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Article

The Path to Poverty Reduction: How Do Economic Growth and Fiscal Policy Influence Poverty Through Inequality in Indonesia?

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Abstract: One of the factors impeding the decline in poverty in Indonesia is the government's lack of attention to the need to reduce income inequality. Fiscal policy and economic growth can effectively reduce poverty by lowering income inequality, so the inequality channel must be considered. Socioeconomic and infrastructure differences between provinces can influence the effectiveness of economic growth and fiscal policy in reducing poverty. This study aimed to assess the effects of economic growth and fiscal policy regarding spending and taxes on direct and indirect poverty reduction through lowering income inequality, as well as considering how these variables influence poverty by province. This study employed secondary data, including panel data for 2010–2023 from 34 provinces in Indonesia, which were analyzed using autoregressive cross-lagged SEM. This study found that economic growth and fiscal policy regarding spending on education and health are statistically significant in directly reducing poverty in regions outside Java but do not affect it through income inequality. Taxes increase income inequality, and the social safety net does not reduce poverty outside Java. The increased spending on education and health should continue, but improvements are needed in terms of targeting social safety nets and tax reforms to strengthen the system and reduce inequality.

Keywords: poverty; income inequality; economic growth; fiscal policy; panel data



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1. Introduction

The determinants of poverty and inequality have become significant topics among academics and trigger complex discussions. According to the literature on economic development, poverty and income inequality can be overcome through economic growth due to its ability to improve the lives of low-income populations (Islam et al. 2017; Iniguez-Montiel and Kurosaki 2018; Ali et al. 2022; Varlamova and Larionova 2015; Nursini 2020) and reduce income inequality (Fosu 2017; Soava et al. 2020).

However, several empirical studies conclude that high economic growth does not always help to alleviate poverty (Adams 2003; Tridico 2010; and, most recently, Efendi et al. 2019) or reduce income inequality (Alamanda 2020; Arkum and Amar 2022; Perera and Lee 2013). Economic growth worsens the lives of low-income populations (Iniguez-Montiel and Kurosaki 2018; Usmanova 2023). If economic growth is only concentrated in specific sectors, it will have a minimal impact in terms of poverty reduction (Montalvo 2010). Economic growth will only benefit high-income groups and not low-income ones (Azis et al. 2016).

This ongoing debate indicates that economic growth is not sufficient to eradicate poverty, because this problem is multidimensional (D'Attoma and Matteucci 2024) and highly complex (Gweshengwe and Hassan 2020), and it is necessary to consider variables other than economic growth to accelerate its reduction (Acosta et al. 2007; Fajnzylber 2018).

Macroeconomic policies, especially fiscal policy, in terms of spending and taxes, are often implemented by the government to eradicate poverty. Fiscal policy, which is implemented through social protection spending components such as fund transfers to low-income populations, has helped extremely low-income populations to manage their daily expenses (Fiszbein et al. 2011; Velkovska and Trenovski 2023). Moreover, education and health spending can boost labor productivity, ultimately increasing the output (Jouini et al. 2018; Nursini 2020). As a fiscal policy instrument (Malla and Pathranarakul 2022), tax can reduce poverty through two mechanisms: as a source of funding for poverty alleviation programs that directly address the needs of low-income populations and as an instrument for equitable income distribution through progressive taxes (Adediyan and Omo-Ikrodah 2023).

The impact of fiscal policy on poverty reduction and inequality does not always support theory (Azis et al. 2016). Fiscal policy is ineffective in reducing inequality if the tax share of the GDP is low (Kunawotor et al. 2022). Taxes on goods and services do not improve income distribution globally (Malla and Pathranarakul 2022).

In empirical studies, the debate on the effects of economic growth and the efficacy of fiscal policy in reducing inequality and poverty has motivated academics to seek more extensive knowledge through econometric approaches and by exploring the conceptual linkages between inequality and poverty. Previous studies rarely focus on a positive relationship between income inequality and poverty. Inequality and poverty are seen as the same concept, so the ultimate goal of various policies and other macro-variables is to reduce poverty and inequality. Inequality and poverty are different concepts, and income inequality is a determinant of poverty (González-López et al. 2020; Perkins et al. 2013; Iniguez-Montiel and Kurosaki 2018; Cerra et al. 2021; Ali et al. 2022).

In general, previous studies have directly observed the impacts of economic growth and fiscal policy in terms of poverty reduction. At the same time, there has been limited observation of the indirect effects of economic growth and budgetary policy through income inequality. Focusing on this aspect, particularly in developing countries such as Indonesia, is crucial as it can provide valuable insights for policymakers in their efforts to reduce poverty. This is reinforced by poverty data collected in Indonesia in the last 10 years, where the rate fluctuated from 11.47 percent in 2013 to 9.22 percent in 2019, after which it increased again to 9.36 percent in 2023 (Statistics of Indonesia 2024). Although the poverty rate shows a downward trend, the annual decline is relatively slow, averaging 0.2 points. This figure is still higher than the target set in the National Medium-Term Development Plan (RPJMN) of 6–7 percent and that indicated in the 2023 Government Work Plan document of 7.5–8.5 percent. It is also higher than that of several ASEAN countries, such as Malaysia, Vietnam, and Thailand, whose rates were 0 percent, 3.41 percent, and 3.4 percent, respectively, in 2023. The trend in the percentage of low-income people parallels the income inequality figures of 0.406 in 2013, 0.380 in 2019, and 0.388 in 2023. Although it is acknowledged that the increase in poverty and income inequality in the period of 2019–2023 was predominantly caused by the COVID-19 pandemic, this phenomenon shows that the dynamics of income inequality are closely related to those of poverty. It is also essential to focus on reducing income inequality, which can then reduce poverty. This supposition aligns with the work of Fosu (2017) and Arkum and Amar (2022), who argue that income inequality reduction is essential in accelerating poverty alleviation.

The case of Indonesia is also interesting because, over the past decade, it has seen a noticeable slowdown in economic growth, with an average increase of only 4.22 percent per year. This is a significant drop from the previous decade, which experienced an average growth rate of 5.69 percent. This slowdown has made it more challenging to address poverty effectively. In the Government Work Plan for 2023, the target was to reduce the poverty rate to between 7.5 and 8.5 percent. Unfortunately, this goal was not achieved, mainly due to insufficient economic growth. In 2023, the economy grew by 5.05 percent, failing to reach the target range of 5.3 to 5.9 percent. From a fiscal perspective, the tax ratio (which reflects tax revenue as a percentage of the GDP) has shown a downward trend, falling from 10.38 percent in 2022 to 10.21 percent in 2023. This places Indonesia

at the seventh position among the eleven ASEAN countries with the lowest tax ratio, surpassing only Brunei Darussalam, Timor Leste, Myanmar, and Laos. This low tax ratio has constrained the government's capacity to engage in fiscal expansion to stimulate economic growth and reduce poverty.

