

The Role of Human Development Index (HDI) in Moderating the Relationship Between Economic Growth, Poverty, and Unemployment on Income Inequality in North Sumatra

Abstract

This study aims to analyze the influence of economic growth, poverty rate, unemployment rate, and Human Development Index (HDI) on income inequality in North Sumatra from 2019 to 2023. The method used is panel data regression with the Fixed Effect Model (FEM), selected based on the Chow test, Hausman test, and Lagrange Multiplier test. The data used covers 33 districts/cities in North Sumatra, obtained from the Central Bureau of Statistics (BPS). The dependent variable in this study is income inequality measured using the Gini Ratio, while the independent variables are economic growth, poverty rate, unemployment rate, and HDI. The results show that poverty rate and unemployment rate have a positive and significant effect on income inequality, indicating that an increase in poverty and unemployment widens income distribution disparities. Conversely, HDI has a negative and significant effect on income inequality, suggesting that improving education quality, healthcare, and living standards can reduce income disparities. The economic growth variable does not significantly affect income inequality, indicating that economic growth has not been equally distributed across all community groups. The coefficient of determination (R^2) is 75.9%, showing that the independent variables explain 75.9% of the variation in income inequality, while the remaining 24.1% is explained by other factors outside the model. This study recommends that regional and central governments improve HDI quality through strengthening education, health services, and social welfare to reduce poverty and unemployment, as well as to encourage more inclusive and equitable economic development in all districts/cities of North Sumatra.

Keywords: Income Inequality, Economic Growth, Poverty Rate, Unemployment Rate, Human Development Index, Panel Data Regression.

I. INTRODUCTION

Income inequality is a global issue that affects various social, economic, and political aspects. In developing countries like Indonesia, income inequality is one of the main problems in economic development. This inequality refers to the uneven distribution of income among community groups, which can be measured using the Gini Ratio. The Gini Ratio ranges from 0 to 1, where a higher value indicates greater inequality. High inequality can trigger social problems such as reduced social stability, weakened community solidarity, and economic inefficiency (Sukirno, 2012; Todaro & Smith, 2014). Therefore, controlling income inequality has become one of the focal points of national economic development policy (Rodionov et al., 2018).

North Sumatra is one of the regions that experiences significant income inequality. Based on data from the Central Bureau of Statistics (BPS), the Gini Ratio in North Sumatra during the 2019 to 2023 period remained in the moderate inequality category, increasing from 0.315 in 2020 to 0.329 in 2023 (BPS, 2023). This upward trend indicates that, despite economic recovery after the COVID-19 pandemic, income distribution has not been evenly distributed. According to Kuznets' (1955) theory, long-term economic growth should reduce income inequality. However, in North Sumatra, economic growth, as reflected by the increase in Gross Regional Domestic Product (GRDP), is accompanied by a rise in income inequality (Sjafrizal, 2012; Becker, 1964).

Economic growth is one of the factors predicted to influence income inequality. Economic growth reflects an increase in the capacity to produce goods and services, which should be accompanied by increased community income. However, in reality, economic growth does not always impact the equitable distribution of income. BPS data shows that the GRDP of North Sumatra increased from IDR 539.51 trillion in 2019 to IDR 602.23 trillion in 2023. However, this increase was not accompanied by a reduction in income inequality (BPS, 2023). This indicates that not all community groups benefit from economic growth. Kuznets' (1955) theory explains that in the early stages of development, economic growth tends to increase inequality, but over time, inequality decreases. This phenomenon was not observed in North Sumatra, where inequality increased along with economic growth (Masruri, 2016; Jhingan, 2018).

In addition to economic growth, poverty is another factor influencing income inequality. Poverty refers to the condition where individuals or community groups cannot meet basic needs such as food, education, and health (Marianti & Munawar, 2006). In North Sumatra, the poverty rate fluctuated from 8.75% in 2019 to 9.01% in 2021, and then declined to 8.15% in 2023 (BPS, 2023). Although the poverty rate has decreased, the poverty disparity between regions remains high. For instance, West Nias Regency had a poverty rate of 22.81% in 2023, much higher than the provincial average. This condition indicates disparities in development between regions, which affects the uneven distribution of income (Maipita, 2014; Utami, 2020).

