirms that investment is more concentrated in certain areas.

In short, all of these data show that there are significant differences across provinces and time, and this diversity is precisely what is good and necessary to continue the analysis to the next stage, which is to find out how much economic growth, HDI, poverty, minimum wage, and investment affect the rise and fall of income inequality in Indonesia.

4.2. Panel model selection tests

Model selection was done using the Chow, Hausman, and Lagrange Multiplier (LM) tests to determine the best specification before estimating the panel data regression. Table 2 presents the findings from these diagnostic examinations.

Table 2. Results of panel data model selectio test

Test	Statistic	p-value	Model Selection
Chow test	62.4636	0.0000	Fixed effects
Hausman test	10.1819	0.0702	Random effects
LM test (Breusch–Pagan)	806.1148	0.0000	Random effects

Source: Authors calculation

Based on the results in Table 2, the Chow test (Redundant Fixed Effect Test) produced a chi-square probability value of 0.0000. Since this value is less than the significance level of 0.05 ($0.0000 < 0.05$), the Fixed Effect Model is preferred over the Pooled OLS model. To further determine whether the Fixed or Random model is more appropriate, the Hausman test was conducted.

The Hausman test in Table 2 shows a chi-square probability value of 0.0702, which is greater than 0.05 ($0.0702 > 0.05$). This indicates that the Random Effect Model is more suitable. Given this result, the Lagrange Multiplier (LM) test was then applied to compare the Random Effect and Pooled OLS models.

The LM test (Breusch–Pagan) reported a probability value of 0.0000, which is below the 0.05 threshold ($0.0000 < 0.05$). This confirms that the Random Effect Model is preferred over the Common Effect model. Therefore, the appropriate estimation method for the panel data regression equation in this study is the Random Effect Model (REM).

According to Gujarati (2012), when the regression model employs random effects, classical assumption tests are not required. In contrast, if the model uses common effects or fixed effects, classical assumption testing must be conducted. Consequently, it is unnecessary to perform classical assumption tests for the data in this study.

4.3. Results of the panel data regression analysis

This stage represents the core of the quantitative research, aiming to test the research hypotheses and provide empirical evidence on the effects of the independent variables on the dependent variable, Income Inequality *INEQ*, as measured by the Gini Ratio in Indonesia during the observation period. The analysis employed a panel data regression method, which combines time-series and cross-sectional data. This approach is considered superior because it manages inter-provincial heterogeneity and produces more efficient and informative estimation results.

Based on the series of model specification tests described in Subsection 3.2, including the Chow Test, Hausman Test, and Lagrange Multiplier Test, the REM was found to be the most appropriate and efficient estimation method for this study. The REM assumes that inter-provincial variations are random and uncorrelated with the independent variables, thus capturing province-specific effects that may be unobserved but still influence income inequality.

From Table 3, the linear regression equation using REM can be expressed as follows:

Table 3. Results of random-effects panel data regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0,304252	0,056124	5,421084	0,0000
EG	-1,08E-05	0,000225	-0,048194	0,9616
HDI	0,000921	0,000790	1,166278	0,2444
POV	0,002804	0,000845	3,318882	0,0010
PMW	-2,11E-08	3,03E-09	-6,974734	0,0000
INV	3,11E-07	1,02E-07	3,042559	0,0026
R-square	0,30			
F-statistics	27,22369			0,0000

Notes: Dependent variable is *INEQ*

Source: Authors calculation

$$\text{INEQ} = 0.3043 - 0.0000108 (EC) + 0.00000921 (HDI) + 0.0028 (POV) - 0.0000000211 (PMW) + 0.000000311 (INV)$$

The interpretation of the coefficients is as follows. The constant value of 0.3043 indicates the baseline level of income inequality when all independent variables are set to zero. The coefficient of EC (-0.0000108) suggests a negative relationship, meaning that a one-unit increase in economic growth is expected to reduce income inequality by 0.000011, holding other variables constant. The HDI coefficient (0.00000921) is positive, implying that an increase in HDI tends to raise income inequality. POV has a positive coefficient (0.0028), indicating that higher poverty rates exacerbate inequality. PMW shows a negative coefficient (-0.0000000211), confirming that increases in provincial minimum wage reduce inequality. Finally, INV has a positive coefficient (0.000000311), indicating that greater investment tends to widen inequality.

