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The role of gender empowerment on income inequality in Indonesia: Evidence from panel data

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ABSTRACT

Income inequality in Indonesia, remains as a serious global issue. This study is driven by the existing inter-regional disparities and the limited integration of gender indicators in inequality analysis, particularly across all provinces in Indonesia. The issue of income distribution inequality is certainly influenced by various factors. This study was conducted with the aim of understanding the effect of the Gender Empowerment Index (GEI), Human Development Index (HDI), poverty, and Domestic Investment (DI) on income inequality in Indonesia. The data in this study is secondary panel data sourced from the Central Bureau of Statistics, covering 34 provinces over the 2015-2023 period. The research method is the fixed effects model. The findings indicate that GEI does not have a statistically significant impact. On the contrary, HDI has a significant negative effect, while poverty and domestic investment have a significant positive effect on income distribution inequality. These findings highlight the need for inclusive human development policies, equitable investment distribution, and targeted poverty reduction strategies. This study also contributes by providing evidence-based recommendations to reduce interprovincial disparities in Indonesia and strengthen discussions on more equitable and fair policies.

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1. Introduction

One of the most persistent and fundamental economic issues faced globally, especially in developing countries like Indonesia, is income distribution inequality (Febriyani & Anis, 2021). The uneven distribution of income is a major challenge in today's world, especially considering the high trends in some countries (Mdingi & Ho, 2021). Despite several countries exhibiting comparatively reduced income inequality, it is imperative to address this issue for equitable and sustainable economic development (Espa et al., 2025). Inequality is included in the Golden Indonesia vision, which consists of five goals of the Golden Indonesia 2045 vision, specifically the second goal, which is to reduce poverty to 0% and reduce inequality. Additionally, issues related to inequality are also present in one of the seven operational priorities of the 2030 Asian Development Index strategy, namely addressing existing poverty and reducing inequality, as well as the Sustainable Development Goals (SDGs), particularly in the 10th pillar, which aims to reduce intra- and inter-country disparities. Therefore, as a country with a large population and economy in Southeast Asia in particular, inequality can hinder economic mobility and threaten long-term growth potential (World Bank, 2020).

Based on data published by the World Bank, it is explained that Indonesia is one of the countries trapped in the middle-income trap, with a per capita gross domestic product (GDP) of $4,940.5 in 2023. The high-income distribution inequality is one of the reasons why Indonesia is still classified as a country trapped in the middle-income trap. Figure 1 shows the Indonesia's per capita GDP growth between 2015 and 2023 has trend. From 2015 to 2018, there was always an increase, but in 2019, there was a decrease of 2.0% from 2018, and the worst was in 2020, when Indonesia's per capita GDP growth reached -2.9%, a decline from 2019, which was 6.9%. This was primarily because of the Covid-19 pandemic's worldwide effects, which also severely affected Indonesia. Then, in 2021, it had already increased until 2022. However, from 2022 to 2023, it experienced another decline from 4.6% to 4.3%.

