



THE EFFECT OF EDUCATION LEVEL, INFRASTRUCTURE, AND POPULATION ON INTER-REGION DEVELOPMENT INEQUALITY IN 2013-2022

Idha Marta Kurnia Ningsih^{1*}, Saparuddin Mukhtar², Dicky Iranto³

^{1,2,3}Faculty of Economics, Universitas Negeri Jakarta, Indonesia
Email : martaidha27@gmail.com¹, saparuddin@unj.ac.id², dicky@unj.ac.id³

Abstract

This study aims to determine the effect of education level, infrastructure, and population on inter-region development inequality. The research method used in this study is a quantitative approach. The data used in this study are panel data from the five largest regions in Indonesia; Sumatra, Java, Kalimantan, Sulawesi and Papua from 2013 to 2022 which are collected through documentation techniques. The test results show that the variables of education level, road stability infrastructure, and infrastructure of households that have access to PLN electricity have a negative and significant effect on inter-region development inequality. Meanwhile, the total population variable has a significant positive effect on inter-region development inequality. Simultaneously, all research variables have a significant effect on inter-region development inequality. The coefficient of determination test in this study shows a 99% influence on development inequality and the remaining 1% is explained by other variables outside the study.

Keywords: Development Inequality, Education Level, Infrastructure, Population

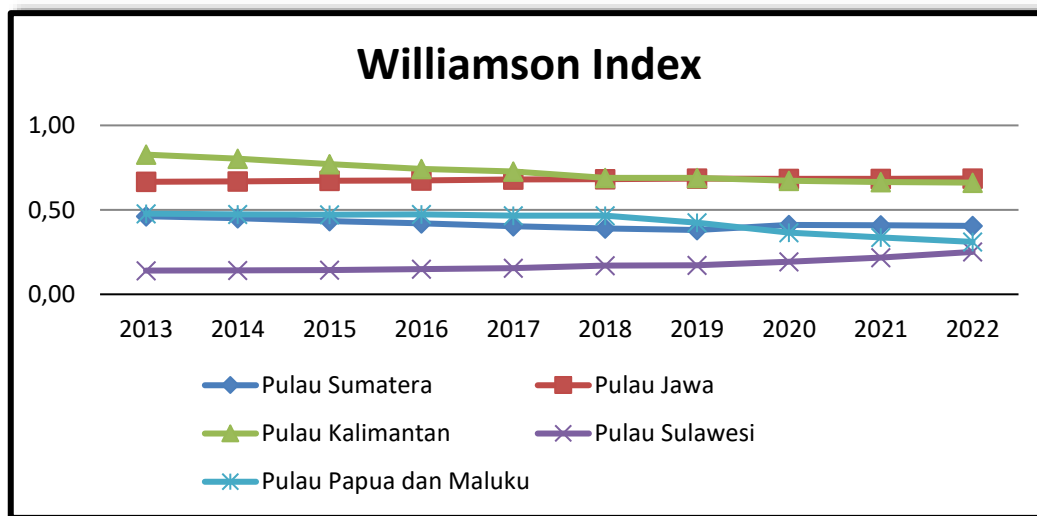
INTRODUCTION

Every country aims to optimize people's welfare through economic development, which utilizes available resources. Economic development is important because it has a broad impact on aspects of life, especially in the era of globalization and technological advances. Welfare is measured through increased national income and economic growth. According to Kuznet, economic growth is a long-term increase in the productivity of a country with increasingly diverse products, driven by technological progress and institutional change. High economic growth, accompanied by improved human welfare, is the ideal outcome of economic development. However, in reality, inequality will arise as a result of rapid economic growth (Santoso & Mukhlis, 2021).

Indonesia is an archipelago that has some of the largest regions in the world; Sumatra, Java, Kalimantan, Sulawesi, Papua, and several other small regions. Although Indonesia implements the same national development program, each region still has different characteristics for implementing the economic development process in its region. Sumatra, Java, Kalimantan, Sulawesi, and Papua are the five main large regions in Indonesia, which have 25 provinces within them with different characteristics from one another. These differences also result in the different capabilities of a region in driving the development process. Therefore, in each region, there are usually developed and underdeveloped regions (Sjafrizal, 2012).

