

The Effect of Electricity Development in Indonesia on Poverty and Income Inequality

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Abstract

Several provinces in Indonesia are still experiencing a crisis and the distribution of electricity is not evenly distributed. This is thought to be one of the causes of poverty and income inequality in several regions. Therefore, research on this matter is very important because electricity is a basic infrastructure which is an important aspect in encouraging community economic activity as well as a tool that helps alleviate poverty and income inequality. This study used a simultaneous panel model, analyzed using the Two-Stage Least Square (TSLS) method, and used data from 31 provinces in Indonesia in 2010-2015. The results showed that electrification had a positive impact on economic growth. On the other hand, economic growth has a negative impact on poverty levels. However, an increase in electrification is actually indicated by an increase in income inequality in this study. So it can be concluded that economic growth is not enjoyed equally by people with low electrification ratios, but only by certain groups. The implication is that policies implemented to alleviate poverty and income inequality through increasing economic growth must pay attention to equal distribution of electricity, especially in areas based on labor-intensive industries, so that they are also able to attract investment and increase access to education.

Keywords: Electricity, Income Inequality, Indonesia, Poverty, Simultaneous Panel

JEL classification: H54, J21, J31, O11, O47

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1. Introduction

The development of electricity infrastructure in the 21st century is main priority of development in country all over the world. However, it's different at Southeast Asia, one of them is Indonesia. It is the lowest growth of electricity infrastructure development than other countries. Electricity ratio as a quality indicator of electricity in Indonesia is still varies greatly between regions with one another (Adam, 2016). Electricity is an important of the basic infrastructures that are needed and urgent to develop especially in developing countries.

In the history of development economics, electricity has been thought of as a key factor

of industrial activities in an area. According to Kassem (2018) that the electrification of new and existing industrial developments. This can be seen from the increase in the number of manufacturing companies, manufacturing workers, and their products. According to him, electrification increases the input and output of firms and it can be said that electricity has a considerable causal impact on the industrial sector. This is because electricity and its distribution are very important for the welfare of industry and labor to make it more secure.

Recently, researchers have shown increased interest in the study of electricity distribution and its relationship to other economic variables.

This is because there is increasing awareness that electrification can play an important role in addressing the issue of poverty and income inequality. Various studies have been applied to determine relationship between energy consumption and economic growth. Attigah & Mayer-Tasch (2013) stated that there is a direct relationship of electricity consumption to economic growth and shows that electricity is a limiting factor for economic growth. Power supply shocks have a negative impact on economic growth. The emerging implications of this study are in countries that has electricity shortages such as Pakistan. On the other hand, the electricity sector operates at a modest capacity margin, require planning and investment in other infrastructure development to meet the growing demand for power supplies.

Apart from industry, electricity is also a source of energy for household activities and also as an important input in achieving the Millennium Development Goals (MGDs), namely alleviating poverty. This is in line with Cook (2011) research which emphasizes the importance of linking electrification development with productivity to alleviate poverty. On the other hand, the poverty reduction strategy in Indonesia is based on the argument that with high economic growth, poverty

will be reduced through the trickle down effect mechanism, but this program has not yet achieved the expected results (Satriawan & Oktavianti, 2012). It is also interesting to note that electrification can also affect the level of poverty through economic growth.

Electricity is a major problem in Indonesia and other middle income countries. Throughout this paper, the term “electrification ratio” will refer to a measure of electricity quality. Electrification ratio shows that Indonesia’s electricity is at the lowest level in Southeast Asia. Indonesia’s electrification ratio has indeed increased every year, in 2007 it was 63 percent, increasing slowly in 2015 to 84.35 percent and even reaching 96.71 percent at the end of 2020 (Badan Pusat Statistik, 2020; Kencono et al., 2015; Zen et al., 2007)5th edition, contains data on Indonesia’s energy and economy from 2000 through 2006. This edition is an updated version of the 4th Edition, covering estimated energy demand for every sector. The updating of the Handbook of Indonesia’s Energy Economic Statistics, is a part of the Center for Data and Information on Energy and Mineral Resource’s (CDI-EMR. However, within the country itself there is still inequality between provinces and regions. This can be seen from the image below.