The F-test results in [Table 3](#) show a statistical F-value of 27.22369, with a Prob(F-statistic) of 0.000000, which is less than the 0.05 significance level. This confirms that all independent variables collectively have a significant effect on INEQ in Indonesia during 2015–2023, meaning the model is overall significant and reliable in explaining variations in income inequality.

The t-test results provide insights into the partial effects of each variable. EC has a coefficient of -1.08E-05 with a probability value of 0.9616 (>0.05), indicating no significant effect on INEQ. Similarly, HDI shows a coefficient of 9.21E-06 with a probability of 0.2444 (>0.05), also not significant. POV has a coefficient of 0.002804 and a probability of 0.0010 (<0.05), meaning it significantly increases inequality. PMW displays a negative coefficient of -2.11E-08 and a probability of 0.0000 (<0.05), confirming its significant role in reducing inequality. INV has a coefficient of 3.11E-07 and a probability of 0.0026 (<0.05), indicating that investment significantly increases inequality, likely because it remains geographically concentrated, capital-intensive, and benefits mainly capital owners rather than unskilled labor.

The Adjusted R-Squared value in [Table 3](#) is 0.30, or 30%. This indicates that the independent variables together explain 30% of the variation in income inequality, while the remaining 70% is influenced by other factors outside the model. Although 30% may appear moderate, such a value is common in social and economic research, where unobserved heterogeneity is substantial. Gujarati & Porter (2009) emphasize in *Basic Econometrics* that applied research should focus on reliable parameter

estimates rather than solely on R-squared values. Similarly, Wooldridge (2019), in *Introductory Econometrics: A Modern Approach*, highlights that low R-squared values are typical in the social sciences due to complex human behavior.

Empirically, the 30% explanatory power of this model compares favorably with previous studies. Sanjaya & Saskara (2022), in their study, reported an R-squared of 26.2%. Likewise, Matondang (2018), obtained an even lower R-squared of 19.5%. Hence, this study's R-squared value is both solid and justified.

In conclusion, supported by theoretical arguments (Gujarati & Porter, 2009; Wooldridge, 2019) and empirical comparisons (Sanjaya & Saskara, 2022; Zulaika, 2018), the Adjusted R-Squared value of 30% demonstrates robust explanatory power. The variables examined are therefore relevant predictors of income inequality dynamics in Indonesia. Consequently, further analysis can reasonably focus on interpreting the significant coefficients to derive evidence-based policy implications.

5. Discussion

5.1. The effect of economic growth on income inequality

Based on the results of the regression analysis, the coefficient value for the Economic Growth variable (EG) is $-1.08E-05$ with a probability value of 0.9616. Since this probability value is significantly greater than the alpha level of 0.05, it can be concluded that economic growth has no significant effect on income inequality in Indonesia during the study period. Based on this finding, Hypothesis 1 (H_1), which states that economic growth has a negative effect on income inequality, is rejected.

The rejection of this hypothesis suggests a decoupling between macro-level economic growth and micro-level income distribution. As noted by Istiqamah et al. (2018), Indonesia's growth is concentrated in capital-intensive sectors with limited labor absorption, causing benefits to accrue mainly to capital owners and skilled workers, while low-income groups gain little. Furthermore, economic growth in Indonesia is highly geographically concentrated in Java and a few other large cities (World Bank, 2016). This spatial concentration creates and exacerbates inter-regional inequality, which is a significant component of national inequality, so aggregate growth figures fail to reflect equitable improvements in welfare.

This finding, although contrary to conventional theory, is strongly supported by various empirical studies at different geographical levels. Anggina & Wahyu (2017)

found that economic growth had no effect on income distribution inequality in the Regency/City of Yogyakarta Special Region during 2007–2014. Similarly, Andiny & Mandasari (2017) also concluded that economic growth had no effect on income inequality in Aceh Province.