Another factor influencing income inequality is unemployment. Unemployment refers to the situation where individuals do not have a job despite having the desire to work. Unemployment directly impacts household income, especially for low-income groups (Sjafrizal, 2012). High unemployment increases the proportion of the population without income, thereby widening income distribution disparities (Sukirno, 2016). BPS data shows that the unemployment rate in North Sumatra increased from 5.41% in 2019 to 6.91% in 2020 due to the COVID-19 pandemic, then declined to 5.89% in 2023 (BPS, 2023). The high unemployment rate in North Sumatra presents a significant challenge in creating inclusive and high-quality jobs. According to Keynes (1936), increasing aggregate demand can create new jobs and reduce unemployment, thereby making income distribution more equitable (Utami, 2020; Todaro & Smith, 2012).

To strengthen the influence of socio-economic factors on income inequality, this study also uses the Human Development Index (HDI) as a moderating variable.

HDI measures three main dimensions: health (life expectancy), education (mean years of schooling), and a decent standard of living (per capita income) (Becker, 1964; Al & Subrata, 2018). BPS data shows that the HDI of North Sumatra in 2023 was 73.37, lower than neighboring provinces such as Riau (74.04) and West Sumatra (73.75) (BPS, 2023). Becker's (1964) Human Capital Theory states that improving human quality can increase productivity and income, thereby reducing income inequality. HDI is expected to strengthen the influence of economic growth, poverty, and unemployment on income inequality (Rodionov et al., 2018; Jhingan, 2018).

Previous studies indicate that socio-economic variables and HDI play an essential role in determining income inequality. Oksamulya and Anis (2020) found that education and migration significantly influence income inequality in Indonesia. Rodionov et al. (2018) showed that HDI negatively affects inequality, where an increase in HDI reduces income inequality. Masruri (2016) revealed that economic growth and unemployment have a positive impact on inequality, while HDI has a negative effect. This study aims to fill the research gap regarding the role of HDI as a moderating variable in the influence of socio-economic factors on income inequality.

This study is expected to provide theoretical and practical contributions. Theoretically, it provides empirical evidence on the influence of economic growth, poverty, and unemployment on income inequality, moderated by HDI. Practically, the findings can serve as policy recommendations for the government to reduce income distribution inequality through human development, poverty alleviation, and the creation of quality employment opportunities. **II. RESEARCH METHODS**

This study aims to analyze the effect of economic growth, poverty, and unemployment on income inequality in North Sumatra Province, with the Human Development Index (HDI) as a moderating variable. This research employs a quantitative design using panel data analysis. Panel data is chosen because it improves the degree of freedom, reduces collinearity issues, and allows for a more precise examination of variable effects compared to cross-sectional or time-series data alone (Hsiao, 2014). The research methods include the following elements:

Research Location The study is conducted in North Sumatra Province, focusing on 33 districts/cities from 2019 to 2023. This location is selected due to its status as one of the provinces with the highest income inequality on Sumatra Island, as reflected in its Gini Ratio consistently being above 0.3 during this period (BPS, 2023). Hence, North Sumatra serves as a relevant case for examining the impact of economic growth, poverty, and unemployment on income inequality, as well as the role of HDI as a moderating variable.

Sample Determination Method The sample is selected using purposive sampling, a non-probability sampling method that selects units based on specific criteria relevant to the research objectives (Iswati & Anshori, 2019). This approach ensures the selection of samples that meet the research criteria, resulting in more accurate data. The sample consists of 33 districts/cities in North Sumatra from 2019 to 2023, combining cross-sectional (33 districts/cities) and time-series data (5 years) for a total of 165 samples (33 districts/cities \times 5 years = 165 observations). The sample size determination follows Roscoe's (1975) rule, which recommends a minimum of 10 samples per independent variable in quantitative research. With five independent

variables (economic growth, poverty, unemployment, HDI, and the interaction of HDI with other variables), the minimum required sample size is 50 (5 variables \times 10 = 50 samples). The 165 total observations meet this requirement, ensuring sufficient sample size for analysis.