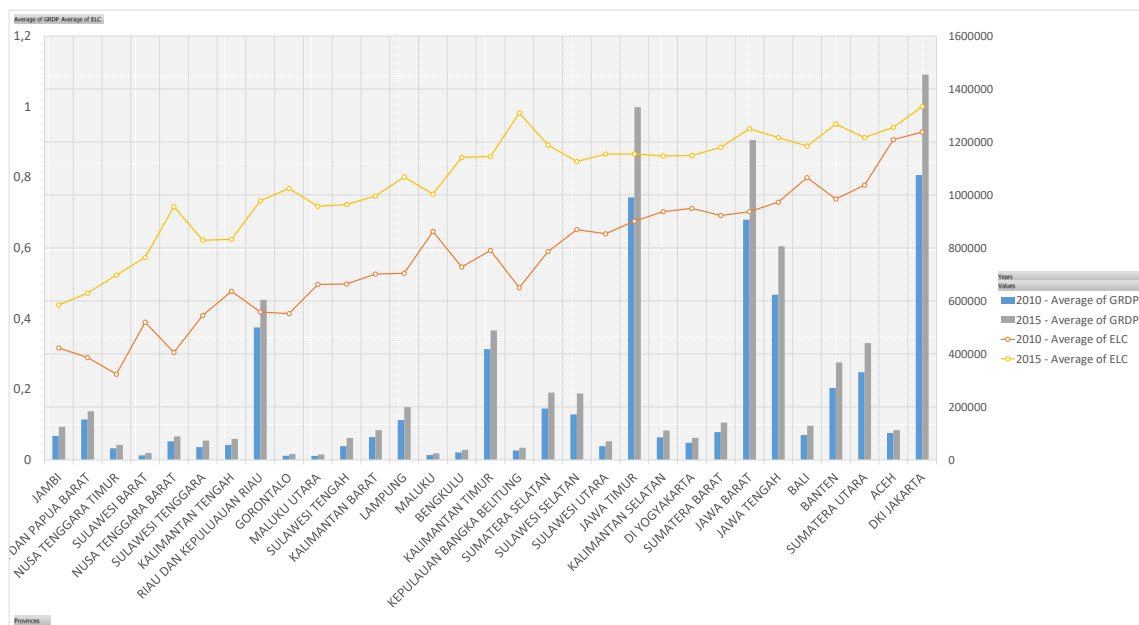


Figure 1. Comparison of Electrification Ratio and GRDP of 31 Provinces in Indonesia, 2010 and 2015
Sources: (Perusahaan Listrik Negara (PLN), 2011, 2016) and (Badan Pusat Statistik (BPS) RI, 2011, 2016)

Based on figure 1, there is an increase in GRDP from the initial year of the study in 2010 to the year of the end of the study in 2015. From this figure, it can be assumed that as the electrification ratio increases, the GRDP increases. Previous studies have explored the relationships between electricity and economic variables in developing countries. Sekantsi & Okot's research (2016) which empirically examined electricity consumption and nexus economic growth in Uganda from 1981 to 2013. The test was carried out with autoregressive distributed Lag-bounds and analyzed by the Granger causality test. The results confirm a long-term relationship between electricity consumption and economic growth, and vice versa.