5.2. The effect of HDI on income inequality

The regression results for the HDI variable show a coefficient value of 0.000921 with a probability of 0.2444. This probability value, which is far above 0.05, means that HDI has no statistically significant effect on income inequality. Therefore, Hypothesis 2 (H_2), which states that HDI has a negative effect on inequality, is rejected.

The rejection of this hypothesis reveals a paradox, where improvements in basic human capabilities (education and health) do not automatically translate into fairer income distribution, the reason behind this finding. Rochim et al. (2019) argues that the benefits of human development (such as education and health) are uneven, Perhaps HDI increases rapidly in big cities, but in peripheral or rural areas the increase is slow, because it is uneven, the overall impact is not strong enough to reduce income inequality at the provincial level, mainly lies in three fundamental issues: quality disparity, skill mismatch, and inequality of opportunity. The education system often fails to produce graduates with skills that are relevant to the needs of a dynamic, technology-driven modern job market. This skill mismatch phenomenon causes many educated workers to end up in underemployment, which limits their earning potential and blunts the equity effect of education. This finding is supported by previous research (e.g. Anggraini (2016) and Rochim et al., (2019).

5.3. The effect of poverty rate on income inequality

The regression results for the Poverty rate variable (POV) show a positive coefficient value of 0.002804 with a probability value of 0.0010. Since this probability value is much smaller than the significance level of 0.05, it can be concluded that the poverty rate has a positive and significant effect on income inequality in Indonesia. Thus, Hypothesis 3 (H_3), which states that poverty rate has a positive effect on income inequality, is accepted.

Theoretically, this result is very intuitive and fundamental. A high poverty rate, by definition, means that there is a large portion of the population whose income is far below the average income of society as a whole. The existence of this large

economically marginalized group will mechanically widen the range of income distribution, i.e. the gap between the richest and the poorest, The larger the proportion of the poor, the larger the portion of national income that is concentrated in the non-poor, thus mathematically increasing inequality indices such as the Gini Ratio. This relationship forms a vicious circle: poverty causes inequality, and high inequality complicates poverty alleviation efforts as economic opportunities become unequal.

At the national level, a study by Yusuf & Sumner, (2015), highlights that in Indonesia, the poor and vulnerable groups often lag behind the pace of economic growth, which directly causes the positive relationship between poverty and inequality. Yusuf & Sumner, (2015) argue that Poverty and inequality create a mutually reinforcing cycle. A high poverty rate by definition means that a large proportion of the population has a very small share of income. This mathematically creates a wide gap with high-income groups, which means high inequality. Conversely, high inequality makes it difficult to alleviate poverty as resources are concentrated in a few people, research by Hindun et al., (2019) found that the poverty variable has a significant positive effect, indicating that an increase in the poverty rate worsens income inequality, Kunenengan et al., (2022) found a similar finding that the poverty variable has a significant positive effect on income inequality.

5.4. The effect of minimum wage on Income Inequality

The PMW variable shows a negative coefficient value of $-2.11E-08$, with a highly significant probability value of 0.0000. These results indicate that PMW has a negative and significant effect on income inequality in Indonesia. Thus, Hypothesis 4 (H_4), which states that PMW has a negative effect on income inequality, is accepted.

The acceptance of this hypothesis provides strong support for the *wage compression theory*. The minimum wage policy functions as a social safety net by setting a "floor" or lower limit of wages that can be received by a worker in the formal sector, by increasing the income of workers at the lowest level, this policy effectively reduces the gap between the wages of the lowest workers and the wages of workers at the middle and upper levels, This process of "compression" of the wage distribution ultimately contributes directly to the reduction of overall income

inequality, making it one of the most direct policy instruments for equity interventions.

This result is in line with various empirical studies that have been conducted, a fundamental study in Sumatra by Riandi & Varlitya, (2020), found that the PMW variable has a negative and significant effect on income inequality. Nangarumba, (2015) founds that the PMW variable has a negative and significant effect on income inequality.

5.5. The effect of investment on income inequality

The estimation result for the Investment variable (INV) shows a positive coefficient of 3.11E-07 and a probability value of 0.0026. This means that investment significantly increases income inequality. Since the direction of the effect is positive rather than negative, Hypothesis 5 (H_5), which states that investment has a negative effect, is rejected.