Data and Data Sources This study employs secondary data collected and published by third parties. Data is obtained using documentation methods, which involve gathering official documents and publications from credible institutions (Siyoto et al., 2015). The primary data source is the Central Bureau of Statistics (BPS), the official statistical agency of Indonesia. Data includes the Gini Ratio, economic growth, poverty rate, open unemployment rate (TPT), and the Human Development Index (HDI).

Data Used

- **Income Inequality (Y):** Measured using the Gini Ratio, where 0 indicates perfect equality and 1 indicates perfect inequality.
- **Economic Growth (X1):** Measured by the annual percentage growth of GRDP.
- **Poverty (X2):** Measured as the percentage of the population classified as poor relative to the total population in a district/city.
- **Unemployment (X3):** Measured using the Open Unemployment Rate (TPT), representing the percentage of the unemployed in the total labor force.
- **Human Development Index (HDI) (Z):** Measured using a composite index based on three dimensions: health (life expectancy), education (mean years of schooling and expected years of schooling), and a decent standard of living (expenditure per capita).

Data Analysis Methods The study employs panel data regression analysis, which combines cross-sectional and time-series data, providing more robust results than traditional regression models. This method accounts for individual heterogeneity and allows for the separation of individual effects from time effects (Widarjono, 2007). The regression model used in this study is:

$$Y = \beta_0 + \beta_1 PE + \beta_2 KN + \beta_3 PR + \beta_4 IPM$$

Where:

- **Y:** Income Inequality (Gini Ratio)
- **PE (X1):** Economic Growth (%)
- **KN (X2):** Poverty (%)
- **PR (X3):** Unemployment (%)
- **IPM (X4):** Human Development Index (HDI)

Panel Data Model Selection The study utilizes three approaches to determine the best model for the panel data regression:

1. **Common Effect Model (CEM):** Assumes uniform behavior for all cross-sectional units with a single intercept.
2. **Fixed Effect Model (FEM):** Allows for different intercepts across cross-sectional units, but the slope remains constant.
3. **Random Effect Model (REM):** Assumes that intercept differences across cross-sectional units are random.

To choose the best model, three tests are conducted:

- **Chow Test:** To select between CEM and FEM.
- **Hausman Test:** To select between FEM and REM.
- **Lagrange Multiplier (LM) Test:** To select between CEM and REM.

Classical Assumption Tests To ensure the model's reliability, the following tests are conducted:

- **Multicollinearity Test:** Ensures no high linear correlation among independent variables.
- **Heteroscedasticity Test:** Verifies that the residuals' variance remains constant across observations.

Model Fit Tests (Goodness of Fit) The model's suitability is tested through:

- **Coefficient of Determination (R²):** Measures how well the independent variables explain variations in the dependent variable.
- **F-Test:** Tests the simultaneous effect of independent variables on the dependent variable.
- **t-Test:** Tests the individual effect of each independent variable on the dependent variable.

Moderated Regression Analysis (MRA) The study employs MRA to examine HDI's role as a moderating variable. The MRA model is:

$$Y = \alpha + b_1X_1 + b_2X_2 + b_3X_3 + b_4Z + b_5X_1Z + b_6X_2Z + b_7X_3Z + e$$

Keterangan:

Y	= Income Inequality (Gini Ratio)
α	= Constant
b_1	= Regression coefficient for X1
b_2	= Regression coefficient for X2
b_3	= Regression coefficient for X3
b_4	= Regression coefficient for the interaction of HDI with X1, X2 dan X3
X ₁	= Economic Growth
X ₂	= Poverty
X ₃	= Unemployment
Z	= Human Development Index (HDI)

This method enables researchers to assess how HDI strengthens or weakens the effects of economic growth, poverty, and unemployment on income inequality.