Electricity consumption is a component that considered an indicator of socio-economic development along with its role in the production function. Rising prices of energy raw materials, depletion of existing resources, the search for alternative energy sources, and energy conservation, energy technology, have been brought to the issue of causality between energy used and economic growth. A study conducted by Ramdani & Setiani (2017) in Indonesia also states that the slow development of electricity infrastructure, particularly in most parts of Eastern Indonesia, makes it difficult for economic growth to grow in some areas and eventually forms a vicious cycle of poverty. Figure 2 shows that the poverty rate, which has experienced a slow decline, is also directly proportional to the electrification ratio in almost all provinces. In more detail, it was found that as many as 20 Provinces experienced a decrease in poverty with an increase in the electrification ratio in the region. However, there are special findings, one of which is in the province of Aceh which did not experience a reduction in poverty with electrification growth of 4 percent during that period. On the other hand, there were 10 provinces that experienced an increase in electrification, but there was an increase in the number of poor people during that period. From this figure, it can be assumed that as the electrification ratio increases, poverty will also decrease. This is in line with the World

Bank's Reaching the Poor report which concluded that there is almost no positive correlation between the availability of infrastructure and poverty alleviation. It should be noted that more than 70 million Indonesians do not have access to electricity and more than 80 percent are in rural areas. Even 3 out of 4 poor people who live in the suburbs and borders of the country have difficulty accessing electricity. Electricity in rural areas is one of the most important problems in reducing poverty (World Bank, 2005).

In Indonesia, the research of Handayani et al. (2017) Handayani et al. (2017) which states that electricity infrastructure is spread throughout the archipelago and most of the power plants are located on the islands of Java and Bali, which is 64 percent. PT. PLN (Perusahaan Listrik Negara) as the State Electricity Enterprise, owns 76 percent of the national power generation capacity, and the rest is owned by private companies. In addition, the transmission and distribution network is run by PLN. This is also one of the challenges for access to electricity to be evenly distributed throughout Indonesia. According to Javadi et al. (2013) who examined global policies on electrification in rural areas, stated that the lack of electricity in rural areas is one of the factors that exacerbates poverty in developing countries. However, other challenges include large geographic areas with dispersed communities and low demand for electricity, leading to increased installation costs, making access to rural electricity difficult in developing countries.

The lack of success of the government in reducing poverty and income inequality needs attention, especially looking for things that can cause low economic growth so that it affects the level of poverty and high income distribution inequality. With the concept of a fair and even electrification ratio, namely a high electrification ratio followed by distribution of income between regions and between economic sectors, low poverty, minimal unemployment, high investment and even distribution in various regional sectors. It is important to map the provinces based on the electrification ratio indicator.