The estimation result for the INV shows a positive coefficient of 3.11E-07 and a probability value of 0.0026. This means that investment significantly increases income inequality. Since the direction of the effect is positive rather than negative, Hypothesis 5 (H_5) stating that investment has a negative effect is rejected. This is in line with the research conducted by Silalahi et al., (2024) and Zahara et al. (2025), arguing that incoming investment tends to lead to capital-intensive sectors (such as high-tech manufacturing or financial services) whose main profits return to the owners of capital, not spread evenly to the workforce. This view is consistent with the findings of Aulia & Isnawati, (2019), argue that investment in Indonesia is still concentrated in the western region, especially Java. Meanwhile, the eastern part of Indonesia receives less attention from investors. The imbalance in investment between regions causes per capita income in the western region to grow faster than in the eastern region, leading to regional income inequality which in turn increases national income inequality.

Although investment is intuitively expected to reduce inequality through job creation, this result can be explained through several theoretical arguments and factual conditions in Indonesia:

1. Spatial Concentration of Investment (Interregional Disparity) This phenomenon is the strongest explanation, Investment, including DDI, is not evenly distributed across provinces. Domestic investors tend to invest in areas that already have

adequate infrastructure, large markets, and ready-made human resources, namely Java Island and several other major cities. . As a result, these regions experience more rapid economic growth, while other regions (particularly in Eastern Indonesia) are left behind, This concentrated increase in economic activity directly widens inter-regional income inequality.

2. *Capital-Intensive Nature of Investment* Many large-scale DDI projects, especially in the manufacturing, processing industry, or mining sectors, are more capital-intensive than labor-intensive. This means that the investment is used more to purchase advanced machinery, technology, and equipment than to absorb large numbers of workers. The profits from these capital-intensive investments flow more to the owners of capital (investors), not to the workers. This widens the gap between income derived from capital (profit) and income derived from wage labor.

This finding is in line with and supports several previous studies that have also found a positive relationship between investment and income inequality in Indonesia. Nurfifah et al. (2022) found that the investment has a positive and significant effect on income inequality.

The main explanation for this counter-intuitive result lies in the highly biased characteristics of investment in Indonesia, both technologically and spatially. First, incoming investment, especially FDI, tends to be technology-intensive and capital-intensive (skill-biased technical change). This technology increases productivity and demand for high-skilled labor, so their wages skyrocket, but displaces low-skilled labor. Second, investment has a strong spatial bias, where capital tends to flow heavily to developed regions (agglomeration), especially in Java, while other regions are left behind.

6. Conclusion

Based on the panel data analysis using the Random Effect Model (REM) for the period 2015–2023, several key conclusions can be drawn. First, Economic Growth (EG) does not have a statistically significant impact on income inequality in Indonesia. This suggests that higher aggregate output has not translated into reduced income disparities, largely due to non-inclusive growth, a bias toward capital-intensive sectors, and geographical concentration of economic activities. Second, the HDI also shows no significant effect, indicating that improvements in education and health have yet to sufficiently enhance income distribution. This is

attributable to disparities in service quality, skill mismatches with labor market demands, and the long time lag between human capital investment and its outcomes. Furthermore, poverty is found to reinforce inequality, as higher poverty rates intensify income gaps between the poorest groups and the rest of society.

In contrast, the PMW demonstrates a negative and highly significant effect on income inequality, confirming its role as an effective policy instrument to reduce disparities by raising the wage floor and compressing income distribution. Surprisingly, INV exhibits a positive and significant impact on inequality, reflecting its concentration in developed regions, its capital-intensive nature favoring capital owners, and persistent skill mismatches that widen wage differentials.

From these findings, several policy implications emerge. The government should not focus solely on GDP growth and investment volumes but prioritize inclusive growth and more equitable investment allocation. Incentives should be directed toward labor-intensive sectors and investments in less-developed regions. At the same time, reforms in human development must ensure equitable access and quality in education and health to address disparities and skill mismatches. Strengthening proven instruments such as the PMW and prioritizing poverty alleviation programs are also crucial, given their direct role in mitigating inequality.

Conflict of interest

The authors declare that there are no conflicts of interest regarding this publication.

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