Empirical studies regarding the effects of fiscal policy and economic growth on poverty and inequality in Indonesia have been conducted. For example, [Nursini and Tawakkal \(2019\)](#) found that regional spending and revenues significantly reduced poverty in a panel data regression model. [Alamanda \(2020\)](#) used panel data from 33 provinces and found that fiscal policy regarding infrastructure spending significantly reduced poverty and inequality, whereas social spending was insignificant. The [World Bank \(2020\)](#) employed a quantitative approach and found a significant correlation between social spending and poverty, and the descriptive analysis performed by [Hill \(2021\)](#) indicated that, during periods of high economic growth, there was a tendency for poverty reduction. However, in their descriptive analysis, [Yusuf and Sumner \(2015\)](#) found that economic growth had a low capacity to reduce inequality and poverty. [Tanjung and Muhafidin \(2023\)](#) found that government spending was insignificant with regard to poverty.

Previous empirical studies have generally only partially estimated the impact of economic growth and fiscal policy on poverty and inequality. This applies to both Indonesia and other developing countries, as there is limited focus on income inequality as a mediating variable that can accelerate poverty reduction. Furthermore, in Indonesia, differences in socioeconomic conditions and the availability of infrastructure across its provinces affect the efficacy of economic growth and fiscal policy regarding poverty alleviation, both directly and indirectly, through the channel of income inequality. This study aimed to explore the effects of economic growth and fiscal policy regarding spending and taxation on poverty reduction, both directly and indirectly, through income inequality reduction. It covers all provinces, as well as distinguishing between provinces within Java and those outside Java. In total, this study used panel data from 34 provinces in Indonesia, covering the period of 2010–2023, using cross-lag autoregressive structural equation modeling (SEM). A novel aspect of this study is the modification of the analytical model to include income inequality as a mediating variable, along with the differentiation of the estimations between provinces within Java and those outside it. This research offers three main contributions: (i) it enriches the literature on the interconnections between economic growth, fiscal policy, inequality, and poverty; (ii) it provides insights for policymakers at both the national and local levels to tailor programs aimed at reducing inequality, differing from those focused on alleviating poverty; and (iii) it could assist local governments in Java and those outside Java in designing programs to alleviate poverty and address income inequality that align with the specific characteristics of their regions.

2. Literature Survey

[Kuznets \(1963\)](#) first studied the determinants of income inequality and its relationship with economic growth. He hypothesized that, in the early stages of economic development, income inequality may increase due to the movement of the economy from the agricultural sector to the industrial sector. However, at a certain level of development, inequality starts to decrease. This hypothesis illustrates the inverted U-shaped relationship between economic growth and income inequality. However, several researchers have questioned this hypothesis. For example, some studies ([Marrero and Servén 2022](#); [Wang et al. 2023](#)) found that the relationship between economic growth and income inequality does not always exhibit an inverted U-shaped pattern. In many nations, data show that economic growth does not consistently change inequality under Kuznets' hypothesis. Therefore, economic development that focuses on increasing outputs without considering income distribution can worsen inequality and hinder poverty reduction ([Kakwani et al. 2000](#)).

Furthermore, the general view on the development of the economy is that economic growth could reduce poverty. It has been empirically proven that there is a positive correlation between economic growth and poverty reduction. The study conducted by

Ravallion and Chen (2022) shows that an increase of 10% in the average living standards could reduce the poverty level by up to 31%. However, their findings only indicate an average trend, and each country may experience different conditions. Traditional views suggest that economic growth impacts all community groups (trickle-down theory), including low-income populations. According to this theory, economic growth will improve the incomes of the whole community and, over time, this impact will also reach low-income groups. However, this approach has been criticized as, in some nations, economic growth does not significantly reduce poverty; this is mainly the case when it is followed by a large gap. Kakwani and Pernia (2000) emphasized the importance of pro-poor development. This approach directly benefits low-income groups and reduces inequality, so it is considered more effective in reducing poverty than economic growth, which relies only on the trickle-down effect. The poverty level is also strongly influenced by the initial income gap level. Large gaps at the initial stage could limit the effectiveness of economic growth in reducing poverty. A study by Ochi (2023) indicates that economic growth reduces poverty when the level of income inequality is below the threshold of 35.28 for low-income countries and 45.15 for middle-income countries. This means that economic growth may not effectively reduce poverty in countries with large initial disparities.

2.1. The Relationship Between Economic Growth, Inequality, and Poverty

The relationship between economic growth, inequality, and poverty is complex and has attracted significant attention among academics. The relationship between these three aspects can be observed from two perspectives. Some studies estimate the effects of economic growth on poverty and inequality (Kouadio and Gakpa 2022; Perera and Lee 2013; Usmanova 2023; Kouadio and Gakpa 2022), while others observe the impacts of poverty and inequality on economic growth (Islam et al. 2017; Cammeraat 2020; Lechheb et al. 2019).

One study focused on the strategies implemented to reduce inequality and poverty through the effects of economic growth. The authors considered whether countries that increased their growth could simultaneously alleviate problems related to inequality and poverty. Numerous empirical studies have examined the impacts of economic growth because, theoretically, it can play a significant role in alleviating poverty and inequality. The correlation between these concepts is empirically inconclusive. Some studies have found that economic growth improves the living standards of low-income groups and reduces the income gap (Iniguez-Montiel and Kurosaki 2018; Bergstrom 2020; Kouadio and Gakpa 2022). Regarding the European Union (EU), Soava et al. (2020) proved Kuznets' hypothesis that high economic growth tends to increase inequality in the early development stages; then, in the final stages, it tends to decrease. Arkum and Amar (2022) employed a panel regression model to study the ASEAN, and their findings support the theory that economic growth could reduce poverty in ASEAN countries. One study (Velkovska and Trenovski 2023) examined 28 UE countries using the VAR model, and they found that economic growth could effectively reduce poverty. Not all previous studies strongly support the influence of economic growth on poverty; these include Adams (2003), who studied 50 developing countries; Usmanova (2023), who considered Uzbekistan; and Ali et al. (2022), who also focused on developing countries. Perera and Lee (2013) observed the effects of economic growth in terms of reducing the income gap in developing countries, and they found that there were no significant differences. Their study supports that of Rejeb (2012) on 52 developing countries.