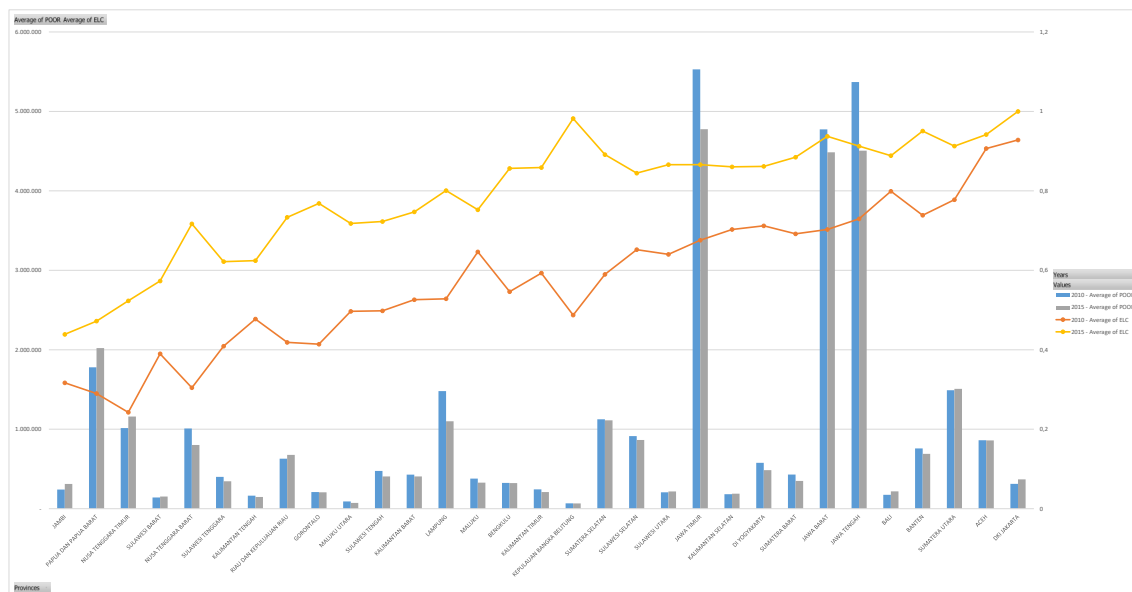


Figure 2. Comparison of Electrification Ratio and Number of Poor Population in 31 Provinces in Indonesia, 2010 and 2015

Sources: (Perusahaan Listrik Negara (PLN), 2011, 2016) and (Badan Pusat Statistik (BPS) RI, 2011, 2016)

Most studies in the field of electricity in economic development have only focused on county level. So far, however, there has been little discussion about electricity on provinces level. Indonesia, whose countries have different electrification ratios, poverty, and income distribution among their provinces, indicates the relationship and implication of electrification on poverty and income distribution. Moreover, differences in the economic characteristics of each province also require special regional research.

Based on the description that has been conveyed, this study therefore set out assess effect of electricity infrastructure on poverty, and the effect of electricity infrastructure on income distribution through increasing economic growth and other economic variables at the regional level simultaneously. This is expected to give policy makers considerations in determining the right regulations in improving the quality and quantity of the electrification ratio that is fair and evenly distributed in all provinces in Indonesia so that the benefits can be felt through economic growth, poverty reduction, and equal distribution of income.

2. Research Method

The descriptive quantitative research method using the correlation approach (correlational research) was used in this study. The type of data used in this study is secondary data. All data is a combination of cross-sectional data and time series data. Cross section data used are 31 provinces in Indonesia with time series data from 2010 to 2015. The research method uses descriptive and quantitative methods with simultaneous panel analysis. The simultaneous panel is used to measure the impact of electricity infrastructure on poverty and income distribution which is believed to have no direct effect but there is a mechanism transmission in view of the impact. The simultaneous equation model consists of 4 structural equations and 1 identity equation which is to see the relation between variables analyzed by Two-Stage Least Square (TSLS) method. Data management and analysis were performed using EViews 9.0 and collected using Microsoft Excel 2013. Here are the specifications of the model used in this study.

Table 1. Number of Samples and the Data Source

No	Definition and variable name	Unit	Source of data
1.	The number of the poor (LN_POOR)	Number of people	BPS
2.	GRDP ADHK 2010 (LN_GRDP)	Billion Rupiah	BPS
3.	Labor (LN_LABOR)	Number of people	Sakernas
4.	Foreign Investment (LN_FI)	Million US\$	BKPM
5.	Lag of Domestic Investment (LN_DI)	Billion Rupiah	BKPM
6.	Electrification Ratio (ELC)	Percent	PLN & ESDM
7.	Gini Ratio (GINI)	Index	Bappenas
8.	Unemployment (LN_UNE)	Number of people	BPS
9.	The average of school duration (EDU)	Year	BPS
10.	Minimum wage rate in province (LN_WAGE)	Rupiah	BPS
11.	Labor force (LF)	Number of people	Sakernas
12.	i	Provinces	BPS
13.	t	from 2010- 2015	BPS

2.1 Economic Growth

The economic growth model used refers to the Solow Neoclassical Growth Theory and also follows a model proposed by Acaravci & Ozturk (2012), Lean, Hooi Hooi and Tan (2011), and Mubarak & SBM (2020) which has been modified and carried out by adding other variables that affect growth. Electricity, on the other hand, is a proxy for access to technology, or simply the ability to use modern equipment, as well as households that have access to electricity. The model specifications used to explain the effect of electricity on economic growth are as follows:

$$LN_{GRDP_{i,t}} = a_0 + a_1ELC_{i,t} + a_2LN_{DI_{i,t-1}} + a_3LN_{FI_{i,t}} + a_4LN_{LABOR_{i,t}} + u_{1i,t} \quad (1)$$

