

ANALYSIS OF THE RELATIONSHIP BETWEEN GDP, EDUCATION AND GENDER EMPOWERMENT INDEX TO POVERTY IN FIVE DISTRICTS OF CENTRAL JAVA

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Abstract

Poverty is a complex problem that is influenced by various economic, social, and structural factors. This study aims to analyze the relationship between Gross Regional Domestic Product (GDP), education level, and Gender Empowerment Index (IDG) on poverty levels in five selected districts in Central Java Province. The data used is secondary data sourced from the Central Statistics Agency (BPS) for the 2015–2023 period. This study analyzes the influence of economic growth, education level, and gender empowerment on poverty levels in five districts in Central Java in the period 2010–2023. Using a multiple linear regression approach with a fixed effect *model*, the results of the study show that economic growth and education have a negative and significant influence on poverty. This means that the increase in GDP and average school age contribute significantly to reducing poverty rates in the study area. In contrast, gender empowerment does not show a significant influence on poverty reduction, indicating the need to strengthen the implementation of gender policies to have a more socio-economic impact. Overall, this model is able to explain most of the variation in poverty levels between regions. This study recommends expanding variables and approaches, including considering spatial aspects and mixed methods, to provide a more comprehensive understanding of regional poverty dynamics. The results of the study also provide an overview of the Sustainable Development goals, which directly support the main goal of the SDGs, namely zero poverty which shows an increase in economic growth (GDP) and education plays an important role in reducing poverty rates

Keywords: Empowerment Index, Poverty, GDP, Gender, SDG's

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INTRODUCTION

Poverty is a structural problem that is still a major challenge for developing countries, such as Indonesia. According to the World Bank's view, poverty is not only limited to financial incapacity, but the state of individuals or groups of people who do not have adequate access to various resources to meet their basic needs (Purwanti, 2024). The poverty problem in Indonesia is complex, complicated, and multidimensional, so it is a top priority for development (Febrianti et al., 2022). The poverty rate in Indonesia is not only seen in terms of income, but also includes inequality in access to basic services such as education and health (Umam & Furqon, 2024). Many regions, especially remote rural areas, still experience serious barriers in terms of the availability and quality of basic services. One example is the low level of education among the poor which causes difficulties in obtaining decent work, thus strengthening the chain of poverty that is difficult to break (Saputri et al., 2025).

Poverty is a complex phenomenon with various aspects that are more profound than just a lack of money, which can be divided into several main categories. Todaro and Smith (2020) stated that there are two types of poverty, namely absolute poverty and relative poverty. Absolute poverty occurs when a person is unable to meet his or her minimum needs, such as food, shelter, and clothing, which are generally determined by the national poverty line. In Indonesia, the poverty line is determined based on the minimum expenditure to meet calorie needs, which is 2,100 Kcal per person per day and the fulfillment of non-food needs (BPS, 2024). Meanwhile, relative poverty refers to a situation where a person has an income or access that is far below the average of the surrounding community, so that they cannot enjoy an adequate quality of life even though they do not experience shortages in the absolute sense (World Bank, 2021). These two categories complement each other in explaining the inequality of welfare in society.

There is also a classification of poverty based on time and its causes, namely chronic poverty and temporary poverty. Chronic poverty refers to a situation in which poverty is long-lasting and often passed from one generation to the next, this is generally caused by various structural barriers such as low quality of education, health problems, and limited access to productive work (Chambers, 1983). Meanwhile, temporary poverty is short-term and generally occurs due to external factors such as natural disasters, disease outbreaks, or economic crises that result in a loss of sources of income in a short period of time (Handayani & Widiyanto, 2020). In Central Java Province, these various types of poverty can be seen from the inequality that occurs between regions, which shows that poverty alleviation strategies need to be adjusted to the characteristics and causative factors of poverty in each region (Nuraini & Rachmawati, 2022).

