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The effect of economic growth on income inequality in the Special Region of Yogyakarta

Nurul Azizah Az zakiyyah, Rifki Khoirudin* and Altis Puspa Gatari

Abstract: This study focuses on income disparity and economic growth in the Yogyakarta Special Region. The area's slow economic expansion contributes to persistent income inequality. Using variables such as population, economic growth, district/city minimum wage, inflation, open unemployment rate, and income inequality, this study investigates the relationship between economic growth and income disparity. A quantitative approach is employed using panel data regression and Seemingly Unrelated Regression (SUR) on secondary data from the Central Bureau of Statistics (BPS). The results show that district minimum wage and open unemployment rate significantly and positively affect income inequality, while inflation, economic growth, and population size have no significant effect. These findings imply that inclusive development policies, equitable job creation, and wage regulations that consider the informal sector are essential for reducing regional income disparities in Yogyakarta.

Keywords: Income inequality, economic growth, Yogyakarta
JEL Classification: E0; E6; H0

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Introduction

One of the issues that frequently arises and is challenging to address in developing nations is economic disparity. Economic disparity and inequality are frequently a significant problem for developing nations, according to (Tambunan, 2001). The unequal distribution of income between high and low income groups is one of its causes (Yuniarti & Sukarniati, 2021). Yogyakarta's Special Province faces numerous trade-offs between income disparity and economic progress. This phenomenon implies that Yogyakarta Special Region's economic growth has not yet attained a sufficient level. However, adequate growth does not only include economic aspects, but also includes equitable distribution of development results and their effectiveness.

In general, every company has the desire to expand its business, this is done by expanding. To carry out this expansion, the company requires quite a large amount of additional capital. In order to meet the large funding needs, often the funds taken from within the company are not

enough. For this reason, efforts are needed to find sources of funds from outside the company, namely in the capital market, by issuing shares (Khoirudin & Musta'in, 2020). Purwanti (2024) states inclusive growth not the main factor in reducing inequality. Maurilla et al (2023) also states that there is no causal relationship between income inequality and economic growth, but minimum wage plays important role to reduce income inequality. Rizal & Mustapita (2024) reported that minimum wage can reduce inequality through increases welfare for employment. While Riyanto et al (2025) explains that the minimum wage policy can improve workers' welfare, protect workers from uncertainty and increase productivity.

According to (Anggraini, 2024) inclusive growth is a type of economic growth that increases opportunities and equal accessibility for all levels of society. This includes efforts to reduce income inequality (Muhammad & Rohtih, 2024). Thus, it is expected that inclusive growth can overcome development challenges by focusing on increasing economic growth, creating jobs, and reducing inequality and poverty. The Special Province of Yogyakarta, which has the lowest level of income inequality in Indonesia, indicates that employment, poverty, and the city minimum wage (MSW) in this province are still inadequate compared to other provinces in Indonesia. Income disparity is a significant issue for MSEs in Yogyakarta Special Region due to the low district/city minimum wage and the unequal distribution of income. Figure 1 showing the proportion of income inequality in Yogyakarta's Special Region from 2019 to 2024.