Expected value of $a_1, a_2, a_3, a_4 > 0$

2.2 Labor

Increase in the amount of labor is one indicator of economic development success and distribution of income. The employment model refers to research of (Jones, 1997) and the theory of labor and wage with slight modification. The model specifications used to explain the effect of electricity infrastructure on labor are as follows:

$$LN_{LABOR_{i,t}} = b_0 + b_1ELC_{i,t} + b_2EDU_{i,t} +$$

$$b_3LN_{WAGE_{i,t}} + u_{2i,t} \quad (2)$$

Expected value of $b_1, b_2 > 0$ and $b_3 < 0$

2.3 Poverty

The poverty model used refers to the theory and the relationships between variables that have been mentioned in some previous researches namely Balisacan et al. (2003) and Akinbobola & Saibu (2004) with modification. The model specifications used to explain the effect of economic growth on poverty are as follows:

$$LN_{POOR_{i,t}} = c_0 + c_1LN_{GRDP_{i,t}} + c_2GINI_{i,t} + c_3LN_{UNE_{i,t}} + u_{3i,t} \quad (3)$$

Expected value of $c_1 < 0$ and $c_2, c_3 > 0$

2.4 Gini Ratio

The Gini ratio model used refers to Kuznets's Hypothesis and research from Fielding & Torres (2006). The model specifications used to explain any variables that may affect the Gini ratio are as follows:

$$GINI_{i,t} = d_0 + d_1LN_{GRDP_{i,t}} + d_2EDU_{i,t} + u_{4i,t} \quad (4)$$

Expected value of $d_1, d_2 < 0$

2.5 Identity Equation

$$LF = LABOR + UNE \quad (5)$$

Based on the identification, it can be concluded that it is true that the analysis model is overidentified, the econometric technique that can be used is the two stages least square (TSLS). TSLS method is done by two stages. That is first, to estimate every equation with all exogenous variables that exist in the model, so that the value of each endogenous variable is expected. The expected value of the endogenous variable from the first stage is then included as an explanatory variable (replacing the actual value of the variable) in the relevant equations (Gujarati, n.d.) heteroscedasticity, autocorrelation, model specification.

3. Results and Discussion

Based on the results of testing model selection, a model is said to be good for a prediction tool if the parameter estimates in the regression model are BLUE (Best, Linear, Unbiased Estimator) which can be said that the Gauss-Markov Assumptions has been fulfilled (Verbeek, 2007) while the use of up-to-date econometric techniques has become more and more standard practice in empirical work in many fields of economics. Typical topics include unit root tests, cointegration, estimation by the generalized method of moments, heteroskedasticity and autocorrelation consistent standard errors, modelling conditional heteroskedasticity, models based on panel data, and models with limited dependent variables, endogenous regressors and sample selection. At the same time econometrics software has become more and more user friendly and up-to-date. As a consequence, users are able to implement fairly advanced techniques even without a basic understanding of the underlying theory and without realizing potential drawbacks or dangers. In contrast, many introductory econometrics textbooks pay a disproportionate amount of attention to the standard linear regression model under the strongest set of assumptions. Needless to say that these assumptions are hardly satisfied in practice (but not really needed either.

Therefore, several models in this study are said to be quite good and can be used to predict and have passed a series of classical assumptions tests that underlie them. The classic assumption test in this study consists of; normality test, multicollinearity test, heteroscedasticity test, autocorrelation test, and economic criteria test.