Previous studies have generally implemented panel data and econometric models to examine developing and developed countries. They have rarely observed the effects of economic growth on inequality and poverty (in the case of individual countries). Moreover, they have mainly focused on the close relationship between economics, poverty, and the income gap.

2.2. The Correlation Between Fiscal Policy, Inequality, and Poverty

For countries that are experiencing problems related to inequality and poverty, fiscal policy is a valuable instrument that should be considered. Numerous empirical studies have estimated the effects of fiscal policy in terms of poverty alleviation and income distribution; these include Higgins (see also [Perera and Lee 2013](#); [Lustig 2018](#); [Lustig et al. 2014](#)). However, not all findings confirm the hypothesis that fiscal policy can reduce inequality and poverty.

Through social protection spending, fiscal policy was found to directly fulfill the needs of low-income populations and reduce income inequality in 26 OECD countries ([Hirvonen et al. 2022](#)). [Adediyan and Omo-Ikirodah \(2023\)](#) applied the ECM model in Nigeria, and the findings showed a significant correlation between fiscal policy and poverty reduction. The most recent study by [Musibau et al. \(2024\)](#) adopted the Bayes model and found that fiscal policy had a statistically significant negative correlation with the income gap at 22% in OECD countries. Redistribution tax could also reduce income inequality ([Jouini et al. 2018](#)). [Malla and Pathranarakul \(2022\)](#) used the Generalized Method of Moments (GMM) and found that progressive tax reduced inequality in developing countries but was not significant in developed countries. In line with this, [Miyashita \(2023\)](#) found that fiscal policy with strict budgeting could reduce the short- and long-term income inequality for cases in the US. It has been found that expenditure reduces poverty, especially regarding education and health ([Nursini 2020](#)). However, this contradicts the findings obtained in Indonesia ([Wicaksono and Amir 2017](#); [Nursini et al. 2018](#)). It was also found that direct and indirect taxes did not directly reduce the incomes of certain ethnic groups in Uruguay, but direct transfer and health transfer lessened the gaps between those of different ethnicities ([Bucheli et al. 2018](#)). This finding is not in line with those of [Higgins and Pereira \(2013\)](#), who found that social expenditure does not influence income distribution in Brazil because most of the recipients are not poor, while the indirect tax paid to low-income groups exceeds the value of the transfers and subsidies that they receive.

2.3. The Correlation Between Income Inequality and Poverty

Other studies have found that poverty is attributed to high income inequality. On the other hand, income inequality influences poverty ([Perkins et al. 2013](#); [Wang et al. 2023](#)). Severe poverty triggers the emergence of gaps ([Amponsah et al. 2023](#); [Lynch et al. 2000](#)). [Lakner et al. \(2022\)](#) found that an annual reduction in the Gini ratio of 1 percent significantly impacts global poverty. This is supported by other studies ([Ali et al. 2022](#); [Asongu and Odhiambo 2023](#); [Cerra et al. 2021](#)), which have found that the income gap statistically influences poverty.

One study found that the weak influence of economic growth and fiscal policy on poverty was caused by the lack of consideration of the interaction between economic growth and the income gap ([Ravallion and Chen 2022](#); [Ravallion 2001](#)). [de Janvry and Sadoulet \(2021\)](#) found that economic growth decreases poverty if the income gap is small, such as that in Latin America. In general, earlier studies have estimated the influence of economic growth and fiscal policy on the income gap and poverty. Nonetheless, the effects of economic growth and fiscal policy in terms of reducing poverty through this gap's reduction have not been considered by many scholars. Meanwhile, observations of economic growth and fiscal policy and their impacts on the income gap and poverty are still predominantly carried out in developed countries, while being limited in developing countries. Developing countries such as Indonesia also need to implement policies based on evidence, so it is essential to investigate such nations individually. Moreover, econometric analyses generally rely on a panel regression model, while the application of autoregressive cross-lagged SEM remains limited.

2.4. Conceptual Framework

Based on the previously described theoretical framework and empirical studies, Figure 1 illustrates the conceptual framework for the relationship between economic

growth, fiscal policy, inequality, and poverty. Economic growth, fiscal policy regarding government expenditure and taxes, and control variables influence poverty directly and indirectly through income inequality.

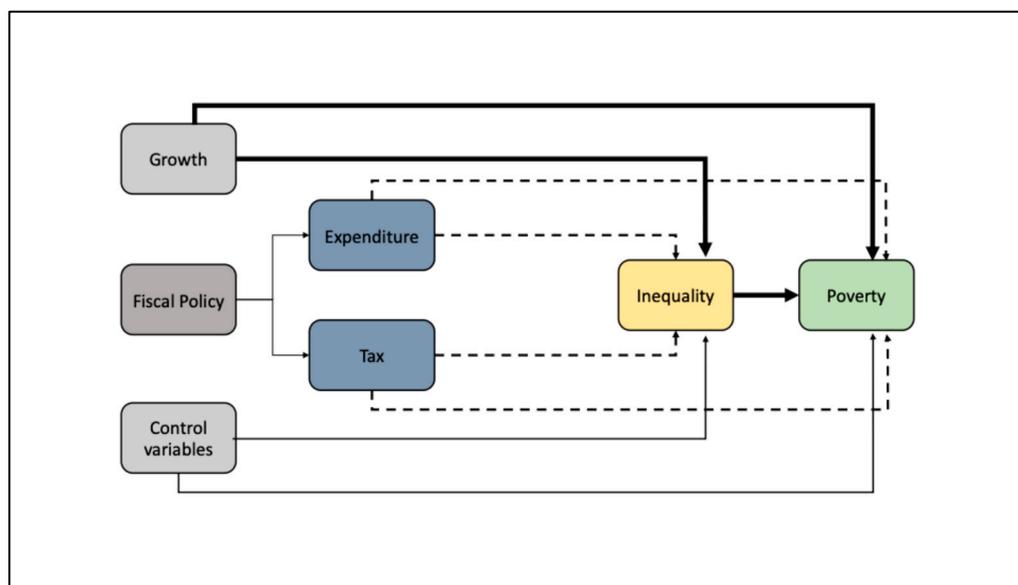


Figure 1. Conceptual framework. Source: authors.