III. RESULTS AND DISCUSSION

3.1 Results

Descriptive Statistics of Research Variables

This study uses five variables: Income Inequality (Y), Economic Growth (X1), Poverty (X2), Unemployment (X3), and Human Development Index (HDI) (Z) as a moderating variable. Descriptive statistics are used to provide an overview of the characteristics of the research data.

Table 1. Descriptive Statistics of Research Variables

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Gini Ratio (Y)	165	0.194	0.402	0.272	0.045
Economic Growth (X1)	165	-1.98	6.05	3.42	1.89
Poverty (X2)	165	3.44	26.42	9.18	4.92
Unemployment (X3)	165	0.19	11.50	5.42	2.78
Human Development Index (HDI) (Z)	165	61.14	82.19	71.04	5.14

Based on Table 1, the Gini Ratio (Y) has an average value of 0.272, with a minimum value of 0.194 and a maximum value of 0.402, indicating the variation in income inequality levels across districts/cities in North Sumatra. The Economic Growth (X1) variable shows an average of 3.42%, with a minimum of -1.98% and a maximum of 6.05%, where negative growth occurred at the start of the COVID-19 pandemic in 2020. The Poverty (X2) variable has an average of 9.18%, with a minimum of 3.44% and a maximum of 26.42%. The Unemployment Rate (X3) has an average of 5.42%, with a minimum of 0.19% and a maximum of 11.50%, while the Human Development Index (HDI) (Z) has an average of 71.04, with a minimum of 61.14 and a maximum of 82.19.

Panel Data Regression Analysis

Selection of Panel Data Regression Model

Panel data is a combination of time-series and cross-sectional data. According to Gujarati (2003), panel data has advantages over cross-section or time-series data when used separately. This study begins by testing three regression models: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The selection of the best model is done through three testing phases:

1. **Chow Test:** To choose between CEM and FEM.
2. **Hausman Test:** To choose between FEM and REM.
3. **Lagrange Multiplier (LM) Test:** To choose between CEM and REM.

Table 2. Results of Chow, Hausman, and Lagrange Multiplier Tests

Test	p-value	Conclusion
Chow Test	0.00	Fixed Effect Model
Hausman Test	0.00	Fixed Effect Model
Lagrange Multiplier Test	-	Not Conducted

The Chow Test indicates a p-value of 0.00, which is less than α (0.05), so H_0 is rejected and H_1 is accepted. Therefore, the selected model is the Fixed Effect Model (FEM). The Hausman Test is then performed to determine whether FEM or REM is more appropriate. The p-value for the Hausman Test is 0.00, less than α (0.05), so H_0 is

rejected and H1 is accepted. Therefore, the model used in this study is the Fixed Effect Model (FEM).

Model Assumption Testing

The model assumption tests aim to ensure that the model meets the BLUE (Best Linear Unbiased Estimator) criteria. The assumption tests carried out in this study include:

1. **Multicollinearity Test**
2. **Heteroscedasticity Test**

Multicollinearity Test

The multicollinearity test is used to ensure that there is no perfect linear relationship between the independent variables. The multicollinearity test results are presented in Table 3.

Table 3. Multicollinearity Test Results

Variable	PE	KN	PR	HDI
PE	1.00	-0.09	-0.16	0.04
KN	-0.09	1.00	-0.10	-0.27
PR	-0.16	-0.10	1.00	0.47
HDI	0.04	-0.27	0.47	1.00

The correlation coefficients between the independent variables are all below 0.85, indicating that multicollinearity does not exist among the independent variables.

Heteroscedasticity Test

The heteroscedasticity test is used to ensure that the variance of the error term is constant. This study employs the Breusch-Pagan Godfrey test.