Table 2. Result of Economic Growth Equation Model

Exogenous Variable	Endogenous Variable: LN_ GRDP		
	Coefficient	Stat. Value t	Probability
C	3.633197	4.550974	0.0000*
ELC	0.593844	14.26579	0.0000*
LN_DI(-1)	0.004869	2.092490	0.0385*
LN_FI	0.017799	3.721487	0.0003*
LN_LABOR	0.990291	9.224528	0.0000*
		DW stat. = 1.510	R ² = 0.999430

Notes: *) Significance level at 10 percent

Table 2 presents an overview of the electricity has a significant effect on economic growth calculated by the value of GRDP. It means an increase in electrification ratio of 1 percent will increase economic growth of 0.593844 percent with the assumption that other variables remain (*ceteris paribus*). Various studies have been conducted to determine the relationship between electricity and economic growth. In line with this, Ikegami & Wang (2016) also support the results of this estimate by stating that total electricity consumption has a positive and unidirectional relationship to real GDP. Several lines of evidence suggest that there is a two-way causal relationship between electricity consumption and economic growth. One of them is in Indonesia's neighboring country, namely Malaysia. So, according to a study, the government must increase investment in electricity infrastructure to increase the supply of electricity so that it can also promote economic growth (Tang & Tan 2013). The overall result from Acaravci & Ozturk (2012) show that there is an evidence of unidirectional short-run and strong causalities running from the electricity consumption per capita to real GDP per capita.

In other words, ‘Growth Hypothesis’ is confirmed in this country. This suggests that electricity plays an important role in economic growth. This study also supports the growth hypothesis which states that an increase in electricity consumption is also a sign of output growth. However, one of this result contradicts the research conducted by Mubarak & SBM (2020), that when examined at the provincial level in Central Sulawesi, there is no influence between labor and economic growth. This is because the large number of available natural resources is not followed by the availability of a quality workforce in the province. Meanwhile, according to Keynesian, if the number of labor force increases then output must also increase.

Estimation result from lag DI and FI, this is in line with Harrod-Domar’s growth theory that investment or capital formation has a direct influence on economic growth. The ability of investment in terms of money and physical investment as additional capital stock and accumulated savings are expected to increase national production so as to increase economic growth. This result is also in line with Alfa & Garba (2012) that in the short term and in the long run lag values of DI influences economic growth in Nigeria. However, in Algeria only DI has a positive effect on the short term on economic growth Bakari (2017). Several researchers have shown that there is a long-term relationship between DI and FI causes GDP growth was also found by Ullah et al. (2014) in Pakistan in the period 1976-2010. They study found that there is a dynamic interaction between FI, DI, and economic growth. Then a two-way relationship has been found between FI and DI which implies that both DI and FI mutually cause each other. The same thing was also stated by Suleiman et al. (2013) who conducted research in countries that are members of the Southern Africa Custom Union (SACU); Botswana, Lesotho, Namibia, South Africa, and Switzerland in the period 1980-2010. The estimated result shows that there is a positive and significant relationship between FI on the economic growth for the SACU countries. This implies that an increase in FI inflow in

SACU region will increase the economic growth of these countries.

The amount of labor significantly influences economic growth. These findings support the neo-classical growth theory that the growth of labor can spur economic growth. According to Todaro (2010), population growth and labor growth are traditionally considered as positive factors that spur economic growth. A larger number of workers means an increase in the number of productive workers while a larger population means an increase in the size of the domestic market. Scott (2015) on his research also proved that the production and consumption of electricity could affect economic growth in Africa as a developing country, though the relationship is complex and context-specific. The evidence from Sub-Saharan Africa suggested that electricity is a factor that does contribute to economic growth. In different countries the causal relationship has been found to be in both directions and in one direction. Whether as a causal factor or enable of growth, it is clear that electricity consumption is linked to economic growth.