Judging from the high poverty rate in Indonesia, Central Java Province is one of the provinces that has a relatively high number of poor people among the provinces in Indonesia (Rusdarti & Lesta Karolina, 2013). Although Central Java Province has a large population and diverse socioeconomic characteristics, there is a gap in poverty reduction between districts/cities (BPS, 2023). Some areas in Central Java Province

were able to record a significant decrease in poverty rates, while other areas experienced stagnation or even increase. This difference in achievement reflects the inequality of access to economic resources, education, and employment opportunities in each region (Indriani & Hartono, 2023). This inequality can be caused by variations in natural resource content, infrastructure quality, as well as demographic inequality and concentration of development investment (Sutanto & Nuraini, 2021). In addition, a study conducted by Nuraini and Rachmawati (2022) shows that differences in unemployment rates, average length of schooling, and access to basic services are the main factors that cause inequality in the poverty rate in Central Java Province. Therefore, comprehensive poverty alleviation efforts require analysis of various social and economic factors that affect it simultaneously and sustainably (Todaro & Smith, 2020).

One of the macroeconomic variables that is often associated with poverty reduction is the Gross Regional Domestic Product (GDP). Gross Regional Domestic Product (GDP) is the total added value generated by all business actors in a region, or it can be interpreted as the accumulation of the final value of goods and services produced by all economic units in the region. The greater the economic growth rate of a region, it shows that its economic activity is increasing. The indicator used to see the economic growth of this region is the GDP growth rate based on constant prices (Romhadhoni et al., 2018). In the trickle-down effect theory, high economic growth is expected to provide benefits to all levels of society through job creation, income increase, and poverty reduction (Todaro & Smith, 2020). However, in practice, economic growth does not automatically reduce poverty if it is not balanced with an equitable distribution of income and inclusive job creation (Harahap et al., 2021). In Central Java Province, although the GDP has increased every year, this is not completely proportional to the reduction in poverty rates. Based on the Central Java BPS (2024), inequality between regions is still quite high, which is reflected in the Williamson Index value which is above 0.6. This inequality indicates that the benefits of economic growth are not evenly distributed, so that the positive impact of GDP on poverty alleviation is limited (BPS Central Java, 2024).

The effectiveness of economic growth in reducing poverty is greatly influenced by factors, especially in social aspects such as average school age and the distribution of development between regions. One of the social elements that has a great impact on welfare and poverty reduction is education. The level of public education is closely related to the quality of human resources, productivity, and access to better job opportunities (Ministry of Education and Culture, 2022). However, in Central Java Province, despite progress in the education sector, the average length of school in 2023 will only reach 8.35 years, which means that people generally only complete junior high school education (BPS Central Java, 2024). This situation shows that there are challenges in improving the level of education of the community, especially in rural and remote areas. Low levels of education are directly correlated with limitations in getting decent jobs, thus prolonging the cycle of poverty (Saputri et al., 2025).

The Gender Empowerment Index is also an important factor that needs to be considered in efforts to reduce poverty. In Central Java Province, the value of the Gender Empowerment Index in 2023 was recorded at 75.02 (BPS Central Java, 2024) which shows that although women's involvement in the economic and political sectors is increasing, there is still significant inequality compared to men. This inequality has an impact on women's access to higher education, formal employment, and positions in strategic decision-making (World Bank, 2021). In the framework of inclusive development, strengthening the IPG is very important, as women's empowerment has

been shown to increase household income and strengthen the local economy, thereby contributing to reducing poverty rates.

In previous research, research has been conducted on the complexity of development inequality and poverty in Central Java Province. Research conducted by (Gratia & Nugroho, 2021) found that inequality between regions in 35 districts/cities in Central Java Province is influenced by fiscal decentralization, inflation, the number of workers, and direct and indirect spending. The study emphasizes that although economic growth occurs, the distribution of benefits is uneven between regions. A similar study was also conducted by (Adriana, 2024) which identified that the Special Allocation Fund, Human Development Index (HDI), and population have a significant effect on regional inequality in Central Java Province with a regression model showing that these variables explain around 72.53% of the variation in inequality between regions. These findings strengthen the argument that economic and social factors, such as GDP, average school age, and gender empowerment have a crucial role in determining poverty and inequality rates in Central Java Province.