Table 4. Heteroscedasticity Test Results

Test	p-value
Obs*R-Squared	0.309

Since the p-value is greater than α (0.05), it is concluded that the regression model does not contain symptoms of heteroscedasticity.

Goodness of Fit and Regression Results

Table 5. Panel Data Regression Results (FEM)

Variable	Coefficient	p-value
Constant	1.042040	0.000
Economic Growth (X1)	0.080001	0.401
Poverty (X2)	0.001239	0.030
Unemployment (X3)	0.001770	0.047
Human Development Index (X4)	-0.010909	0.000

Adjusted R²: 0.759

F-statistic: 33.872 ($p = 0.000$)

The results show that the independent variables of poverty, unemployment, and HDI have significant effects on income inequality, while economic growth does not. Specifically:

- **Poverty (X2)** has a positive and significant effect on income inequality ($p = 0.030$), meaning that higher poverty rates lead to increased inequality.
- **Unemployment (X3)** has a positive and significant effect on income inequality ($p = 0.047$), indicating that higher unemployment rates increase income inequality.
- **HDI (X4)** has a negative and significant effect on income inequality ($p = 0.000$), implying that improvements in education, health, and living standards reduce income inequality.
- **Economic Growth (X1)** does not have a significant effect on income inequality ($p = 0.401$), indicating that economic growth alone does not affect income inequality.

3.2 Discussion

The Effect of Economic Growth on Income Inequality

The research results show that the coefficient for the economic growth variable is 0.080 with a probability of 0.401. Since the probability value is greater than $\alpha = 0.05$, it can be concluded that the economic growth variable does not have a significant effect on income inequality in North Sumatra. In other words, economic growth does not have a strong contribution to reducing or increasing income distribution inequality in the region during the study period.

The insignificance of economic growth on income inequality may be due to the unequal distribution of the benefits of economic growth across all segments of society. This situation can occur when higher-income groups benefit more from increased income, while lower-income groups do not experience comparable benefits. This condition aligns with the "trickle-down effect" theory, which suggests that the benefits of economic growth are initially enjoyed by the middle and upper classes before trickling down to the lower classes. However, if the distribution mechanism does not function properly, economic growth will not have a significant impact on income inequality.

Another possible explanation is that economic growth in North Sumatra is likely driven by certain sectors that do not involve all layers of society, such as large industrial or financial service sectors. These sectors generally do not engage a large number of workers from lower-income groups, thereby limiting their impact on reducing inequality. On the other hand, those working in the informal sector or agricultural sector may not benefit from the economic growth experienced in other sectors.

This finding is consistent with previous studies conducted by Todaro & Smith (2015), who stated that economic growth without the equal distribution of income would only benefit certain groups. Additionally, a study by Nadya & Syafri (2019) found that although economic growth positively affects income, its influence on reducing income inequality is not significant. Therefore, government policies should focus on strengthening income redistribution mechanisms through the development of micro,

small, and medium enterprises (MSMEs), community economic empowerment, and social protection programs to ensure that the effects of economic growth are felt more equitably.

The Effect of Poverty on Income Inequality

Based on the regression results, the coefficient for the poverty variable is 0.001239 with a probability value of 0.030. Since this probability value is less than $\alpha = 0.05$, it can be concluded that poverty has a positive and significant effect on income inequality. This means that an increase in poverty will lead to an increase in income inequality.

Poverty is one of the key factors that influence income inequality. Poor communities often have limited access to decent jobs, adequate healthcare, and quality education. The inability of poor people to access these basic needs impacts the quality of human resources. Consequently, their opportunities to secure high-paying jobs are limited, resulting in a lower level of income. As a result, the income gap between rich and poor groups widens, ultimately increasing income inequality.

High levels of poverty can also hinder the distribution of wealth within a region. Poor communities tend to have low purchasing power, which, in turn, affects the demand for goods and services in the market. This condition disrupts the local economic cycle, especially in rural or remote areas. As a result, communities working in the informal or agricultural sectors may experience stagnant incomes, which further widens the income inequality gap between urban and rural communities.