Table 3. Result of Labor Equation Model

Exogenous Variable	Endogenous Variable: LN_LABOR		
	Coefficient	Stat. Value t	Probability
C	6.177614	66.90880	0.0000*
ELC	0.053489	1.905313	0.0586*
EDU	0.033555	1.423030	0.1568
LN_WAGE	0.082832	4.539694	0.0000*
		DW stat. = 1.954	R ² = 0.999647

Notes: *) Significance level at 10 percent

Table 3 shows an overview of electricity has a significant effect on the labor. Elasticity of labor to the electrification ratio of 0.053489 which means that each increase in electrification ratio of 1 percent will increase labor by 0.053489 percent with the assumption of *ceteris paribus*. Electricity can also reflect access to technology that contributes directly to increasing employment and income below the poverty line, and reducing poverty through growth. These results are in line

with the research of Vernet et al. (2019) which shows that adequate access to electricity can increase average household income, especially in the form of entrepreneurial activities and opportunities for business development and production, so as to reduce the number of unemployed in the area.

An important economic mechanism, where electrification will encourage the entry of companies and industrialization, increase output, and economic growth. This is in line with (Kassem, 2018, 2020) which concludes that electrification encourages the development of new and existing industries and of course new jobs for the region. In essence, the government must increase investment in electricity infrastructure in order to increase the supply of electricity so that it can drive economic growth. Therefore, electricity infrastructure and its distribution are very important so that the welfare of industry and labor becomes more secure so as to increase output and economic growth in these industrial areas.

Wages that apply in the labor market are the price of the labor concerned. The determination of the level of wages depends very much on the attractive forces between supply and demand in the labor market (Seran, 2012). Based on the results above that Provincial minimum wage policy (WAGE) has a significant effect on number of labors. The minimum wage policy and the number of workers will be positive if the number of workers in the informal sector also increases. According to Jones (1997), any increase in the minimum wage will increase the number of informal sector workers. As for the case in Indonesia, the high incidence of low pay in Indonesia may related to the issue of minimum wage compliance, with 48.55 percent of regular wage employees receiving wages below the lowest wage that is permissible by law in August 2014 (ILO, 2015). On the other hand, the minimum wage imposed by the government through this policy has not been considered expensive enough for the company. So, it is still acceptable to the company and not yet burden the company. If

minimum wage policies are perceived to be burden some to firms, they can circumvent or reduce the effectiveness of minimum wage policy.

Table 4 Result of Poverty Equation Model

Exogenous Variable	Endogenous Variable: LN_POOR		
	Coefficient	Stat. Value t	Probability
C	14.31622	15.12131	0.0000*
LN_GRDP	-0.145134	-2.357835	0.0197*
GINI	-0.103928	-0.800836	0.4245
LN_UNE	0.047862	1.974990	0.0501*
DW stat. = 1.449			R ² = 0.998392

Notes: *) Significance level at 10 percent

Based on Table 4, GRDP referring to economic growth has a significant negative effect on poverty. Elasticity of the poor to the GRDP of 0.145134 which means that each increase in GRDP of 1 percent will decrease the poor peoples by 0.145134 percent with the assumption of *ceteris paribus*. This finding is consistent with that of Balisacan et al. (2003) who studied of growth and poverty reduction in 285 districts (kotamadya/kabupaten) in Indonesia. Their result suggest that growth and poverty show strong linkages to the aggregate level. In addition, there are other factors that also directly affect the welfare of the poor apart from its impact on growth itself. One of them is infrastructure. Growth and poverty reduction vary enormously across the island group, provinces, and districts of Indonesia. So that, in the Indonesian case, changes in the poor's welfare in response to overall economic growth seem fairly large.

The estimation results are according to the opinion of Adams's (2003) study of 50 developing countries and 101 intervals to examine the impact of economic growth on poverty and inequality. He found that per capita GDP statistically has significant effect on poverty reduction (negative value). Nevertheless, per capita GDP does not significantly reduce poverty through the effects of income inequality. This is due to the insignificance of economic growth in affecting income inequality.