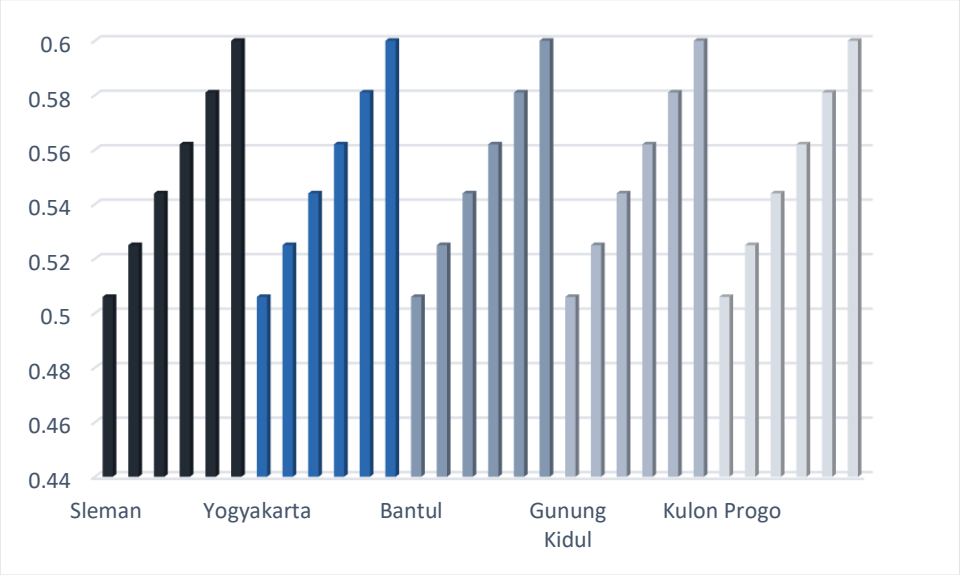

Figure 1 Percentage of Income Inequality in Yogyakarta from 5 Regencies/city 2019-2024

The Figure 1illustrates income inequality levels across five regions in Yogyakarta: Sleman, Yogyakarta City, Bantul, Gunung Kidul, and Kulon Progo. Each region is represented by a group of bars showing data progression, most likely over time. From the Figure 1, it is evident that Bantul, Gunung Kidul, and Kulon Progo show the highest levels of income inequality, with their final bars reaching approximately 0.60 on the inequality index. This

suggests a more unequal distribution of income in these areas compared to others. In contrast, Sleman consistently shows the lowest inequality values, starting around 0.50, indicating a relatively more equal income distribution among the five regions. Yogyakarta City shows a steady increase over time but remains slightly lower than Bantul and Gunung Kidul at the peak. Overall, the Figure 1 indicates a general upward trend in income inequality across all regions, signaling a growing disparity that may require targeted policy intervention.

Recent data shows that inflation, open unemployment rate (Unemp), district/municipality minimum wage (UMK), Yogyakarta Special Region's population and economic growth are still erratic, which could lead to economic uncertainty, especially in terms of income inequality. This condition raises serious concerns for the people of the Special Region of Yogyakarta where income is not proportional to the price of primary needs because the district / city minimum wage income in DIY is very small and staples are the same as prices throughout Indonesia so that for comparison it is very unlikely to meet daily needs. Income inequality is not only limited to the national scope, but also at a broad regional level (RENI, 2023). However, DIY Province, which only consists of 5 regions, namely 4 regencies and 1 city, has the highest level of inequality in Indonesia. Looking back over the past few years, in 2013 the province was the second highest in Indonesia in terms of disparity (Hartini, 2017). According to Bourguignon (2004) in the *World Bank Economic Review*, income inequality persists even in growing economies if the benefits of growth are not equitably distributed. This emphasizes that growth alone is not sufficient without inclusive policies

Transmission through inflationary countries land ownership is an investment and is used as a hedge against inflation (Kurniawan et al., 2023). In 2018 and 2019, DIY Province still topped the rankings compared to Gorontalo, West Java, Southeast Sulawesi, and DKI Jakarta (Risdiyanto et al., 2023). Every type of collaboration has benefits and drawbacks, as well as reciprocal trade-offs; the local government's goals for asset development will determine which model is best (Khoirudin et al., 2021). Previous studies have generally used conventional approaches and have not discussed income inequality specifically in the Special Region of Yogyakarta. In fact, Yogyakarta is the province with the highest level of inequality despite its small area and high GRDP. The novelty of this study lies in the use of the Seemingly Unrelated Regression (SUR) method to analyse the simultaneous relationship between macroeconomic variables and inequality, as well as the finding that economic growth is not significant in reducing inequality - contrary to the assumptions of Kuznets' theory.