Considering the complexity of the poverty problem in Central Java which is influenced by socio-economic factors such as GDP, average length of schooling, and gender empowerment index, a multidimensional approach is needed in examining the factors that affect the poverty rate. Efforts to alleviate poverty are not enough to depend only on economic growth, but must also pay attention to improving the quality of human resources and empowering vulnerable groups in a sustainable manner (Todaro & Smith 2020).

RESEARCH METHODS

This study uses a quantitative descriptive method with a focus on research in five districts and cities in Central Java which are areas with high poverty rates from 2010 to 2023 in Kebumen Regency, Brebes Regency, Wonosobo Regency, Pemaslang Regency, and Purbalingga Regency. The data source used in this study is sourced from the Indonesian Central Statistics Agency in the form of secondary data. And the method used is a literature study.

This study uses multiple linear regression analysis with panel data, which is a combination of cross section data and time series data. Regression analysis is used in this study because it is in accordance with the purpose of the study, which is to test the influence of independent variables on dependent variables. Because the variables used are more than one, in this study a multiple linear test is used. The multiple linear regression equation model is:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \epsilon_{it}$$

where:

Y = Poverty level

X1 = GDP of 5 Central Java districts

X2 = Education level/average schooling (year)

X3 = Gender empowerment index of 5 Central Java districts

β_0 intercep

The symbols β_1 , β_2 , and β_3 are the regression coefficients for independent variables and the ϵ_{it} symbol is the error component at time t for the cross section unit

to i , $i = 1, 2, 3, 4, 5$ (cross section data of five districts in Central Java) $t = 1, 2, 3, \dots, 14$ (time series data, 2010-2023).

In the analysis of panel data regression, three main approaches are known, namely *Common Effect Model* (CEM), *Fixed Effect Model* (FEM), and *Random Effect Model* (REM). The CEM approach combines *time series* and *cross section* data and is estimated using the *Ordinary Least Squares* (OLS) method. The FEM approach considers the possibility of *omitted variables* that can cause changes in intersecting between times or between individuals. In FEM, a dummy variable is used to capture the difference in intercepts.

In contrast to FEM, REM does not use dummy variables, but rather relies on residual components that are assumed to have correlations between time and individuals. REM assumes that each entity in the data has a different intercept, but the difference is random (Gujarati et al., 2012). The determination of the most suitable model is carried out through the Chow Test and the Hausman Test. The Chow test aims to evaluate whether the right approach is CEM or FEM in estimating panel data. Meanwhile, the Hausman Test is used to determine whether a more appropriate FEM or REM model is used (Gujarati et al., 2012).

In multiple regression, the OLS estimation method is used because it is able to meet the basic assumptions in classical analysis. This estimate is categorized as BLUE (*Best Linear Unbiased Estimator*) because it meets conditions such as normality, absence of multicollinearity, heteroscedasticity, and autocorrelation (Latucosina, 2017; Matondang & Nasution, 2021). Furthermore, statistical testing is carried out using t-tests and F-tests based on predetermined criteria.

a) T-test

$H_0: \beta_i \geq 0$ (There is no significant negative influence of the independent variable X individually on the dependent variable Y).

$H_1: \beta_i < 0$ (There is a significant negative influence on the dependent variable Y).

b) F-Test

Test $F < F$ table: H_0 accepted and H_1 rejected (all independent variables X had no significant effect on dependent variables Y).

Test $F > F$ table: H_0 is rejected and H_1 is accepted (all independent variables X together affect dependent variables Y).