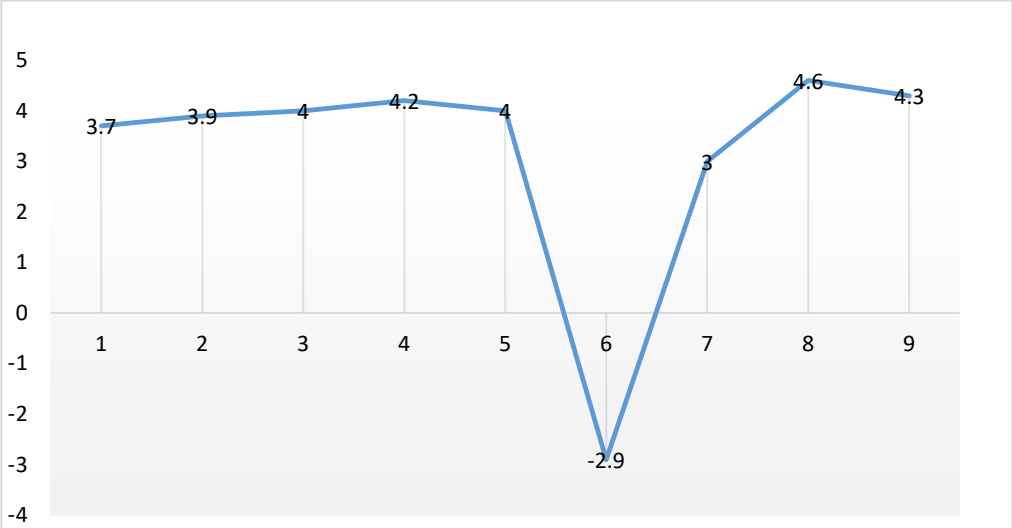

Figure 1. Growth of GDP Per-capita in Indonesia (Percentage)

Indonesia's economic growth also affects the Gini ratio, which is a measure of income distribution inequality. This index indicates the extent of inequality in income distribution. Similar to GDP trends, Indonesia's Gini ratio from 2015 to 2023 fluctuated. The fluctuating of Gini ratio indicates income inequality that is at all unstable, where there are short-term factors such as subsidies, etc., that put pressure on the middle and lower classes, making them vulnerable (Ilyasa et al., 2025). Figure 2 shows Indonesia's Gini ratio between March 2015 and March 2023 has overall remained above the target set in the Golden Indonesia vision. The highest Gini ratio was in March 2015, with a value of 0.408. Then the value consistently decreased each semester until September 2019, when it reached 0.380. However, from March 2020 to March 2021, there was a slight increase again, and then until March 2023, the Gini ratio fluctuated. These fluctuations occurred during the period of the Covid-19 pandemic and subsequent economic recovery efforts. As noted by Shin (2024) stated the pandemic exacerbated income inequality by intensifying direct economic shocks while overlooking broader systemic impacts.

This phenomenon of income inequality is not something that stands alone, but rather is influenced by multiple interrelated factors. One of them is women's empowerment, as this can drive economic development and reduce income inequality through women's contributions as income supporters of households alongside other family members (Wang & Naveed, 2021). In Indonesia, women who are usually passive recipients of economic growth are expected to have their roles enhanced so that they can make a tangible contribution to economic growth (Robiansyah et al., 2024). The United Nations Development Programme uses the Gender Empowerment Index (GEI) to gauge how strong women are in a nation (Li, 2023). Several previous studies, such as Hortas-Rico & Rios (2022) and Wang & Naveed (2021) found that the empowerment of women can lower income inequality. Studies on the impact of women's empowerment on inequality in Indonesia are still limited and show varied results. Aqilah et al (2024) found that GEI did not have a significant impact in Sumatra. This indicates the need for research that covers all provinces in Indonesia. This indicates that the impact of women's empowerment on inequality needs to be studied more deeply, especially in Indonesia. Szczepanian et al (2022) highlights the role of political institutions and reveals the improvements in institutional factors, namely economic freedom, corruption control, government effectiveness, regulation quality, and voice and accountability, significantly reduced income inequalities during the *Era Reformasi* in Indonesia.