Research Method

This study utilizes panel data by combining cross-sectional data from five regencies/cities in the Yogyakarta Special Region with time series data from 2012 to 2022, using secondary data obtained from the Central Bureau of Statistics (BPS). The dependent variable in this study is income inequality measured using the Gini Index, which is a statistical measure that shows the inequality of income distribution, with values ranging from 0 (perfect

equity) to 1 (perfect inequality). Meanwhile, the independent variables consist of several macroeconomic indicators. First, economic growth, which is measured based on the percentage change in Gross Regional Domestic Product (GRDP) at constant prices from year to year. Second, district/city minimum wage (DMW) which reflects the annual minimum wage level in each region, expressed in rupiah. Third, inflation, which shows the general rate of increase in the prices of goods and services in a certain period, measured in percentage based on data from the Consumer Price Index (CPI). Fourth, the open unemployment rate (Unemp), which is the percentage of the labour force that has not yet obtained a job but is actively seeking work. Finally, population, which is the total population per year in each region, is used to see the effect of population quantity on income inequality. All data were obtained from official BPS publications and statistically processed using the panel data method.

The research design carried out by the author is quantitative with a descriptive research design. Descriptive research focuses on depiction research objects along with phenomena and events coherently and clearly based on the information obtained from informants. One form of descriptive analysis is the activity of explaining as well summarize large amounts of raw data, so that the results can be interpreted (Khoirudin & Khasanah, 2018). Descriptive analysis is analysis that aims to describe one or more variables without the need to compare or look for relationships between variables. Descriptive research is intended to provide an overview of certain facts or populations in a systematic, current and careful manner (Sutrisno et al., 2023).

A group of methods known as spatial descriptive analysis are used to examine data from a spatial perspective and re-present it in a way that is easier to understand. Using numerical data to gather, examine, and characterize information is the foundation of quantitative research. This method uses statistical techniques to measure variables, with the aim of obtaining a systematic understanding of the correlation of variables and testing previously formulated hypotheses. This type of research emphasizes the use of quantitative data that can be measured objectively. The aim is to present statistical descriptions, identify patterns or trends, and test associations or causality between variables. This study analyse the income inequality and the based equation as follows:

$$Inequality = f(Inf, Unemployment, Minimum\ Wage, Growth\ and\ Population)$$

Where the inequality is gini ratio, Inf is the general rate of increase in the prices of goods and services in a certain period, Unemployment is the percentage of unemployment, minimum wage is the regional minimum wage based on province, growth is the economic growth and population is the total population each province. The data used in this study collide in time-series and cross-section. Panel data used for combining data based on time-series and cross-section. The equation for panel data as follows:

$$Inequality_{it} = \alpha_0 + \beta_1 Inf_{it} + \beta_2 Unemployment_{it} + \beta_3 Minimum\ Wage_{it} + \beta_4 Growth_{it} + \beta_5 Population_{it} + \varepsilon_{it}$$

Where α_0 is the constanta, $\beta_1 - \beta_5$ is the coefficient of independent variables, ε is the error term, i notation for cross-section and t is notation for time-series data. The Seemingly Unrelated Regression (SUR) method was selected for this study due to its efficiency in estimating multiple regression equations simultaneously while accounting for potential correlations among error terms. Unlike traditional regression methods such as Ordinary Least Squares (OLS), which assume independent error terms across equations, SUR is more appropriate when residuals are likely to be contemporaneously correlated. This feature allows the model to produce more accurate and efficient parameter estimates (Khasanah & Kurniawan, 2024). Additionally, SUR enables the simultaneous analysis of multiple macroeconomic variables influencing income inequality, making it highly suitable for capturing the complex empirical relationships present in the context of the Special Region of Yogyakarta.