3. Methodology

3.1. Data

The data utilized in this study were obtained from two primary sources: the Indonesian Central Bureau of Statistics (BPS) and the Ministry of Finance. The dataset covers all 34 provinces in Indonesia across the period of 2010 to 2023 (Supplementary Materials). It includes crucial economic indicators such as the gross regional domestic product (GRDP) per capita, fiscal policy measures, income inequality, and poverty rates. The BPS provides detailed data on the socioeconomic conditions, including the income inequality and poverty levels, while the Ministry of Finance supplies data on government expenditure and taxation, representing fiscal policy. The key variables in this study are the GRDP per capita, fiscal policy, income inequality, and poverty. These variables are defined and measured as follows.

- **GRDP per capita:** This is measured via the gross regional domestic product (GRDP) per capita at nominal prices.
- **Income inequality:** Income inequality is measured using the Gini coefficient, which ranges from 0 to 1. A Gini coefficient of 0 indicates perfect equality, while a coefficient of 1 indicates the maximum inequality.
- **Poverty:** Poverty is measured with the poverty rate, defined as the percentage of the population living below the poverty line in each province. The poverty line is determined using the minimum income necessary to meet citizens' basic needs, as defined by the BPS.
- **Fiscal policy:** Fiscal policy is represented by government expenditure and taxation. Government expenditure is measured as the total spending for education and health and for social assistance in millions of rupiah. Taxation is calculated as the total tax revenue collected in each province, also expressed in millions of rupiah.

3.2. Estimation Strategy and Econometric Model

The estimation strategy used is autoregressive cross-lagged SEM. This approach is commonly employed with longitudinal or panel data to analyze the temporal relationships between multiple variables. In this case, the autoregressive feature captures the stability or persistence of each variable over time, allowing us to control for the influence of previous

values of the dependent variables. The cross-lagged component is useful in examining the directional influences between the variables across different periods, helping to identify potential causal relationships. Within this framework, a mediation analysis (such as considering the indirect effect of the GRDP per capita on poverty through the Gini coefficient) is performed, while controlling for these temporal dynamics, offering a robust estimation of the indirect paths over time. This strategy is particularly valuable in distinguishing direct and indirect effects, while accounting for the complex interdependencies and feedback loops between the variables.

The formula for the cross-lagged autoregressive model is derived as follows. This formula outlines the process of estimating the coefficient of each variable and the error variance in the model. For two variables X and Y , measured over two time periods t_1 and t_2 , the structural equations for the autoregressive cross-lagged model are typically

$$X_{t2} = \beta_X X_{t1} + \gamma_Y Y_{t1} + \epsilon_{x_{t2}} \quad (1)$$

$$Y_{t2} = \beta_Y Y_{t1} + \gamma_X X_{t1} + \epsilon_{y_{t2}} \quad (2)$$

where

- β_X and β_Y are autoregressive coefficients (the effects of X and Y on themselves over time);
- γ_X and γ_Y are cross-lagged coefficients (the effect of X on Y and vice versa);
- $\epsilon_{x_{t2}}$ and $\epsilon_{y_{t2}}$ are the residual errors, which are assumed to be normally distributed.

There are two assumptions in this model: (1) errors $\epsilon_{x_{t2}}$ and $\epsilon_{y_{t2}}$ are independent and identically distributed (i.i.d.) with zero mean and constant variance; (2) the residuals follow a multivariate normal distribution. The joint likelihood for the observed data $X_{t1}, Y_{t1}, X_{t2}, Y_{t2}$ is based on the multivariate normal distribution. Let us assume that we observe the variables X and Y for N individuals over two time periods. The joint likelihood for the observed data can be written as

$$L(\theta; X, Y) = \prod_{i=1}^N f(X_{t2}^{(i)}, Y_{t2}^{(i)} | X_{t1}^{(i)}, Y_{t1}^{(i)}; \theta) \quad (3)$$

where $f(\cdot)$ represents the probability density function (PDF) of the multivariate normal distribution, and $\theta = \{\beta_X, \beta_Y, \gamma_X, \gamma_Y, \sigma_{\epsilon_X}^2, \sigma_{\epsilon_Y}^2\}$ are the parameters to be estimated. Given the normality assumption for the residuals ϵ_X and ϵ_Y , the likelihood function is

$$L(\theta) = \prod_{i=1}^N \left(\frac{1}{2\pi \sqrt{|\Sigma|}} \exp\left(-\frac{1}{2}(y_i - X_i\beta)^T \Sigma^{-1}(y_i - X_i\beta)\right) \right) \quad (4)$$

where

- $y_i = \begin{pmatrix} X_{t2}^{(i)} \\ Y_{t2}^{(i)} \end{pmatrix}$;
- $X_i = \begin{pmatrix} X_{t1}^{(i)} & Y_{t1}^{(i)} \\ X_{t1}^{(i)} & Y_{t1}^{(i)} \end{pmatrix}$ (the matrix of the lagged predictors);
- $\beta = \begin{pmatrix} \beta_X & \gamma_Y \\ \gamma_X & \beta_Y \end{pmatrix}$ (the matrix of coefficients);
- Σ is the covariance matrix of the errors, which is assumed to be diagonal with $\sigma_{\epsilon_X}^2$ and $\sigma_{\epsilon_Y}^2$ as the variances of the residuals for X .

Moreover, the log-likelihood function is highly suitable for MLE. Taking the log of the likelihood function, we have

$$\log L(\theta) = -\frac{N}{2} \log(2\pi) - \frac{N}{2} \log |\Sigma| - \frac{1}{2} \sum_{i=1}^N (y_i - X_i\beta)^T \Sigma^{-1} (y_i - X_i\beta) \quad (5)$$

where $|\Sigma|$ is the determinant of the covariance matrix of residuals. The term $(y_i - X_i\beta)$ represents the residuals (i.e., the difference between the observed outcomes and the predicted values). To obtain the MLE estimates for β_X , β_Y , γ_X , and γ_Y , we need to maximize the log-likelihood function with respect to $\theta = \{\beta_X, \beta_Y, \gamma_X, \gamma_Y, \sigma_{\epsilon_X}^2, \sigma_{\epsilon_Y}^2\}$. This involves solving the following system of equations (the first-order conditions for maximization):

$$\frac{\partial \log L(\theta)}{\partial \beta_X} = 0, \quad \frac{\partial \log L(\theta)}{\partial \beta_Y} = 0, \quad \frac{\partial \log L(\theta)}{\partial \gamma_X} = 0, \quad \frac{\partial \log L(\theta)}{\partial \gamma_Y} = 0 \quad (6)$$

This yields the MLE estimates for the coefficients β_X , β_Y , γ_X , γ_Y and the residual variances $\sigma_{\epsilon_X}^2$, $\sigma_{\epsilon_Y}^2$. Based on this estimation strategy, the econometric model can be derived, focusing on the relationships between fiscal policy, the GRDP per capita, income inequality, and poverty. This model is designed to explore both the direct and indirect effects of the GRDP per capita and fiscal policy on poverty and income inequality. In this model, we consider income inequality as a mediating variable. The econometric model consists of two main equations.