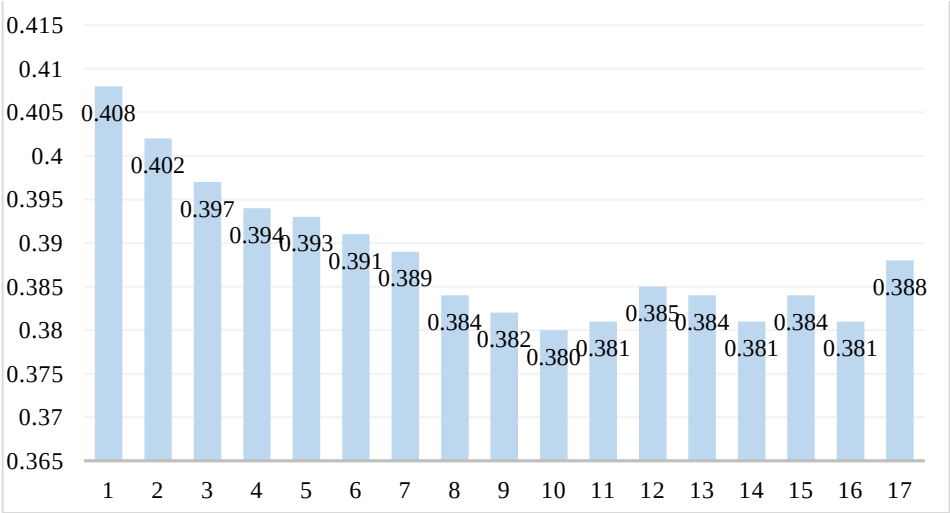

Figure 2. The Gini Ratio of Indonesia

Human resource standards are very important in relation to income in Indonesia, which is measured by the Human Development Index (HDI). The human capital theory proposed by Todaro and Smith (2006) emphasizes the importance of education, health, and other human capacities. This human capital regulates the labor market supply; thus, an increased proportion of trained workers correlates with a heightened supply of skilled labor (Le et al., 2020). With the improvement in the quality of human development, it will tend to reduce inequality. Study from Ghifara et al. (2022) found that an increase in HDI significantly affects the reduction of income inequality. Another important factor that influences income inequality is poverty. Poor communities tend to become poorer, while the rich become richer, thereby increasing inequality (Karimi et al., 2023). Therefore, income redistribution is necessary to reduce existing poverty so that inequality is also low (Hindun et al., 2019). The findings from previous research indicate that there is a positive and significant relationship between poverty and income inequality.

In addition, investment also contributes to income inequality. Investment is divided into domestic and foreign investment. This study uses domestic investment because its workers tend to be predominantly local compared to foreign investment. However, this investment faces problems when it is concentrated in certain regions (Juniati et al., 2022). The uneven concentration of investment becomes one of the causes of inequality, resulting in a positive relationship, as found in the study by Tamrin et al (2023). However, investment also has a significant role in economic development because an increase in investment will absorb a lot of labor, leading to income distribution (Febriyani & Anis, 2021). However, there are limitations in previous research, namely the lack of comprehensive studies examining the influence of GEI, HDI, poverty, and domestic investment on income distribution inequality using panel data from 34 provinces in Indonesia during the period 2015-2023. Furthermore, the use of gender aspects through the Gender Empowerment Index in relation to income inequality is still very rarely conducted in the context of Indonesia. However, women's empowerment plays an important role in addressing income inequality through increased access and economic opportunities (Gonzales et al., 2015). Given these conditions and the lack of comprehensive studies that combine these four variables across all provinces in Indonesia, it is important to conduct further analysis. Therefore, this study aims to fill this gap by empirically analyzing the impact of the gender empowerment index, human development index, poverty, and domestic investment on income distribution inequality in Indonesia.

2. Literature Review

Income distribution inequality has long been a concern in economic development worldwide. Regardless of the source of income, the distribution of income measures displays the total amount received by many groups and considers the inequality among various beneficiaries (Muryani et al., 2021). Economic growth is considered a key driver of income inequality improvement by providing the working class with job choices through the enhancement of their living standards, while economic instability is believed to worsen income distribution (Bahmani-Oskooee & Ardakani, 2020). The classical Kuznets theory (1955) states that income Inequality typically rises during the initial phases

of economic expansion and decreases after the economy reaches a certain point. However, further findings indicate that in conditions of stagnant growth, inequality actually has a negative impact on growth (Shen & Zhao, 2023). This emphasizes the importance of other factors that can influence income distribution, such as the quality of human resources, gender empowerment, poverty, and investment.