Seemingly Unrelated Regression (SUR)

This research applies the SUR panel weighing method designed by Arnold Zellner in 1962. The SUR method is part of Generalized Least Squares (GLS) and is included in multiple linear regression analysisIn a set of such equations, the SUR model estimates parameters efficiently. Kapetanios & Pesaran (2007) in *Econometric Reviews*, show that the SUR model provides more efficient estimates when cross-sectional dependence is present. A typical SUR model is constructed as follows, consisting of M multiple regression equations

$$y_1 = X_i\beta_1 + \varepsilon_1, \; i = 1,2,3, \ldots \ldots, M$$

Here yi is T-dimension vector with elements yti, Xi is T × Ki matrix represents explanatory variable's T-th observation in the i-th equation; and βi is ki vector, εi is T disturbance vector with the expanded form like:

$$\begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_m \end{pmatrix} = \begin{pmatrix} X_1 & 0 & \cdots & 0 \\ 0 & X_2 & & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & X_m \end{pmatrix} \begin{pmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_m \end{pmatrix} + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_m \end{pmatrix}$$

Moreover, for estimation it requires that the variance of all εti is constant, the contemporaneous covariance between εti and εtj is constant for all time, and intertemporal covariance of εti is zero. The estimation should be implemented with multistep maximum likelihood method (Nguyen & Nguyen, 2010).

Result and Discussion

Before conducting quantitative regression analysis, a descriptive analysis was carried out to understand the general overview of each variable. This analysis aims to identify trends and data distribution as a basis for assessing the potential relationships between economic variables empirically. The descriptive results serve as an initial foundation for

evaluating the patterns of relationships that are later tested using panel regression with the Seemingly Unrelated Regression (SUR) method.

Table 1 Descriptive Analysis

Variable	Obs	Mean	Std. dev	Min	Max
Inequality	50	-.937	0.120	-1.217	-0.655
Inf	60	3.788	1.791	1.4	8.28
Unemployment	60	3.793	1.80	1.09	9.16
Minimum Wage	60	14.18	0.280	13.70	14.65
Growth	60	4.803	2.263	-4.06	13.49
Population	60	13.45	.436	12.89	14.07

Based on descriptive analysis in Table 1, the average income inequality stands at -0.9379 with a standard deviation of 0.1209, indicating relatively small variations between regions. Inflation and the open unemployment rate (Unemp) each have an average of 3.79% with a fairly large spread, reflecting the differences in economic conditions between districts/municipalities. The district/municipality minimum wage (UMK) is relatively stable with an average of IDR 14.19 million and a low standard deviation, indicating a small wage gap in the study areas. Economic growth showed high fluctuations, with a low of -4.06% and a high of 13.49%, possibly influenced by the impact and recovery after the pandemic. Meanwhile, population is relatively evenly distributed between regions with an average of 13.45 million people.

Table 2 indicates that the Common Effect Model (CEM) was selected as the best regression model because the Chow test results, which have a probability value of 1.0000, demonstrate a substantial value at a significant level of 5%. The Random Effects Model (REM) is the best model choice in the Hausman test since the probability value is more than the significant level of 0.0569, which indicates a difference in the regression model selection.

Table 2 Best Model Selection

Test Type	Alpha	Prob F	Selected models
Test Chow	0,05	1,0000	CEM
Test Hausman	0,05	0,0569	REM

The Seemingly Unrelated Regression (SUR) method was chosen because it accounts for the possibility of contemporaneous correlation among the error terms of multiple regression equations analyzed simultaneously. SUR is more efficient than traditional OLS methods when the residuals across cross-sectional units are not independent, which is common in spatial economic studies. International studies such as Zellner (1962), as well as subsequent research by Bai & Ng (2004) and Baltagi (2008), have shown that the SUR model provides more efficient estimates, especially when dealing with small panel data and high cross-regional heterogeneity. In the context of Yogyakarta, the use of SUR enhances the validity of the results, as it allows for a more accurate exploration of the simultaneous relationships between various macroeconomic variables and income inequality.