1. Income Inequality Equation:

$$Inequality_{it} = \alpha_1 Inequality_{it-1} + \beta_1 Poverty_{it-1} + \beta_2 GRDPpercapita_{it-1} + \beta_3 FiscalPolicy_{it-1} + X_{it-1}\gamma + \mu_i + \epsilon_{it} \quad (7)$$

where

- $Inequality_{it}$: Gini coefficient in province i at time t ;
- $Inequality_{it-1}$: Gini coefficient in province i at time $t - 1$;
- $Poverty_{it-1}$: poverty rate in province i at time $t - 1$;
- $GRDPpercapita_{it-1}$: GRDP per capita in province i at time $t - 1$;
- $FiscalPolicy_{it-1}$: fiscal policy measure in province i at time $t - 1$;
- $\alpha_1, \beta_1, \beta_2, \beta_3, \gamma$: coefficients;
- X_{it-1} : vector of control variables in province i at time $t - 1$;
- μ_i : province-specific fixed effects;
- ϵ_{it} : error term.

2. Poverty Equation:

$$Poverty_{it} = \alpha_2 Poverty_{it-1} + \beta_4 Inequality_{it-1} + \beta_5 GRDPpercapita_{it-1} + \beta_6 FiscalPolicy_{it-1} + X_{it-1}\gamma + \mu_i + \epsilon_{it} \quad (8)$$

where

- $Poverty_{it}$: poverty rate in province i at time t ;
- $Poverty_{it-1}$: poverty rate in province i at time $t - 1$;
- $Inequality_{it-1}$: income inequality in province i at time $t - 1$;
- $GRDPpercapita_{it-1}$: GRDP per capita in province i at time $t - 1$;
- $FiscalPolicy_{it-1}$: fiscal policy measure in province i at time $t - 1$;
- $\alpha_2, \beta_4, \beta_5, \beta_6, \gamma$: coefficients;
- X_{it-1} : vector of control variables in province i at time $t - 1$;
- μ_i : province-specific fixed effects;
- ϵ_{it} : error term.

The autoregressive components α_1 and α_2 account for the persistence of income inequality and poverty over time. The cross-lagged terms β_1, β_2 , etc., capture the influence of the lag of the independent variable on the income inequality and poverty in subsequent periods. The fixed effects μ_i are included to control for unobserved heterogeneity across provinces. Incorporating provincial fixed effects into this model plays a crucial role in enabling it to address potential endogeneity issues.

In addition, to calculate the indirect effect of the GRDP per capita and fiscal policy on poverty using income inequality as a mediating variable, we multiply the coefficients in Equations (7) and (8). Regarding the indirect effect of the GRDP per capita, we multiply

the coefficient of the GRDP per capita on income inequality (β_2) in Equation (7) with the coefficient of income inequality on poverty (β_4) from Equation (8). In addition, regarding the indirect effect of fiscal policy, we multiply the coefficient of fiscal policy on income inequality (β_3) in Equation (7) with the coefficient of inequality on poverty (β_4) from Equation (8).

To test the significance of the indirect effect variables, we employ the Sobel test. To do this, we need to calculate the standard error of the indirect effect variable using the standard errors of the respective variables. For example, to calculate the standard error of the indirect effect of the GRDP per capita on poverty, we need the standard errors of β_2 and β_4 , denoted as $SE\beta_2$ and $SE\beta_4$, respectively. Then, the formula for the standard error of the indirect effects is

$$SE_{Indirect} = \sqrt{(\beta_4^2 \cdot SE_2^2) + (\beta_2^2 \cdot SE_4^2)} \quad (9)$$

After we have obtained the coefficient and standard error of the indirect effect, we compute the Z-statistic using the following formula:

$$Z = \frac{Indirect\ Effect}{SE_{Indirect}} \quad (10)$$

4. Results and Discussion

4.1. Descriptive Statistics

Table 1 provides a view of the key socioeconomic variables used in the analysis. The Gini index indicates moderate income inequality, while the poverty rate varies significantly across different regions. Economic indicators such as the GRDP per capita, government expenditure on education, health, and social safety nets, and tax revenues highlight the varying levels of economic development and public investment. Investment also shows substantial variability, indicating differences in the capital inflows among different regions. These variables capture important aspects of the regional disparities in income, poverty, and government spending, which are crucial in understanding the dynamics of inequality and poverty.

Table 1. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Gini	476	0.359	0.041	0.245	0.459
Poverty Rate	476	11.386	6.139	3.42	36.8
Ln GRDP per Capita	476	3.489	0.573	2.232	5.258
Ln Govt Expenditure for Education and Health	476	8.899	0.897	5.878	11.134
Ln Govt Expenditure on Social Safety Net	476	5.602	0.766	3.227	8.268
Ln Tax Revenue	476	7.548	1.371	2.678	10.683
Ln Investment	476	8.868	1.686	3.195	12.282

Source: authors' calculations.

The map in Figure 2 illustrates the distribution of the poverty rates across Indonesia's provinces, with darker shades indicating higher poverty levels. The eastern regions, including Papua and several provinces in Sulawesi and Nusa Tenggara, show the highest poverty rates, ranging from 12.41% to 26.03%. In contrast, the western provinces, such as those in Java and Southern Sumatra, tend to have lower poverty rates, with some areas reporting figures as low as 4.25% to 6.17%. The large contrasts in the poverty levels highlight the regional disparities, where the eastern regions of Indonesia face significantly greater economic challenges than the more developed western regions. This pattern suggests the need for targeted poverty alleviation programs focusing on the eastern provinces.