Human capital is an important aspect of economic development. Todaro and Smith (2006) emphasize that by improving health and education standards, the capacity of individuals in economic activities will be strengthened, income will increase, and inequality will be reduced. Therefore, improvements in the Human Development Index (HDI) are expected to have a negative impact on income inequality, supported by research from Nga-Ndjobo & Otabela (2023). According to Rachmawatie & Prakoso (2023) found that HDI has a significantly positive effect in a case study in the Special Region of Yogyakarta, and according to Moyo et al (2022) reveals human capital has a positive relationship with income inequality. In the context of gender equality, the increase in the Gender Empowerment Index (GEI), particularly in the form of women's political empowerment, can create more inclusive public policies. Hortas-Rico & Rios (2022) states that the increase in women's representation correlates with a decrease in income inequality in various countries. Additionally, according to Gonzales et al (2015) the relative increase in women's wages also reduces income inequality in the economy. The empowerment of women in the social, political, and economic fields plays an important role in reducing income inequality (Wang & Naveed, 2021). However, according to Aqilah et al (2024) conducted a case study in Sumatra Island, the result showed that GEI does not significantly affect income inequality.

Poverty is also one of the important factors that exacerbate income inequality. The complicated issues raised by poverty and income disparity, in both industrialized and developing countries, have received more attention in recent years (Clementi, 2024). Poor communities often have limited access to education, healthcare, and decent jobs. Ramdani (2015) states that the high level of poverty causes inequality because the distribution of development results is uneven. However, different results were shown by Huda (2023) found that poverty does not significantly affect income inequality in a case study in Indonesia. Meanwhile, domestic investment from Suparmoko (1998) explains that investment can expand job opportunities through job creation, thereby increasing the income of the wider community, which has the potential to reduce inequality. On the other hand, according to Syaifudin et al (2024) with a case study in Indonesia, it was found that domestic investment has a significantly positive impact on income inequality. The empirical findings of each variable in this study show inconsistencies compared to previous studies. Therefore, there is still a research gap to identify which results are most appropriate based on the context of the analyzed case study.

3. Method

This study used a quantitative approach using panel data, which combines time series and cross-sectional data. The research covers 34 provinces in Indonesia, over the period 2015 to 2023. This study uses secondary data obtained from the Central Bureau of Statistics. The variables in this study have the following operational definitions. Data panels are used because the combination of time-series and cross-section data. The advantages of using panel data in this research include: first, panel data allows for a larger amount of data to be available because it combines time-series data and cross-sectional data, resulting in a greater degree of freedom and more efficient estimates. Second, panel data can also address issues arising from the loss of important unobserved variables that are constant, as the unique characteristics of each individual or region can be controlled in the model (Singagerda, 2019). The equation for panel data as follows:

$$GR_{it} = \alpha_0 + \beta_1 GEI_{it} + \beta_2 HDI_{it} + \beta_3 POV_{it} + \beta_4 lnDI_{it} + \varepsilon_{it} \quad (1)$$

Where GR is the gini ratio; GEI is the gender empowerement index; HDI is the human development index; DI is the domestic investment; ln is the form for logarithm; α_0 is the constanta; $\beta_1 - \beta_4$ is the coefficient of independent variables; ε is the disturbance error; i is the notation for the cross-section and t is the notation for time-series. This study specifically analyzes the effect of the gender empowerment index on inequality in Indonesia. Day (2022) emphasize that government policies related to tax collection to increase state revenue led to inequality. The panel data analysis including the selection of the most appropriate panel data model among common, random, and fixed by Hausman test (Baltagi, 2005).

4. Results and Discussion

In this section, it is divided into two main points, namely the test results and the discussion of each variable based on the tests that have been conducted. In the results section, it starts with the presentation of descriptive statistics first. This study comprises 306 observations from 34 provinces and 9 years from 2015 to 2023 (n = 306). Table 1 shows for all variables has the standard deviation of all variables in this study is relatively small compared to their respective means, indicating low data variability and suggesting a consistent dataset.