Table 3 Test Seemingly Unrelated Reggression (SUR)

Variable	SUR Result (Standard Error)
Inf	-0028 (0.072)
Unemployment	0457*** 0.083
Minimum Wage	1.089** 0.0520
Growth	0.007 0.038
Population	0.044 0.023
Cons	-3.284*** 0.975

After model selection, because it did not get a strong model selection, the next step was testing using the Seemingly Unralated Regression (SUR) test. This is due to several reasons (1) More efficient: Parameter estimation is done simultaneously and considers the correlation between errors that occur at the same time (2) Detects significant coefficients: Contemporaneous error correlation occurs when errors in different equations are correlated together. This may cause coefficients that should be significant to go undetected by the OLS method of conventional linear regression. (3) Able to examine the relationship between variables simultaneously: SUR is one of the analytical methods that allows simultaneous assessment of the relationship between variables.

Effect of Inflation on Income Inequality

According to the analysis, income inequality in do-it-yourself projects is not substantially impacted by inflation. With a probability of 0.683, the alpha significance level of 0.05 is surpassed. Consequently, Ha is rejected and H0 is accepted, suggesting that inflation has no discernible effect on regional income disparity. According to the coefficient of -0.027581, income disparity in do-it-yourself projects will decrease by 0.027581% for every 1% increase in the inflation rate.

On the other hand, income disparity will rise if the rate of inflation declines. This implies that inflation and income disparity in do-it-yourself projects are negatively correlated. According to Keynes' theory, inflation caused by demand exceeding production capacity can reduce people's purchasing power, especially that of low-income groups, thus exacerbating inequality (Umiyati, 2014). However, Hidayat & Surahman, (2017) state that the effect of inflation on inequality depends on the initial inflation rate. When inflation is low, its impact can reduce inequality. Similar findings are observed in developing economies according to Erosa and Ventura (2002) in the *Review of Economic Dynamics*, where the structural nature of inflation matters for inequality impacts.

People's propensity to replace consumer products with more cost-effective alternatives and their propensity to buy goods and services even if doing so requires taking on debt are two factors that contribute to the decline in income inequality. Thus, the inflation rate

in Yogyakarta seems to play a smaller role in determining the level of income inequality, compared to other factors that may be more dominant such as regional economic policy and resource distribution.

Effect of Inflation on Income Inequality

With a coefficient of -0.028 and a standard error of (0.072), the result is statistically insignificant. This means that changes in the inflation rate do not have a significant impact on income inequality in the Special Region of Yogyakarta. This finding is consistent with Hidayat and Surahman (2017), who argue that at low levels of inflation, the effect on inequality tends to be neutral or even slightly redistributive depending on the inflation structure. According to (Aprilia Putri, 2016) Unemp describes the condition of an economy that is unable to absorb labour. Unemployed people have no income, thus widening the income gap between workers and the unemployed. Poor unemployment rates have a detrimental effect on people's lives and long-term economic development since they can cause political and social instability in a nation. The number of impoverished individuals might rise and inequality can worsen if fundamental requirements are not met.

Although the estimated coefficient for inflation is statistically insignificant, indicating no direct impact on income inequality in the Special Region of Yogyakarta, it's important to consider potential indirect effects. A comprehensive meta-analysis by Akinsola and Odhiambo (2023) found that, on average, inflation tends to have a small-to-moderate effect in increasing income inequality globally. However, the impact varies depending on factors such as institutional quality and the structure of inflation. In contexts where inflation is low and stable, its redistributive effects may be neutral or even slightly equalizing, as suggested by Hidayat and Surahman (2017). This aligns with the findings in Yogyakarta, where controlled inflation levels may not significantly influence income disparities.