This study is consistent with the findings of Darmuji et al. (2024), who found that poverty has a positive and significant effect on income inequality in both the short and long term. In other words, higher poverty levels in a region tend to increase income inequality. Therefore, poverty alleviation efforts should be a top priority for local and central governments by strengthening social protection programs, creating new job opportunities, and enhancing access to education and healthcare services.

The Effect of Unemployment on Income Inequality

The regression results show that the coefficient for the unemployment variable is 0.001770 with a probability of 0.047. Since the probability value is less than $\alpha = 0.05$, it can be concluded that unemployment has a positive and significant effect on income inequality. In other words, as the unemployment rate increases, the distribution of income becomes more unequal in North Sumatra.

Unemployment causes a large proportion of the population to lose their main source of income. Without a stable job, people are unable to generate sufficient income to meet their basic needs. As a result, disparities in welfare arise between those who have jobs and those who do not. This disparity becomes one of the causes of increased income inequality.

High unemployment is also linked to differences in the quality of human resources. People who lack the necessary skills or education are more likely to struggle in accessing formal employment opportunities, causing them to rely on low-income informal sector jobs. Conversely, individuals with better education and skills can access higher-paying formal jobs, thereby widening the income gap.

This finding is supported by studies by Masruri (2016) and Yusica (2018), which found that unemployment has a positive and significant effect on income inequality. Therefore, reducing unemployment should be a key priority for policymakers by promoting skills training, supporting MSMEs, and creating sustainable job opportunities.

The Effect of Human Development Index (HDI) on Income Inequality

The research results indicate that the coefficient for the Human Development Index (HDI) variable is -0.010909 with a probability of 0.000. Since this probability value is less than $\alpha = 0.05$, it can be concluded that HDI has a negative and significant effect on income inequality. This means that an increase in HDI will lead to a reduction in income inequality.

The HDI measures human development in terms of education, health, and living standards. An increase in HDI reflects an improvement in the quality of human resources, enabling the population to access better jobs and earn higher incomes. This creates more equitable employment opportunities, reducing the gap between wealthy and poor communities.

In addition, an increase in HDI also promotes inclusive economic growth. Regions with higher levels of education tend to have more productive and innovative labor forces. This enables these regions to develop more productive economic sectors that can generate new jobs. Consequently, income inequality can be reduced.

This finding aligns with Becker's (1964) Human Capital Theory, which states that improving human resource quality through education will increase worker productivity. Higher productivity has the potential to reduce disparities in income distribution. This study is also supported by the findings of Bayhaqi (2018) and Noorachmadan (2024), which state that HDI has a negative and significant impact on income inequality.

IV. Conclusion and Recommendations

Based on the research results, it can be concluded that poverty, unemployment, and the Human Development Index (HDI) have a significant effect on income inequality in North Sumatra. Poverty and unemployment have a positive effect, meaning that higher poverty and unemployment levels lead to increased income inequality. Conversely, HDI has a negative effect, indicating that improvements in the quality of education, health, and living standards can reduce income inequality. Meanwhile, the economic growth variable does not have a significant effect on income inequality, suggesting that economic growth has not been fully felt by all segments of society. Therefore, a more inclusive economic development strategy needs to be implemented.

To reduce income inequality in North Sumatra, it is recommended that the local and central governments improve access to education and the quality of healthcare services to strengthen the Human Development Index (HDI). Governments also need to promote policies to reduce unemployment through the creation of new job opportunities, skills training programs, and the development of MSMEs. Additionally, poverty reduction efforts can be achieved through the strengthening of social protection programs, direct cash assistance (BLT), and the development of labor-intensive projects in rural areas. Inclusive economic policies are also needed to ensure that economic growth benefits all segments of society, especially the poor and vulnerable groups.