Table 1. Descriptive Statistics

Statistics	GR	GEI	HDI	POV	lnDI
Mean	0.353	69.01	70.66	10.83	3.63
Median	0.351	69.62	70.71	9.04	3.70
Maximum	0.449	83.20	82.46	28.54	4.98
Minimum	0.236	47.88	57.25	3.47	0.00
Standard Deviation	0.041	6.73	4.12	5.65	0.72

Source: data processed

The Chow test yielded a cross-section Chi-Square probability of 0.000, which is less than 0.05. Thus, the chosen model is the fixed effect. Furthermore, the Hausman test also yields a probability of 0.000 or less than 0.05, so the fixed effect is the chosen model. Therefore, the Lagrange Multiplier test is not required, and the Fixed Effect Model is deemed the most appropriate. Before proceeding to interpret the test results of the selected model, it is first necessary to understand the results of the classical assumption tests. First is the result of the multicollinearity test. The purpose of this test is to ascertain whether the independent variables are connected in the regression model (Kunenengan et al., 2023).

Table 2. Multicollinearity Test

	GEI	HDI	POV	lnDI
GEI	1	0.2157340	-0.1415062	0.1893811
HDI	0.2157340	1	-0.6601442	0.5006636
POV	-0.1415062	-0.6601442	1	-0.4607456
lnDI	0.1893811	0.5006636	-0.4607456	1

Source: data processed

The condition for the data to pass the multicollinearity test is if its value is less than 0.8 (Napitupulu, 2021). Table 2 shows there are no values greater than 0.8, so there is no multicollinearity issue or it is safe. For the heteroskedasticity test aims to conduct to determine whether, within a regression model, the residual variance is the same or not between one observation and another. The heteroscedasticity in the model used Park approach.

Table 3. The Heteroskedasticity Test

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	0.004	0.023	0.163	0.8708
GEI	5.772	8.149	0.708	0.4794
HDI	-1.616	0.0003	-0.054	0.9573
POV	-0.0002	0.0004	-0.399	0.6900
lnDI	2.154	0.0007	0.003	0.9975

Source: data processed

The heteroskedasticity test requirement where the probability value of all variables greater than 0.05, the model has no heteroscedasticity. Table 3 shows the probability for each variables of independent greater than 0.05, thus it can be concluded that the regression model does not hold heteroskedasticity. shows the results of the F test, with an F-statistic value of 84.68758 and a probability level of 0.000000 ($p < 0.05$), indicating that all independent variables in this study collectively affect income distribution inequality. The T-test shows that a total of five variables were used, resulting in k = 5, while the total number of data points is 306, resulting in n = 306. The degrees of freedom value is 301 (306-5). Thus, the t-table value obtained is 1.968. The t-statistic for the GEI variable is less than t-table and its probability value greater than 0.05. Therefore, GEI does not have a significant influence. Meanwhile, the statistics for HDI, poverty, and domestic investment are greater

than the t-table. and the significance value <0.05. Therefore, poverty, domestic investment, and HDI have a significant impact on income inequality. According to the adjusted r-squared indicate that 91.03% of the variation in income distribution inequality in Indonesia between 2015 and 2023 is explained, while the remaining 8.97% is ascribed to other factors that were not considered in the analysis. The section related to the test results is complete, next is the discussion of each independent variable.

Table 4. Result of Panel Data Estimation

Variable	CEM	FEM	REM
C	-0.052	0.673	0.611
	(-0.991)	(9.336)***	(10.179)***
GEI	0.001	-0.0004	-0.0004
	(3.085)***	(-1.545)	(-1.681)*
HDI	0.004	-0.005	-0.004
	(5.541)***	(-5.119)***	(-4.471)***
POV	0.004	0.003	0.002
	(8.815)***	(2.527)**	(2.607)***
lnDI	0.005	0.004	0.002
	(1.555)	(1.978)**	(0.988)
Diagnostic Tools			
Adj R-squared	0.221	0.910	0.219
F-stat	22.653***	84.688***	22.460***
Selection of Best Panel Data			
Chow Test	0.000		
Hausman Test		0.000	