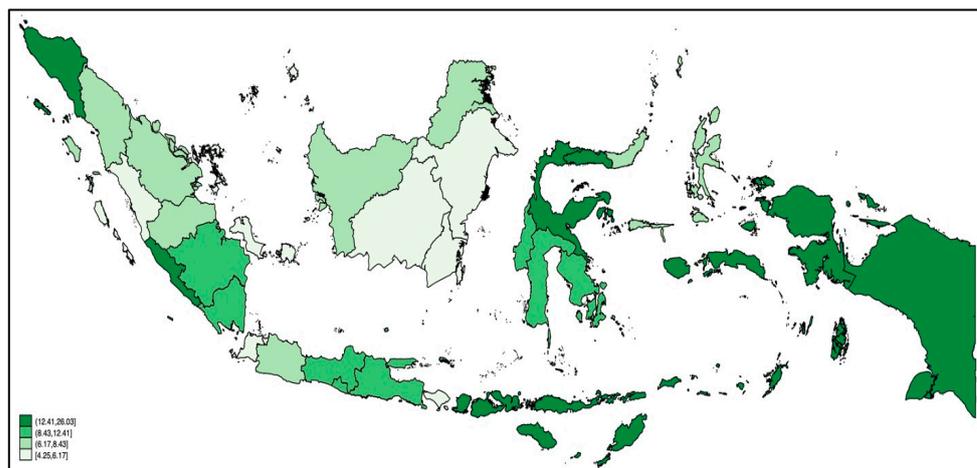


Figure 2. The distribution of the poverty rate across provinces in Indonesia in 2023.

In addition, the map in Figure 3 shows the income inequality distribution across the Indonesian provinces, measured in terms of the Gini coefficient. The provinces shaded in dark green have the highest Gini coefficients, ranging from 0.371 to 0.449, indicating greater income inequality. These high-inequality areas are concentrated in Java, Sulawesi, and Papua. In contrast, the provinces shown in light green, such as Bali and West Nusa Tenggara, have Gini coefficients between 0.245 and 0.313 and show lower levels of income inequality, reflecting their more equitable income distribution. This map highlights the regional variations in inequality across Indonesia, with some areas experiencing significantly larger income disparities. These patterns suggest the need for targeted policies to address income inequality, particularly in the provinces with the highest Gini coefficients.

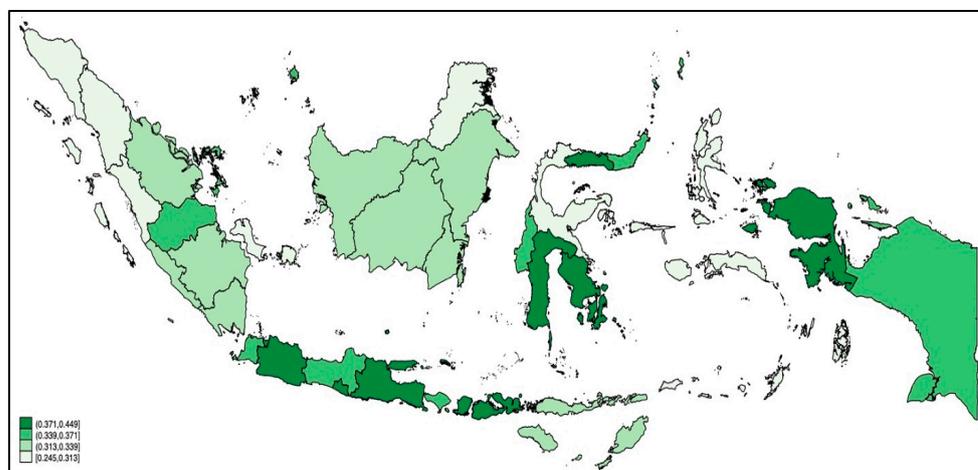


Figure 3. The distribution of the Gini coefficient across provinces in Indonesia in 2023.

The comparison between the poverty and Gini coefficient distributions across Indonesia reveals that regions with higher income inequality, such as Papua, Sulawesi, and parts of Java, also tend to have higher poverty rates. This suggests a connection between unequal income distribution and the persistence of poverty in these areas. In contrast, provinces with lower Gini coefficients, such as Bali and West Nusa Tenggara, show more equitable income distribution and tend to have lower poverty rates. This relationship indicates that income inequality may exacerbate poverty, highlighting the need for integrated policies that address income distribution and poverty reduction to promote more balanced regional development across Indonesia.

4.2. Regression Analysis

4.2.1. Regression Results for All Provinces

The impact of the GRDP per capita on poverty and inequality is assessed in terms of both direct and indirect effects, as shown in the Table 2. Regarding the direct effect, the pathway from $\ln\text{GRDPperCapita}$ to Poverty shows a significant negative relationship, with a coefficient of -0.2013 . This suggests that the poverty level decreases as the GRDP per capita increases, while keeping the other factors constant. However, the pathway from $\ln\text{GRDPperCapita}$ to Inequality is insignificant, as the coefficient is 0.0001 . This indicates that changes in the GRDP per capita do not directly and significantly impact inequality. Regarding the indirect effects, the pathway from $\ln\text{GRDPperCapita}$ to Inequality to Poverty has a coefficient of 0.0001 , suggesting that the impact of the GRDP per capita on poverty through inequality is negligible and statistically insignificant.

Table 2. Regression results for all provinces.

	Inequality Equation (Direct Effect)	Poverty Equation (Direct Effect)	Indirect Effect on Poverty Through Inequality
Inequality _{t-1}	0.8335 *** (0.0269)	1.3333 (0.8742)	
Poverty _{t-1}	0.0006 *** (0.0002)	0.9355 *** (0.0071)	
$\ln\text{GRDPper capita}_{t-1}$	0.0001 (0.0023)	-0.2013 *** (0.0736)	0.0001 (0.0019)
Tax _{t-1}	0.0070 *** (0.0018)	-0.0219 (0.0587)	0.0058 ** (0.0015)
Gov Education and Health _{t-1}	-0.0073 * (0.0041)	-0.3074 ** (0.1313)	-0.0061 * (0.0034)
Gov Social Assistance _{t-1}	0.0006 (0.0036)	0.4427 *** (0.1172)	0.0005 (0.003)
Investment _{t-1}	-0.0008 (0.0010)	0.0197 (0.0316)	-0.0007 (0.0008)
COVID-19 _{t-1}	-0.0015 (0.0024)	0.4137 *** (0.0771)	-0.0013 (0.002)
Constant	0.0667 *** (0.0196)	0.7547 (0.6343)	
N	476	476	476