Regarding unemployment, Aprilia Putri (2016) emphasizes that high unemployment rates can exacerbate income inequality by increasing the number of individuals without income, thereby widening the gap between the employed and unemployed. This is supported by a study conducted in Indonesia, which found that unemployment has a significant positive effect on income inequality, highlighting the need for policies that promote job creation to address income disparities (Parulian et al., 2023).

The Influence of the District/City Minimum Wage (DMW) on Income Inequality

The minimum wage variable shows a coefficient of 1.089** with a standard error of (0.520), indicating statistical significance at the 5% level. This result suggests that a 1% increase in the minimum wage correlates with a 1.089 point increase in income inequality. This outcome supports findings by Dewi et al. (2017) and is consistent with Mankiw's (2011) theory, where minimum wage policies can disproportionately benefit formal workers while leaving informal sector workers behind, thus widening inequality. Therefore, in the Yogyakarta Special Region, MSEs have a favorable effect on income inequality. Because the minimum wage mainly impacts the formal sector and ignores the

informal sector, which includes laborers, farmers, fishermen, and others, as is seen in South Sulawesi Province, the higher the minimum salary, the bigger the income inequality. This is also consistent with Neumark and Wascher (2007) in their meta-analysis in the *Journal of Economic Literature*, which concludes that minimum wage increases often have unintended distributional effects, especially when informal sectors are large. The results of this research are also in line with the theoretical basis, namely that the impact of the minimum wage on the distribution of family income may be negative unless there is less work but it is better allocated to family members in need rather than, for example, teenagers from non-poor families (Mankiw, 2011). Research by (Dewi et al., 2017) in Yogyakarta also show that MSEs have a positive influence on inequality. This indicates that wage increases are only enjoyed by some groups, while the majority of informal workers remain behind. The relationship between District/City Minimum Wage (DMW) and income inequality in Indonesia presents a complex and region-specific dynamic. While minimum wage policies aim to improve the earnings of low-income workers, their effectiveness in reducing income inequality varies across different regions and economic contexts.

A study by Zaitun Rohmah and Prani Sastiono (2017) analyzed the impact of minimum wage increases on wage inequality across provinces in Java between 2008 and 2014. The findings indicate that in provinces like DKI Jakarta, West Java, Central Java, and Banten, higher minimum wages contributed to a reduction in wage inequality when employment effects were not considered. However, when accounting for potential employment effects, such as job losses or shifts in employment patterns, the same wage increases were associated with heightened wage inequality. Notably, in the Special Region of Yogyakarta and East Java, minimum wage hikes led to increased wage inequality regardless of employment considerations.

Further supporting this nuanced perspective, research by Lubis et al. (2019) examined the effects of provincial minimum wages on wage disparities in Java from 2008 to 2017. The study revealed that increases in effective minimum wages reduced the wage gap between workers at the 30th percentile and the median wage, suggesting benefits for lower-income workers. Conversely, the same wage increases widened the gap between the 60th percentile and the median wage, indicating a potential spillover effect that could exacerbate inequality among middle-income earners.

In the context of Yogyakarta, a study by Maghriza and Hasmarini (2024) analyzed data from 2019 to 2023 to assess the impact of various factors on income inequality. The results showed that while the number of poor people and the Human Development Index significantly influenced income inequality, the minimum wage and open unemployment rate did not have a discernible effect during the study period. These findings underscore the importance of considering regional economic structures, labor market dynamics, and the potential unintended consequences of minimum wage policies. Policymakers should tailor minimum wage strategies to local conditions, ensuring that such interventions effectively address income disparities without adverse side effects.