Source: data processed

Table 4 shows the Gender Empowerment Index (GEI) variable does not significantly affect the inequality income in Indonesia during the period of this study. The test results show that the t-statistic (1.545) does not exceed 1.968 (t-table), and the p-value (0.1235) is greater than 0.05, indicating that the variable is not statistically significant. Theoretically, an increase in gender empowerment should reduce inequality, but this result has not yet occurred in Indonesia. Although GEI is not significant, this study fills the gap by providing national-level analysis across all provinces, which has been rarely explored in previous research. Contrast with the previous research by Wang & Naveed (2021) in that women's empowerment, which encompasses social, economic, and political fields, can reduce income inequality. However, similar to the research by Aqilah et al (2024) also found no significant results with the research location only in Sumatra Island. One of the reasons explaining this finding is that many Indonesian women work in the informal sector. According to data from the Ministry of Women's Empowerment and Child Protection, around 66% of female workers in Indonesia are informal workers. Informal workers are associated with lower income generation. Therefore, women's contribution to income is smaller. Then, regarding the representation of women in parliament in the following graph:

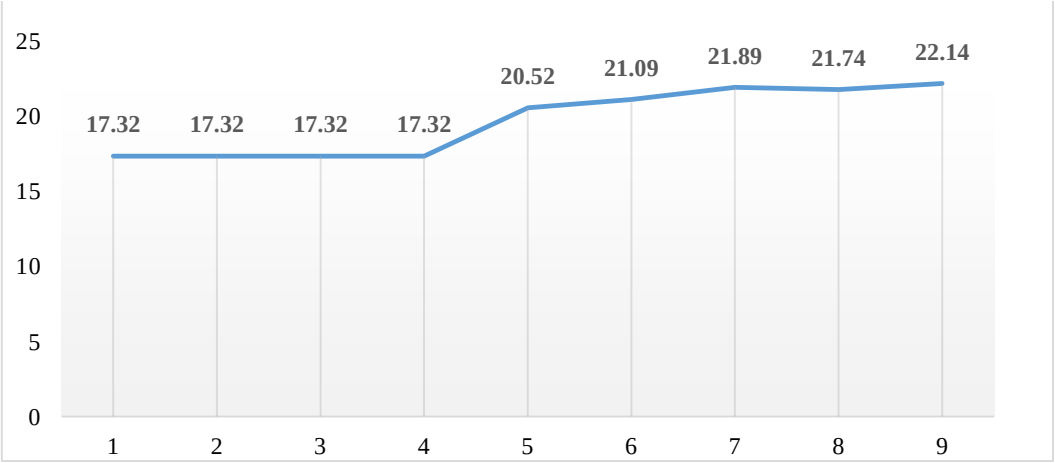

Figure 3. Graph of female representation in parliament 2015-2023 (percent)

As shown, female representation in parliament has fluctuated over the years, with general increase observed from 2018 to 2021. However, that figure, when linked to the policy of a minimum 30 percent quota for female legislative candidates in Indonesia, has not been achieved. In fact, according to information from the Indonesian Ministry of State Secretariat (2025), it is also stated that the actual percentage of elected women has not yet reached that figure. Thus, the GEI value in Indonesia is indeed not optimal, so when it increases, it does not significantly impact the reduction of income inequality. The importance of enhancing women's empowerment programs to have a tangible impact on reducing income inequality. The Gender Empowerment Index, in this case, provides information regarding whether women are actively involved in the economic and political fields. In the economic field, equal access to jobs and fair wages for women need to be expanded. Then, in the political field, increasing the representation of women in parliament can encourage the emergence of more inclusive policies, especially related to education, health, and poverty alleviation, which indirectly contribute to reducing inequality. Thus, the main hope is that the GEI increases and significantly contributes to reducing income inequality.