*** significant at 1%, ** significant at 5%, * significant at 10%. Standard errors in parentheses.

The results in Table 2 also highlight the impact of tax ($\ln\text{Tax}$) on income inequality and poverty, focusing on both direct and indirect effects. Regarding the direct impact, the relationship between Tax and Poverty is weak, with a coefficient of -0.0219 , indicating that there is no significant direct influence of tax on poverty. In contrast, the pathway from $\ln\text{Tax}$ to Inequality shows a positive and significant coefficient of 0.0070 , suggesting that tax increases contribute to greater income inequality. This could imply that tax policies are regressive or that the tax burden disproportionately affects lower-income groups, leading to rising inequality. Regarding the indirect effects, the pathway from $\ln\text{Tax}$ to Inequality to Poverty shows a positive coefficient of 0.0058 but with a p -value of less than 5 percent, indicating that taxes may slightly increase poverty via their influence on inequality.

The results in the Table 2 also reflect the impact of government expenditure on education and health (LnHealtheduc) on inequality and poverty, considering both the direct and indirect effects. Regarding the direct effects, the pathway from LnHealtheduc to Poverty shows a significant negative relationship, with a coefficient of -0.3074 . This suggests that increased government spending on education and health significantly reduces poverty. However, the direct impact of LnHealtheduc on Inequality is not statistically significant, with a coefficient of -0.0073 . This indicates that government expenditure on education and health does not directly or meaningfully influence inequality, although it shows a slight negative trend. Regarding the indirect effects, the pathway from LnHealtheduc to Inequality to Poverty is not significant. This implies that the indirect effect of reducing inequality through education and health spending does not significantly impact poverty.

In addition, the results for government expenditure on social safety nets (LnSocnet), shown in the Table 2, reveal a counterintuitive relationship between spending and poverty. The direct effect of LnSocnet \rightarrow Poverty shows a positive coefficient of 0.4427 , with a highly significant p -value of 0.000 . This indicates that increased government spending on social safety nets is associated with increased poverty levels, which may suggest inefficiencies in allocating or targeting these resources. A possible explanation is that higher poverty levels lead to increased social safety net spending or that social safety nets do not effectively reduce poverty as intended. Regarding inequality, the direct pathway of LnSocnet \rightarrow Inequality shows an insignificant effect, with a coefficient of 0.0006 . This suggests that government expenditure on social safety nets does not directly impact income inequality. In addition, the indirect pathway of LnSocnet \rightarrow Poverty \rightarrow Inequality reveals an insignificant effect (with a coefficient of 0.0005), indicating that government spending on social safety nets does not indirectly increase inequality through its impact on poverty.

4.2.2. Regression Results for Heterogenous Impact on Poverty and Inequality Based on Region

Performing separate regressions for Java and non-Java provinces allows us to capture distinct socioeconomic and regional dynamics that might otherwise be masked in a combined analysis. Java and non-Java provinces have different economic structures, levels of development, and demographic characteristics. Java is more urbanized, industrialized, and economically developed, while non-Java regions tend to be more rural and dependent on agriculture. These differences can lead to varying relationships between economic growth, inequality, and poverty. The regression results in Table 3 reveal notable differences in how various factors affect poverty in Java and non-Java provinces. In Java provinces, inequality has an insignificant direct effect on poverty, as indicated by the small coefficient (0.4253) and large standard error, suggesting that inequality does not significantly drive poverty changes in this region. In contrast, in non-Java provinces, inequality plays a critical role, with a significant, positive, direct effect on poverty (with a coefficient of 2.3991), implying that higher inequality is strongly associated with increasing poverty levels in non-Java provinces. This divergence highlights that inequality is a more pressing issue in non-Java regions, where reducing inequality may be critical for poverty alleviation efforts.

Economic growth, measured as LnGRDPperCapita, shows a more significant effect in non-Java provinces, where it significantly reduces poverty, with a coefficient of -0.2553 . This suggests that, in these regions, poverty decreases as the economy grows, emphasizing the importance of growth-focused policies for poverty reduction outside Java. However, in Java, economic growth's direct effect on poverty is insignificant, indicating that economic growth alone may not be sufficient for meaningful poverty reduction in this region. The impact of taxation is marginal and insignificant in both areas.

Government expenditure on education and health also shows differential effects. In non-Java provinces, this spending has a significant direct effect in terms of reducing poverty, as indicated by the negative coefficient (-0.3810). This contrasts with the results for Java, where the direct impact could be more important and significant. Furthermore, no statistical

significance is found for any independent variable when estimating the indirect effect on poverty through inequality in both Java and non-Java provinces.

Table 3. Regression results based on region.

	Java Provinces			Non-Java Provinces		
	Inequality Equation (Direct Effect)	Poverty Equation (Direct Effect)	Indirect Effect on Poverty Through Inequality	Inequality Equation (Direct Effect)	Poverty Equation (Direct Effect)	Indirect Effect on Poverty Through Inequality
Inequality _{t-1}	0.7175 *** (0.0704)	0.4253 (2.0755)		0.7975 *** (0.0321)	2.3991 ** (1.0854)	
Poverty _{t-1}	0.0005 (0.0009)	0.9354 *** (0.0247)		0.0008 *** (0.0002)	0.9311 *** (0.0079)	
lnGRDPper capita _{t-1}	0.0082 (0.0062)	-0.2131 (0.1767)	0.0035 0.0172	0.0013 (0.0026)	-0.2553 *** (0.0848)	0.0031 (0.0064)
Tax _{t-1}	-0.0079 (0.0105)	0.2781 (0.3019)	-0.0034 (0.0170)	0.0034 (0.0022)	0.0445 (0.0723)	0.0082 (0.0064)
Gov Education and Health _{t-1}	-0.0034 (0.0100)	-0.2622 (0.2869)	-0.0014 (0.0082)	-0.0044 (0.0050)	-0.3810 ** (0.1671)	-0.0106 (0.0129)
Gov Social Assistance _{t-1}	0.0064 (0.0060)	0.2333 (0.1728)	0.0027 (0.0135)	-0.0026 (0.0045)	0.5324 *** (0.1502)	-0.0062 (0.0112)
Investment _{t-1}	-0.0001 (0.0028)	-0.1083 (0.0799)	0.0000 (0.0012)	0.0002 (0.0011)	0.0274 (0.0367)	0.0005 (0.0026)
COVID-19 _{t-1}	0.0041 (0.0043)	0.4969 *** (0.1255)	0.0017 (0.0087)	-0.0032 (0.0028)	0.3858 *** (0.0945)	-0.0077 (0.0076)
Constant	0.1452 *** (0.0450)	0.4036 (1.3008)		0.0828 *** (0.0234)	0.2685 (0.7799)	
N	98	98		378	378	