Every country seeks to maximize the welfare of the people through economic development that utilizes existing resources. Economic development affects various aspects of life, especially in the era of globalization and technological advances. Welfare is measured by an increase in national income and

economic growth. According to Kuznet, economic growth is a long-term increase in productivity with more diverse products, driven by technological progress and institutional change (Umiyati, 2014). Indonesia's inter-region development gap arises from an equity gap. The 2030 global agenda emphasizes inclusive development. Inequality has both positive and negative impacts, such as economic competition and weak social stability (Todaro & Smith, 2004). Todaro and Smith also said that on a regional scale, we can use the Williamson Index, which is an approach to measure inequality between regions based on GRDP per capita. The following is the Williamson Index between the regions of Sumatra, Java, Kalimantan, Sulawesi, and Papua over the last 10 years.



Source : Central Bureau of Statistics (BPS Indonesia)

Figure 1. Inter-region Williamson Index in Indonesia 2013-2022

It can be seen from Figure 1 that the regions of Sumatra and Papua fall into the category of moderate inequality; the region of Java tends to increase over the last 10 years while the region of Kalimantan tends to decrease, but both regions fall into the category of very high inequality because they reach more than 0.5, which is close to 1 and indicates the widening development inequality on the region. Meanwhile, the region of Sulawesi falls into the category of near-even inequality but has experienced an increasing trend from year to year.

Development of underdeveloped areas should focus on improving human resources (Aprianoor & Muktiali, 2015; Badan Pusat Statistik (2022). The development of quality human resources (HR) in each region is inseparable from improving the welfare of the community (Todaro & Smith, 2004). According to The World Bank (2016), equitable development is one of the Sustainable Development Goals (SDGs) that aims to achieve equality through improving the education system. A better quality of human resources is inseparable from the quality of education in a region. In line with this statement, a study by Nurhuda, Muluk, & Prasetyo (2013) found that the policy that can improve the quality of human resources is to improve education in the region. Improving the quality of education can also improve people's standard of living, which in turn will reduce development inequality.

Another factor that influences the rate of change of inequality in Indonesia is the difference in infrastructure between regions. Infrastructure plays an important role in driving the economic growth of a region, as economic development requires the availability of adequate facilities and infrastructure. Therefore, the relationship between infrastructure development and economic development is very close and interdependent. Inequality in infrastructure development will affect the level of economic welfare, which in turn will have an impact on inter-region welfare inequality (Sukwika, 2018). Infrastructure such as roads and bridges provide access to the economy. Apart from road infrastructure, another example of infrastructure that can boost economic productivity is the electricity network. Electricity is an energy that is closely related to people's daily activities that will support economic activity.

In addition, population affects development, as it is a key element in economic activity. The local government must manage the population well to meet the needs of its region (Iqbal, Tanjung, & Supriono, 2017). Although not the main cause of underdevelopment, population size affects the economic development of a region (Indris, Kamal, 2014). The population can be a capital asset if it is able to improve quality and productivity, but a burden if the structure of regional spending is low (Devita, Delis, & Junaidi, 2014). Local governments must consider population in development planning because the population is a fundamental asset as well as a challenge in economic development efforts. Bustam Anggun Pamiati (2021) stated that development inequality is caused by population inequality. The government seeks to ensure equal opportunities and reduce inequality by removing discriminatory laws, policies and practices, and promoting appropriate legislation. Therefore, the issue of inequality must be considered in development.

Based on the description above, the research questions can be formulated as follows: 1) Is there an effect of education level on inter-region development inequality for the period 2013-2022. 2) Is there an effect of infrastructure on inter-region development inequality for the period 2013-2022. 3) Is there an effect of population on inter-region development inequality for the period 2013-2022.

LITERATURE REVIEW

Development Inequality

Economic development involves an increase in total income, income equality, and per capita income, taking into account population growth and structural changes in the economy. The theory of development inequality originated from the Neo-Classical hypothesis, and Douglas C. North was the first to discuss inter-regional development inequality in his analysis of the Neo-Classical Growth Theory (Sjafrizal, 2012). Hypothesized in this theory, there is a correlation between the level of development inequality between regions and the level of national economic development. According to the Neo-Classical hypothesis, a country's level of development inequality will reach its highest peak in the early stages of its growth. After that, development will continue in the following decades, while inequality will continue to decline.

Education Level

The National Education Act No. 20 of 2003 emphasizes that education aims to create a learning atmosphere for students to develop their potential, skills, and morals. Education in the Human Capital Theory proposed by Becker (1985) emphasizes education as a form of human investment that can increase individual capabilities and productivity. In the classical theory put forward by Adam Smith, which states that humans are the determining factor for the prosperity of the nation, human resources that are improved through education are the main key to successful development. Education also affects the quality of human resources and the economic level of a region (Sirilius, 2017). The average years of schooling indicate the level of education in a society, which affects the quality and mindset of individuals as well as economic growth. Therefore, education level is an important indicator in measuring the effectiveness of education and regional development.