The Human Development Index (HDI) has the probability value 0.0000 and less than 0.05. The coefficient of HDI variable is -0.005. Every increase in the HDI by one unit will reduce income distribution inequality by 0.005. Therefore, the HDI variable has a negative impact on income distribution inequality in Indonesia. These results are in line with Ghifara et al (2022). In addition, these findings are also in line with the human capital theory. Based on that theory, each additional year of schooling can raise an individual's level on income and productivity at work. So, the improvement in human resource development reduces income inequality in Indonesia (Thye et al., 2022) Therefore, with the increase in the HDI, the productivity level of the community will also rise, which will subsequently lead to increased income and result in a reduction in income inequality occurring in a region (Suryani & Woyanti, 2021).

Table 4 shows the poverty (POV) has a probability of 0.0121 and value of coefficient 0.003. For every one percent increase in poverty, there will be an increase in income distribution inequality by 0.003 points. These findings are also consistent with the results of the studies by Karimi et al (2023) and Hindun et al (2019). Despite their close relationship, poverty and economic inequality are two different ideas (Dupont & Roy, 2024). Poverty can be reduced when needs are met with the increase in income earned by the community. With the increase in income among the community, the gap between different segments of society will narrow, thereby reducing income distribution inequality (Hindun et al., 2019).

The domestic investment (lnDI) variable has a probability value of 0.0048 and a coefficient value of 0.004 means one percent increase in domestic investment in Indonesia will cause an increase in income inequality by 0.004 points. Therefore, the domestic investment has a significant and positive impact on inequality income in Indonesia. This finding contradicts the initial hypothesis, which assumed a negative relationship, but is consistent by the findings from Tamrin et al (2023) and Syaifudin et al (2024). According to Tamrin et al (2023) as domestic investment increases, economic growth also rises, which in turn affects income distribution inequality. However, due to the uneven distribution of domestic investment, which is mostly concentrated in the western part of Indonesia, particularly on the island of Java, the increase in domestic investment tends to be followed by an increase in income inequality. Thus, it may be inferred that domestic investment can contribute to income inequality, especially when its distribution is regionally unbalanced. However, domestic investment remains important in driving inclusive growth if managed well and fairly (Amponsah et al., 2023).

5. Conclusion

This study concludes that among the four analyzed variables the Gender Empowerment Index (GEI) does not influence the inequality of income distribution in Indonesia. The improvement in the Human Development Index (HDI) reflects advancements in health, education, and income, thereby influencing the reduction of inequality. Meanwhile, both poverty and domestic investment indicate that the increase in poverty levels and investment contributes to the rising inequality in Indonesia. Various findings indicate a contribution to the increasing inequality in Indonesia Therefore, the government is expected to enhance the implementation of targeted and measurable policies. For example, women's empowerment programs should not only provide access to jobs but also guarantee formal job opportunities with decent wages and social protection. An example of concrete government

policy in this regard is the strengthening of Ruang Bersama Indonesia (RBI) and the SAPA 129 service by the Ministry of Women's Empowerment and Child Protection as a form of protection and empowerment for women. If the program is implemented well and evenly without any misuse, it is hoped that the empowerment of women will increase. The human development program needs to be focused on underdeveloped areas with improvements in the quality of health services, education, and training to create equity. In addition, domestic investment policies must be implemented evenly, such as through incentives for companies that invest outside the islands of Java and Sumatra. Efforts to alleviate poverty must also integrate capital assistance with entrepreneurial support, such as through the Mekaar program by PNM, which also empowers pre-prosperous women. Then, capital assistance can also be provided to individuals who have participated in and passed the government's entrepreneurship training certification, so that their knowledge and skills can be directly implemented independently.

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This study is being conducted in the hopes that its findings will advance the subject of economics. In addition, this research article serves as an implementation of the theories or knowledge that have been acquired.

Declarations

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Conflict of interest	:	The authors declare no conflict of interest.
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