*** significant at 1%, ** significant at 5%. Standard errors in parentheses.

4.3. Discussion

The findings of this study provide important insights into the dynamics between economic growth, fiscal policy, income inequality, and poverty in Indonesia. The results show that economic growth, as measured with the GRDP per capita, has a direct and significant impact in terms of reducing poverty. This aligns with the broader literature, which highlights the role of economic growth in improving the living conditions of people with low incomes, as seen in previous studies (Islam et al. 2017; Ravallion and Chen 2022; Iniguez-Montiel and Kurosaki 2018). However, the present study also indicates that economic growth alone cannot fully address poverty. While economic growth reduces poverty, its indirect effect on poverty through reducing inequality remains limited. This suggests that although economic growth helps to alleviate poverty, the benefits are not evenly distributed across different segments of society.

Furthermore, this study finds no significant relationship between economic growth and income inequality, challenging the classical Kuznets hypothesis, which suggests that income inequality first increases and then decreases as economies develop. Instead, the findings resonate with criticisms of the Kuznets hypothesis, such as those of Marrero and Servén (2022), Wang et al. (2023), and Kakwani et al. (2000), who argue that growth does not consistently reduce inequality, particularly when the benefits of growth are concentrated in specific sectors or regions. In Indonesia, this growth appears to be unevenly distributed,

with certain areas or industries benefiting more than others, leaving inequality relatively unchanged. This finding underscores the need for more targeted policies to reduce these disparities beyond simply fostering economic growth.

Interestingly, this study also highlights the regressive nature of Indonesia's tax system. The findings suggest that tax revenue is associated with increased income inequality, indicating that the current tax structure may disproportionately burden lower-income households. This contradicts the theoretical expectation that taxation, particularly progressive taxation, should reduce inequality by redistributing wealth. Instead, the results align with the findings of [Kunawotor et al. \(2022\)](#), which suggest that, when the tax-to-GDP ratios are low, fiscal policy is less effective in reducing inequality. Moreover, this study finds that the indirect effect of taxes on poverty through inequality is insignificant, indicating that, while taxation increases inequality, it does not necessarily worsen poverty. This highlights the need for more equitable tax policies that do not disproportionately affect low-income populations.

Fiscal policy—particularly government expenditure on education and health—is critical in reducing poverty. This study shows that increased spending on these sectors directly lowers the poverty levels, which aligns with studies by [Nursini and Tawakkal \(2019\)](#) and [Jouini et al. \(2018\)](#), who emphasize the importance of social spending in improving labor productivity and economic outcomes for low-income populations. However, this study finds that while social spending directly reduces poverty, it has a less significant impact on income inequality. This result suggests that, while these expenditures improve the living standards, they are less effective in addressing the structural inequalities that persist in society, echoing the concerns raised by [Bucheli et al. \(2018\)](#) on the limitations of social programs in reducing inequality.

An unexpected finding in this study is the positive relationship between poverty and government expenditure on social safety nets. Contrary to our expectations, increased spending on social safety nets is associated with higher poverty levels. This counterintuitive result may reflect inefficiencies in designing or implementing social safety net programs, suggesting that these resources may not reach the most vulnerable populations. This finding aligns with the concerns of [Wicaksono and Amir \(2017\)](#), who argued that poorly targeted social programs might increase the degree of dependency rather than alleviating poverty. Furthermore, this study finds that social safety net spending, while aimed at reducing poverty, may indirectly increase inequality. This suggests that the current structure of social safety nets may not effectively address the underlying causes of inequality, and more targeted interventions are necessary to achieve poverty reduction and equity goals.

5. Conclusions

This study shows that economic growth, as measured via the GRDP per capita, significantly reduces poverty but has little impact on income inequality. Government expenditure on education and health effectively lowers poverty, highlighting the importance of social investments. However, these policies have limited success in reducing inequality. This study also finds that Indonesia's tax system tends to increase inequality, and social safety net spending is associated with higher poverty levels, indicating inefficiencies in program implementation. According to these results, policymakers should focus on promoting inclusive growth that benefits lower-income groups to address both poverty and inequality. The increased spending on education and health should continue, with improvements in terms of targeting social safety nets to ensure that these resources reach the most vulnerable. Additionally, tax reforms are needed to ensure that the system is more progressive and to reduce inequality. The focus on provincial-level data is a limitation of this study, as they may cause us to overlook local disparities. Future research should explore these variations at the regency/city level. Additionally, further investigation is needed regarding the counterintuitive relationship between social safety nets and poverty, potentially through qualitative assessments of program implementation.

Supplementary Materials: The following supplementary material contains the dataset used for analysis in this manuscript. It can be downloaded at: https://docs.google.com/spreadsheets/d/1uwyIbXJJWD_QfuEtRq0xqimx9XjnD07I/edit?usp=sharing&ouid=111172963724238337782&rtfpof=true&sd=true, accessed on 27 September 2024.

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Informed Consent Statement: All data and information provided have been approved by all authors. This study observed important variables related to reducing poverty and inequality, but the researchers did not have direct contact with low-income groups, so there was no agreement provided by these groups regarding this information. The analysis only focused on secondary data processing using a regression model.

Data Availability Statement: This study used quantitative data sourced from the Indonesian Statistics Agency (BPS) through the BPS website (<https://www.bps.go.id/id>, accessed on 10 May 2024); <https://www.bps.go.id/id/statistics-table?subject=531> (accessed on 10 May 2024) and the Ministry of Finance Directorate General of Fiscal Balance (DJPK) (<https://djpk.kemenkeu.go.id>, accessed on 11 May 2024) (<https://djpk.kemenkeu.go.id/?p=5412>, accessed on 11 May 2024). The data sourced from the BPS included poverty rates, inequality, and economic growth. The data from the DJPK reflected government spending on education and health, social protection, and taxes for each district, city, and province throughout Indonesia.

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