References

- Ajija, S. R., et al. (2011). *Smart Way to Master Eviews*. Jakarta: Salemba Empat.
- Ansori, M. (2020). *Quantitative Research Methods 2nd Edition*. Airlangga University Press.
- Basuki, A. T. (2014). *The Use of SPSS in Statistics*. Tri Basuki.
- Becker, G. (1964). *Human Capital*. New York: Columbia University Press.
- Bayhaqi, A. (2018). *The Effect of Human Development Index on Income Inequality in Indonesia*. Journal of Economics and Development.
- Darmuji, D., et al. (2024). *The Effect of Poverty on Income Inequality*. Journal of Economics and Finance.
- Frisch, R. (1934). *Statistical Confluence Analysis by Means of Complete Regression System*. Institute of Economics, Oslo University, Publication No. 5.
- Ghozali, I. (2016). *Multivariate Analysis Application Using IBM SPSS Software*. Semarang: Diponegoro University Press.
- Ghozali, I. (2018). *Multivariate Analysis Application Using IBM SPSS 25*. Semarang: Diponegoro University Press.
- Gujarati, N. D. (2003). *Basic Econometrics*. Jakarta: Salemba Empat.
- Istiqamah, D., et al. (2018). *The Effect of Economic Growth on Income Inequality in Indonesia*. Journal of Economics and Business.
- Kazt, L., & Autor, D. (1999). *Changes in the Wage Structure and Earnings Inequality*. In O. Ashenfelter & D. Card (Eds.), *Handbook of Labor Economics* (Vol. 3, pp. 1463–1555).
- Minium, E. W., & Clarke, R. B. (1982). *Elements of Statistical Reasoning*. New York: John Wiley & Sons.
- Nadya, F., & Syafri, H. (2019). *Analysis of the Effect of Economic Growth on Income Inequality in Indonesia*. Journal of Economics and Development.
- Nachrowi, D. N., & Usman, H. (2006). *Popular and Practical Approach to Econometrics for Economic and Financial Analysis*. Jakarta: University of Indonesia Press.
- Noorachmadan, D. (2024). *Analysis of the Human Development Index on Income Inequality in Indonesia*. Journal of Economics and Finance.
- Purwanto, S., & Suharyadi. (2009). *Statistics for Modern Economics and Finance*. Jakarta: Salemba Empat.
- Restiasanti, R. (2022). *The Effect of the Human Development Index on Income Inequality Moderated by Economic Growth in Indonesia*. Journal of Economics and Development.
- Roscoe, J. T. (1975). *Fundamental Research Statistics for the Behavioral Sciences* (2nd ed.). New York: Holt, Rinehart & Winston.
- Santosa, I. (2020). *The Effect of the Human Development Index on Income Inequality in Indonesia*. Journal of Economics and Business.
- Subrata, Y., & Al, B. (2018). *The Effect of Income Inequality in Districts/Cities in East Java*. Student Scientific Journal of FEB Brawijaya University, 1–13.
- Supriana, T. (2015). *Macroeconomics*. Medan: USU Press.

- Syamsir, A., & Rahman, A. (2018). *Exploring Income Distribution Inequality in Regencies and Cities. Ecces (Economics, Social, and Development Studies)*.
- Todaro, M. P., & Smith, S. C. (2006). *Economic Development in the Third World*. Jakarta: Erlangga.
- Todaro, M. P., & Smith, S. C. (2015). *Economic Development* (11th ed.). Jakarta: Erlangga.
- Todaro, M. P., & Smith, S. C. (2016). *Economic Development* (9th ed.). Jakarta: Erlangga.
- Widarjono, A. (2007). *Econometrics: Introduction and Application Accompanied by Eviews Guide*. Yogyakarta: UPP STIM YKPN Yogyakarta.
- Widarjono, A. (2018). *Econometrics: Introduction and Application Accompanied by Eviews Guide*. Yogyakarta: UPP STIM YKPN.
- Yusica, L. (2018). *The Effect of Unemployment on Income Inequality*. Journal of Economics and Finance.