RESULTS AND DISCUSSION

SELECTION OF ESTIMATION METHODS

First, to determine the selection of regression models is carried out through the Chow Test. The hypotheses tested in the Chow Test are as follows:

H_0 : Common Effects models are more suitable than Fixed Effects models

H_1 : The Fixed Effects model is more appropriate than the Common Effects model

The basis for decision-making in the Chow Test is based on the value of significance (p-value). If the p-value is greater than the significance level of $\alpha = 0.05$, then H_0 is acceptable. Conversely, if the p-value is smaller than the significance level of $\alpha = 0.05$, then H_0 is rejected and H_1 is accepted.

Table 1. Selection of Regression Models with Chow Test

Effects Test	Statistic	Df	Probability
Cross-section F	51.567982	(4,62)	0.0000
Cross-section Chi-Square	102.540672	4	0.0000

Source: Data processed, 2025

Based on the results of the Chow Test shown in Table 2, the Cross-section value F is 0.0000 and the Cross-section Chi-square value is 0.0000. The value is smaller than the significance level of $\alpha = 0.05$, then H_0 is rejected and H_1 is accepted. With the acceptance of H_1 , the model that was declared the most suitable to be chosen was the Fixed Effects Model (FEM).

Table 2. Selection of Regression Models with Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Probability
Cross-section random	183.230976	3	0.0000

Source : Data processed, 2025

Second, to determine the right panel regression model between the *Fixed Effect Model* (FEM) or *Random Effect Model* (REM) models, it is necessary to do Uji Hausman. The Hausman test aims to see if there is a significant difference between the estimates of the two models. The hypotheses used for the test are formulated as follows:

H_0 : The random effect model is more suitable than the Fixed Effect.

H_1 : The Fixed Effect model is more suitable than the Random Effect

The basis for this decision-making is based on the significance value (p-value). If the p-value $< \alpha$ (0.05), then H_0 is rejected and H_1 is accepted. If the significance value is less than $\alpha = 0.05$ then H_0 is accepted. The results of the Hausman Test can be seen in the following table, based on the table, the Hausman Test shows that the significance value (p-value) of the cross section is 0.0000. The significance value is less than $\alpha = 0.05$. This indicates that the accepted hypothesis is H_1 . In other words, the regression model chosen is the *Fixed Effect Model* (FEM).

CLASSIC ASSUMPTION TEST

The Normality Test aims to find out whether the residual data in the regression model is distributed normally. The test was carried out using the One-Sample Kolmogorov-Smirnov Test, with Asymp results. Sig. (2-tailed) is 0.200. This value is greater than the significance level $\alpha = 0.05$ ($0.200 > 0.05$). This indicates that the residual data is distributed normally. In general, normality tests can be performed through three approaches, namely the graph method (histogram), the probability plot (normal P-P plot), and the statistical test (such as the Kolmogorov-Smirnov). All three approaches show consistent results, so the assumption of normality in this model has been met.

The Multicollinearity test was carried out using the *Pairwise Correlation Method*. The multicollinearity test aims to detect whether there is a high relationship or correlation between independent variables in a regression model. In a good regression

model, there should be no correlation between these independent variables because a high correlation can cause problems in estimating regression coefficients and reduce the accuracy of the analysis results (Effiyaldi et al., 2022). Based on table 4, it is known that all the values of the coefficient of independent variables are less than 0.80. It can be seen in the table, the value of the correlation coefficient X1 and X2 is $0.059363 < 0.80$, X1 and X3 are $0.089181 < 0.80$, and X2 and X3 are $0.281804 < 0.80$. Therefore, it can be stated that there is no multicollinearity in the model.

Table 3. Multicollinearity Test Results

	X1	X2	X3
X1	1.000000	0.059363	0.089181
X2	0.059363	1.000000	0.281804
X3	0.089181	0.281804	1.000000

Source : Data processed, 2025

The heteroscedasticity test is part of the classical assumption test in the regression model which aims to test whether there is a difference in variance from the residual value in one observation period to another observation period (Juliandi et al., 2014). To detect the presence or absence of heteroscedasticity in a multiple linear regression model, it can be done by looking at a scatterplot graph. If the points of the graph do not have a specific pattern and are randomly spread above or below the zero on the y-axis, then it can be concluded that heteroscedasticity does not occur. Regression models that do not contain heteroscedasticity are good research models (Ghozali, 2016).