Infrastructure

Infrastructure is a physical system that provides transportation services, irrigation, and public facilities to meet human social and economic needs (Grigg, 1988). According to the American Public Works Associate, infrastructure is the physical facilities required by public agencies to carry out government duties, such as water, electricity, and transportation (Kodoatie, 2005). Infrastructure underpins regional and national economic development, providing smooth economic activity and an improved quality of life. Infrastructure in the Stages of Growth theory proposed by Rostow (1960) views social overhead capital as one of the important factors needed to start the take-off process. The role played by social overhead capital to accelerate economic growth and community welfare will be greater. Infrastructure is part of social overhead capital or capital goods, that is important as basic facilities for the needs of society and indirectly contributes to increasing economic output. Improving social overhead capital such as infrastructure, can help reduce development inequality.

Population

Residents are all individuals who have lived in Indonesia for six months or more, as Badan Pusat Statistik (2022b). This includes Indonesian citizens and foreigners residing in Indonesia, according to the law (Article 26 Paragraph 2). The number of residents determines the population of a region or country. The population in the demographic transition theory proposed by Warren Thimpson (1929) says that development inequality can occur in the early stages of the demographic transition. In the early stages, high birth rates are combined with declining death rates, leading to rapid population growth. Optimum population theory states that there is an optimal level of population growth that can support economic development. However, if population growth exceeds this optimal level, it can lead to excessive pressure on resources, which in turn can result in development inequality.

METHOD

This study examines the effect of education level, infrastructure and population on inter-region development inequality in Indonesia. The type of data used in this study is secondary data obtained from the Central Bureau of Statistics and PUPR open data. The secondary data used is a combined panel data of time series and cross section from 2013 to 2022 from the 5 largest regions in Indonesia; Sumatra, Java, Kalimantan, Sulawesi and Papua. The education level variable (X_1) uses the average years of schooling, while infrastructure (X_2) uses road stability and (X_3) uses electricity access infrastructure. The population variable (X_4) is measured by total population, while development inequality (Y) uses the Williamson index. Data were processed using EViews 12 software.

RESULTS AND DISCUSSION

Model Testing Results

Selection of Estimation Results

Chow Test

Table 1. Chow Test Result

Effects Test	Statistic	d.f.	Prob.
Cross-section F	221.885317	(4,41)	0.0000
Cross-section Chi-square	156.002138	4	0.0000

Source : Output EViews12

Based on the table above, it can be seen that the Cross-section Chi-square probability value is 0.0000 (<0.05), which rejects H_0 . So according to the Chow test, the selected model is the Fixed Effect Model (FEM), then the Hausman test is next.

Hausman Test

Table 2. Hausman Test Result

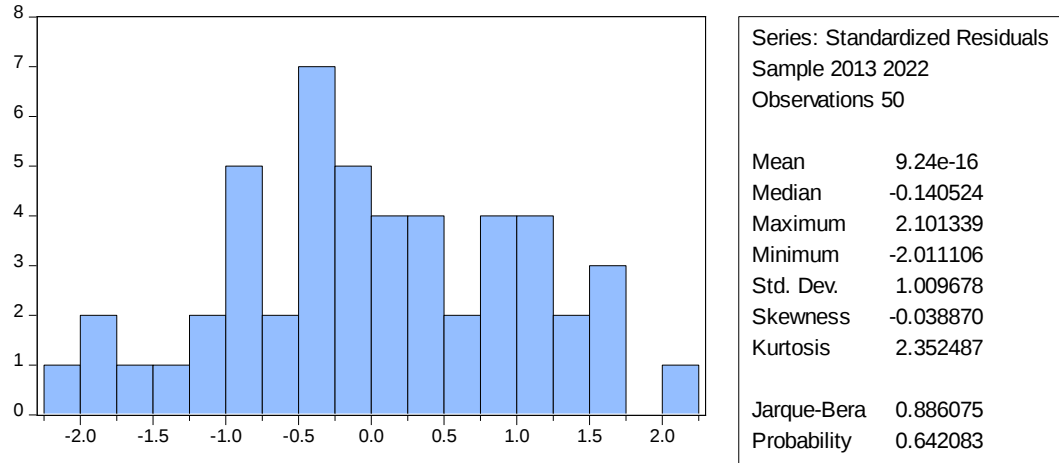
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	887.541268	4	0.0000

Source : Output EViews12

Based on the table above, it shows the Prob. value of 0.0000 (<0.05), which rejects H_0 . So according to the Hausman test, the Fixed Effect Model (FEM) is the best model. Furthermore, after getting the best model, weighting is done with GLS Weight: SUR cross section on the Fixed Effect Model (FEM). This is done to minimize the existence of classical assumptions so that the output will be better.