The effect of economic growth on income inequality

The coefficient of economic growth is 0.007 with a standard error of (0.038), and the result is statistically insignificant. This implies that economic growth does not have a significant influence on income inequality in Yogyakarta. This result contrasts with Kuznets' (1955) hypothesis, but is in line with findings by Sartono et al. (2023) in Aceh Province, where economic growth alone was not sufficient to reduce income disparities without accompanying inclusive policies. Similarly, recent evidence by Deininger and Squire (1998) in the *World Bank Economic Review* questions the universal validity of the Kuznets curve across different country contexts. Therefore, theoretically speaking, economic expansion has no beneficial effect on local income disparity. According to Kuznets' hypothesis, a region's income inequality should gradually decline with strong economic growth. Nevertheless, there is little proof that economic expansion considerably lowers wealth disparity in this situation. Similar findings showing economic expansion had no discernible impact on lowering income disparity were also found in a study carried out in Aceh Province by (Sartono et al., 2023). This demonstrates that depending on various regional economic settings and conditions, the impact of economic growth on lowering income disparity may change.

The influence of population on income inequality

The total population variable has a coefficient of 0.044 with a standard error of (0.023) and is statistically insignificant. This indicates that changes in population size do not have a meaningful effect on income inequality in the Special Region of Yogyakarta. This finding deviates from the traditional Population Trap theory, suggesting that in Yogyakarta, relatively even population distribution across regions prevents significant inequality pressures, as also noted by Firdaus and Indira Hasmarini (2023). Thus, it may be concluded that there is no appreciable relationship between population size and income disparity in the Special Region of Yogyakarta. Findings are in line with the demographic dividend framework discussed by Bloom and Canning (2003) in *World Development*, which argues that the relationship between population and inequality is not linear but highly context-dependent

Contrary to the Population Trap theory, which holds that population expansion influences per capita income and consumption, the research findings demonstrate that inequality is not necessarily caused by population growth. This demonstrates how welfare may be impacted by population expansion. Research by (Firdaus & Indira Hasmarini, 2023) shows an inconsistent relationship between population and inequality. In the context of DIY, the distribution of population is relatively even and not too dense so it does not have a significant effect on income distribution. Population growth does not necessarily lead to income inequality because of the equitable distribution of the population, which can be attributed to factors like migration for better incomes or quality of life. Reducing unemployment also makes it possible for more individuals to work, which raises productivity and, eventually, per capita income.

Conclusion

Yogyakarta's Province faces numerous trade-offs between income disparity and economic progress. This phenomenon implies that Yogyakarta Special Region's economic growth has not yet attained a sufficient level. The Special Province of Yogyakarta, which has the lowest level of income inequality in Indonesia, indicates that employment, poverty, and the city minimum wage (MSW) in this province are still inadequate compared to other provinces in Indonesia. Income disparity is a significant issue for MSEs in Yogyakarta Special Region due to the low district/city minimum wage and the unequal distribution of income. The gap of research of this study lies in the use of the Seemingly Unrelated Regression (SUR) method to analyse the simultaneous relationship between macroeconomic variables and inequality, as well as the finding that economic growth is not significant in reducing inequality

The results of this study show that income inequality in Yogyakarta Special Region is significantly influenced by the variables of unemployment and Minimum Wage, both variables have a positive influence, which means that an increase in the open unemployment rate and minimum wage increases income inequality in the region. Meanwhile, inflation, economic growth, and population have no significant effect on income inequality. This finding confirms that economic growth in Yogyakarta has not been inclusive and has not been able to reach all levels of society equally. The high income gap indicates that the distribution of development results tends to be concentrated in certain regions and groups, while the informal sector and areas with high unemployment rates still do not get optimal benefits from economic growth. The implication of this study and to reduce income inequality in Yogyakarta, a development strategy is needed that not only focuses on increasing economic growth, but also on equitable distribution of development results and increasing the inclusiveness of regional economic policies and implementation of a competitive minimum wage to gradually improve people's welfare.

Author Contributions

Conceptualisation, S. S. W. and R. K; Methodology, R. K; Investigation, S. S. W; Analysis, S. S. W; Original draft preparation, T. S; Review and editing, R. K; Visualization, T. S. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors of the study declare that they have no competing interests. The funders had no control over the study's design, data collection, analysis, and interpretation, paper authoring, or decision to publish the results.

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