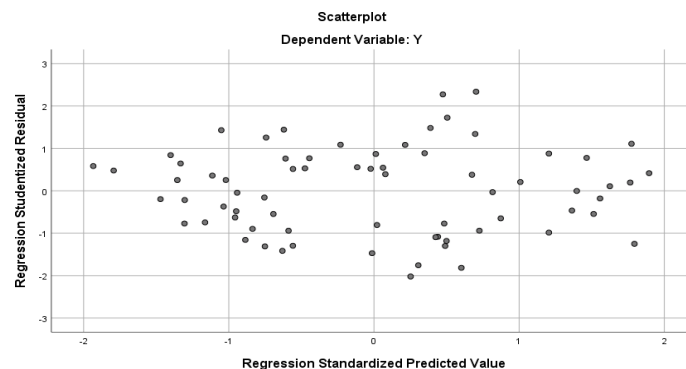


Figure 1. Scatterplot Heteroscedasticity Test Results

Source: Data processed, 2025

Figure 1 shows that the research model did not have heteroscedasticity. This is because the spread of data points spreads above and below or around zero (not accumulating in a single point). In addition, the spread of data points is also unpatterned. Therefore, it can be concluded that there is no heteroscedasticity problem, so the regression model used is good and ideal.

MULTIPLE LINEAR REGRESSION RESULTS

Based on the results of multiple linear regression analysis of panel data, it is known that the adjusted R-squared value is 0.471 or it can be said to be 47.1%. This value shows that the variation of independent variables, namely GDP, education, and

the Gender Empowerment Index (GDI), is able to explain the variation in poverty change of 47.1% and the remaining 52.9% is explained by other variables outside the model.

Table 6. Adjusted R-square Test Results

Model	R	R Square	Adjusted R-square	Std. Error of the Estimate Durbin-Watson
1	0.703	0.494	0.471	1.92154

Source : Analysis Results, 2025

Table 6 explains the results of the analysis where the variation of independent variables, namely GDP, education, and the Gender Empowerment Index (IPG), is able to explain the variation in poverty change of 47.1% and the remaining 52.9% is explained by other variables outside the model. *The Fixed Effect Model (FEM)* is the appropriate model in this study. The results of multiple linear regression in this study are shown in the following table:

Table 4. Multiple Linear Regression Results

Variabel	Coefficin	Std. Error	t-Statistics	Probability
C	43.39565	3.366104	12.89195	0.0000
X1	-2.85E-07	8.35E-08	-3.419738	0.0011
X2	-3.230367	0.569651	-5.670783	0.0000
X3	0.021255	0.044005	0.483013	0.6308

Source: Analysis Data, 2025

Table 4 shows the coefficient values of each variable and significance. Insignificant variables are shown in variable X3 while 2 other variables are significant. Poverty is a major problem in many complex regions, although in many regions there has been a successful development in national income and production. Poverty in an area reflects the level of welfare of the people living in that area (Zuhdiyaty & Kaluge, 2018). Based on the results of the research through regression with the FEM model (fixed effect model) the normality test of the data, it can be said that it is distributed normally, then the heteroskedatity test shows that there is no heteroscedasticity, and there is no multicollinearity between independent variables. The regression results conducted through the t-test showed that GDP and education had a significant negative relationship with poverty and the gender empowerment index had a positive relationship with poverty but showed insignificant results. Meanwhile, the results of the regression through the F-test show that GDP, education, and the gender empowerment index together have a significant effect on poverty. For the explanation of each variable on poverty, it can be seen in the following definition:

The Relationship between GDP and Poverty

The results of the data processing were obtained that the Gross Regional Domestic Product had a negative relationship with the poverty level variable. This is the same as the results of Amelia Saputri's research in the journal "Journal of Economics and Business" which states that the Gross Regional Domestic Product variable has an influence and is negatively related to the poverty rate. This means that

when the Gross Regional Domestic Product of a region increases, the poverty rate in that area will decrease. This can be due to an increase in Gross Regional Domestic Product which can increase the productivity of regional output, so that it can cause an increase in workers' income because it has higher productivity. By having income, the needs of these workers can be met (Amalia, 2023). The higher the GDP of a region, the higher the potential source of income for the region. The success of programs in third world countries is often judged on the basis of high levels of national output and income (Todaro & Smith, 2012). Therefore, it can be interpreted that any increase in the number of Gross Regional Domestic Product in a region can affect the reduction of the poverty rate in that area.

The Relationship between Education and Poverty

In the results of this study, data was found that the education measured from the average length of school in five Central Java districts had a negative relationship with the variable poverty rate in the area as well. This is in accordance with the theory used by Hutabarat (2018), namely the variable of average length of school has a negative and significant effect. And in accordance with (Mankiw, 2012) which states that education is a person's investment, if one's education is high, one's welfare will be better. This result is also supported by previous research by Amelia Saputri and others, stating that education has a negative and significant effect. Education has a negative and significant effect because based on Human Capital theory, education plays a very important role in the quality of human resources which has an impact on community productivity. If the quality of education is good, the quality of human resources will also be better. Not only related to the quality of resources, education is also related to the segmentation of labor wages. And also supported by Sharp's opinion, et.al in Kuncoro (2006), one of the factors of poverty is inequality in the quality of human resources (HR). The low quality of human resources results in individual knowledge and skills, resulting in low productivity which ultimately impacts individual work. Low education will result in lower individual positions or even unemployment so that it will increase poverty as well because it cannot meet their needs

The Relationship between the Gender Equality Index and Poverty

Based on the data processed, it was found that the Gender Empowerment Index **had no effect** on poverty in the five districts that had the highest percentage of poverty in Central Java. Therefore, it can be interpreted that when the Gender Empowerment Index (IPG) increases, it does not have an impact on the increase in poverty rates. This is because the five districts tested have a fairly low percentage of IPG, resulting in a low influence of IPG to affect poverty due to the lack of gender equality in Kebumen, Brebes, Wonosobo, Peralang and Purbalingga Regencies. The low level of IPG is caused by several things such as women having a double burden, namely working in the public sector and working as housewives, so that it can hinder women from carrying out their socio-economic activities. In addition, women's education levels are lower compared to men's which can affect gender equality. This research is in line with research conducted by Amelia Saputri et al. (2023).

CONCLUSION

Based on the results of multiple linear regression analysis using the Fixed Effect Model (FEM) on panel data from five districts in Central Java (Kebumen, Brebes, Wonosobo, Pemalang, and Purbalingga) in the 2010-2023 period, this study found that GDP had a negative and significant effect on the poverty rate with a coefficient of -2.85 and a probability value of 0.0011. This shows that every increase in GDP of one rupiah will reduce the poverty rate by 2.85 percent, in accordance with the trickle-down effect theory that economic growth can contribute to poverty reduction in the regions.

The impact of education on poverty was the most important finding, with a coefficient of -3.23 and a probability value of 0.0000. This means that the average length of school has a negative and very significant influence. Education is the most important element in reducing poverty, with an average increase of one year in average school duration reducing poverty by 3.23 percent. This shows why education funding is a very important strategy to reduce poverty in the long term. However, with a coefficient of 0.02 and a probability value of 0.6308, the Gender Empowerment Index (IGP) does not show a substantial impact on poverty levels. In the context of the five districts studied, women's empowerment did not have a major impact on poverty reduction, although it theoretically should. With an F test score of 21,494, all three independent variables simultaneously had a significant impact on poverty. This study model was able to explain 47.3% of the variation in change

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