Classic Assumption Test

Normality Test



Source : Output EViews12

Figure 2. Normality Test

Based on the figure above, the Jarque-Bera probability value is 0.642083 (>0.05), meaning that H_0 is accepted and the normality assumption is met. So it can be concluded that the residuals are normally distributed.

Multicollinearity Test

Based on the test output, it shows that the correlation between independent variables has a correlation value of less than 0.80. So, it can be concluded that there is no multicollinearity problem in the regression model.

Heterosdecasticity Test

Based on the test output, it shows that after the weighted process, it can be seen that the R-Squared value has increased to 0.999497 from the previous value of 0.966497 (unweighted), this means that there is no heteroscedasticity problem because the R-squared value has increased.

Multiple Linear Regression Test

The test results can be seen as follows:

Table 3. FEM Estimation Results with GLS Weight: SUR cross section

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.917836	0.025717	35.69012	0.0000
X1	-0.023360	0.006726	-3.473317	0.0012
X2	-0.000129	6.02E-05	-2.146781	0.0378
X3	-0.003773	0.000476	-7.925642	0.0000
X4	2.13E-06	5.76E-07	3.690050	0.0007

Source : Output EViews12

$$Y = 0.917836 - 0.023360 X_1 - 0.000129 X_2 - 0.003773 X_3 + 0.00000213 X_4 + \varepsilon$$

Hypothesis Test

T Test

In this study, the t-statistic probability used is 0.05 (5%). Based on the t-statistic output, it shows that the variables of education level, road stability infrastructure, electricity access infrastructure and population have an effect on inter-region inequality in Indonesia with a significance value of 0.05. In this study, the t-table value is based on the df (n-k) formula where n is the number of observational data used, namely 50 and k is the number of variables in the study, namely 5 variables. Then df (50-5) = df (45). So with a df45 value and a probability level of 0.05, the t_{table} value is 1.67943.

1. The education level variable has a t-value of -3.47331 > t-table of 1.67943 and a significance value of 0.0012 < 0.05, so it can be said that education has a significant and negative effect on inter-region development inequality in Indonesia.
2. The road stability infrastructure variable has a t-value of -2.146781 > t-table of 1.67943 and a significance value of 0.0378 < 0.05, so it can be said that road stability has a significant and negative effect on inter-region development inequality in Indonesia.
3. The electricity access infrastructure variable has a t-value of -7.925642 > t-table of 1.67943 and a significance value of 0.0000 < 0.05, so it can be said that electricity access has a significant and negative effect on inter-region development inequality in Indonesia.
4. The total population variable has a t-value of 3.690050 > t-table of 1.67943 and a significance value of 0.0007 < 0.05, so it can be said that population has a significant and positive effect on inter-region development inequality in Indonesia.

F test

The F test is used to determine whether the independent variables together have a significant effect on the dependent variable. To do this test, the F-statistic and F-statistic probability of the multiple linear regression results are required. The test results show that the F-statistic is 10176.21 and the probability value is 0.000000 which has a value smaller than 0.05 (5%). The F_{table} value is sought through degrees of freedom (df) 1 and 2. df 1 has the formula k-1. Where k is the number of variables. Then df 1 is 5-1 = 4. df 2 has the formula n-k-1. n is the number of observation samples, so that df 2 is 50-5-1 = 44, based on the known degrees of freedom, F_{table} is 2.58. So, it can be concluded that based on the F test it can be assessed that $F_{count} > F_{table}$ (10176.21 > 2.58) or probability < 0.05 (0.000000 < 0.05) which means that simultaneously the four independent variables affect the development gap as the dependent variable.

Coefficient of Determination (R^2)

Based on the test output, the R-squared value is 0.99, meaning that the independent variables are able to explain the dependent variable by 99% and the remaining 1% is influenced by other factors. The use of GLS Weight weights: SUR cross section in the Fixed Effect Model (FEM) causes the coefficient of determination (R^2) value to increase (Pusakasari, 2015).

DISCUSSION

Effect of Education Level on Development Inequality

The education variable used in this study is the average years of schooling, where the test results using panel data regression show that the average years of schooling has a negative effect on development inequality. Based on the t-test output on this variable, $t\text{-count} > t\text{-table}$ ($-3.47331 > 1.67943$) or probability value < 0.05 ($0.0012 < 0.05$) so H_0 is rejected H_a is accepted which means that partially education has a significant negative effect on development inequality.

This is in accordance with the Human Capital theory put forward by Gary S. Becker and supported by the classic theory put forward by Adam Smith which states that increasing human resources through education is the main key to successful development because education is an investment to determine an achievement. This study has the same results as research conducted by Hakim, Intan, & Putri (2018) and Siahaan (2020) who obtained the results of education having significant negative results on development inequality. These researchers said that the level of public education that contributes to increasing human resources and production capacity will be able to reduce inequality.

Effect of Road Stability Infrastructure on Development Inequality

The test results using panel data regression show that road stability has a negative effect on development inequality. Based on the t-test output on this variable, $t\text{-count} > t\text{-table}$ ($-2.146781 > 1.67943$) or probability value < 0.05 ($0.0378 < 0.05$) so that H_0 is rejected H_a is accepted which means that partially road stability has a significant negative effect on development inequality.

This is in accordance with Rostow's (1960) Stage of Growth theory, which suggests that social overhead capital is a key prerequisite for the take-off process. With increased accessibility and availability of infrastructure such as road access to previously marginalized areas, it will provide economic opportunities and access to basic services can be evenly distributed throughout the region so that it can help reduce inequality between regions. The results of this study have the same results as research conducted by Rosmeli (2018) which found that roads have a significant effect on development inequality. A good and quality road network will improve accessibility and strengthen inter-region connectivity.

The Effect of Household Infrastructure on Access to PLN Electricity on Development Inequality

The test results using panel data regression show that access to electricity has a negative effect on development inequality. Based on the t-test output on this variable, $t\text{-count} > t\text{-table}$ ($-7.925642 > 1.67943$) or probability value < 0.05 ($0.0000 < 0.05$) so H_0 is rejected H_a is accepted which means that partially electricity access has a significant negative effect on development inequality.

This research is also in accordance with the stages of growth theory proposed by Rostow (1960) which considers that social overhead capital is the main prerequisite for take-off and electricity access infrastructure is part of social overhead capital that is able to encourage and accelerate economic growth and improve people's welfare so that it will reduce inequality. The results of this study are similar to research conducted by Sarkodie & Adams (2020) which states that there is a negative effect of the interaction between inequality and electricity access.

Effect of Population on Development Inequality

The test results using panel data regression show that population has a positive effect on development inequality. Based on the t-test output on this variable, $t\text{-count} > t\text{-table}$ ($3.690050 > 1.67943$) or probability value < 0.05 ($0.0007 < 0.05$) so that H_0 is rejected H_a is accepted, which means that partially population has a significant positive effect on development inequality.

This is supported by the demographic transition theory. The theory explains the stages of a country's transition from high fertility and mortality rates to low levels. In the early stages of the transition, when fertility rates are high and mortality rates are high, population growth can trigger inequality. This is further supported by the optimum population theory, which shows that if the population density exceeds the optimum limit, then development inequality may occur. The results of this study have the same results as research conducted by Raharti, Laras, & Oktavianti (2021) and Bustam Anggun Pamiati (2021) which show that population has a positive and significant effect on development inequality. Population can be a factor in increasing inequality if there is unevenness in the distribution of the population. The uneven distribution of the population in a region can affect the economic conditions of the region.

CONCLUSION

From the research that has been presented, it can be concluded that:

1. The level of education through Average Years of Schooling has a negative and significant influence on inter-region development inequality in Indonesia in 2013-2022, which means that an increase in Average Years of Schooling has an influence in reducing inter-region development inequality in Indonesia.
2. Infrastructure through Road Stability has a negative and significant effect on inter-region development inequality in Indonesia in 2013-2022, which means that increasing Road Stability has an influence in reducing inter-region development inequality in Indonesia.

3. Infrastructure through Households with Access to Electricity has a negative and significant effect on inter-region development inequality in Indonesia in 2013-2022, which means that increasing Access to Electricity has an influence in reducing inter-region development inequality in Indonesia.
4. Total Population has a positive and significant influence on inter-region development inequality in Indonesia in 2013-2022, which means that an increase in population is also followed by an increase in inter-region development inequality in Indonesia.
5. Simultaneously, the level of education, road stability infrastructure, electricity access infrastructure, and population have a significant effect on inter-region development inequality in Indonesia.

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