The results also show that unemployment has a positive and significant relationship with poverty: as poverty decreases (or increases), unemployment decreases (or increases). These results suggest that if it is related to electricity, recent evidence from Kassem (2018) suggests that energy infrastructure is potentially important to get people out of poverty, but it is also important to provide it in a cheap and sustainable way. This is supported by the latest research by Kassem (2020) which states that a sufficient electrification ratio will have a limited impact on poverty alleviation, especially in the short term. One of the ways to do this is through increasing long-term economic growth in an area.

Based on Table 5, GRDP has positive and significant effect on Gini ratio. The estimation results show that the probability of economic growth on the gini ratio of 0.0423 means that the probability is far below the real level (α) used ie 10 percent. It means an increase in GRDP of 1 percent will increase gini ratio of 0.053766 percent with the assumption that other variables remain (*ceteris paribus*). Similar results are shown by Wodon (1999) which stated that national economic growth in Bangladesh has a significant effect on increasing income inequality especially in urban areas because of the higher correlation rate in urban areas than in rural areas. So that, a pro-rural development strategy would also reduce inequality. He developed a regression equation to estimate the correlation between growth and income inequality in Bangladesh using panel data of 30 urban areas and 40 rural areas of 1983 - 1996.

Table 5 Result of Gini Ratio Equation Model

Exogenous Variable	Endogenous Variable: GINI		
	Coefficient	Stat. Value t	Probability
C	0.080279	0.366522	0.7145
LN_GRDP	0.053766	2.048098	0.0423*
EDU	-0.038655	-3.016568	0.0030*
DW stat. = 1.825			R ² = 0.901959

Notes: *) Significance level at 10 percent

High economic growth is the goal of all countries, because high economic growth can be used as an indicator of the success of a country's economic development. However, there is actually more important than just high economic growth, namely income equity and low poverty rates (Nuraini & Hariyani, 2019). Indonesia has a noteworthy record in terms of reducing income disparities, especially over the last decade in which the gini ratio has increased significantly. Nevertheless, the level of income gap is still low compared with many other developing countries. Nevertheless, the share of the highest income rose sharply in the late 1990s, which coincided with the economic crisis and was generally still higher than in some other countries (Leigh & van der Eng, 2009).

According to this study, the increasing economic growth also triggered the increase of public consumption, so that economic growth is only enjoyed by certain groups of people. This result is also similar to the Kuznets Hypothesis which stated that in the short term there is a positive correlation between economic growth and income inequality, especially in countries that have a fairly rapid rate of economic growth such as in Indonesia. The higher the growth of GRDP, it could be greater the difference between the poor and the rich. The classical approach also emphasizes that income inequality will promote economic growth.

On the other hand, the quality of education in a region that can be seen from the high average of school length significantly influence the Gini ratio. This suggests that the average length of school significantly influences the magnitude of income inequality, the higher the average length of schooling or the level of education in the province, the lower the income inequality. This result is in line with research by Pratysto & Panjaitan (2020) which concluded that increasing human resources, one of which is through education, can reduce the Gini coefficient. This means that it can make the distribution of income more evenly distributed in the long run, particularly

in lower middle income countries, and thus result in a more equitable distribution of income. A simultaneous equation model of economic development and inequality from Fielding & Torres (2006) identifies bi-directional relationship between income inequality and other indicators of social and economic development such as per capita income, literacy, and life expectancy. Overall, inequality was lower than improvements in other development indicators. So, it can be ignored that the better the quality of education, the more equitable the income distribution will be. According to (Todaro, 2010) the education sector plays a major role in shaping the ability of a developing country to absorb modern technology and develop production capacity in order to create sustainable growth and development.

The central thesis of this paper is that electricity development has the effect of reducing the rate of growth through economic growth which also increases as a result of reliable energy supply support, in this study electricity with an indicator of the electrification ratio. The demand for electricity will increase in line with economic development and population growth. An important economic mechanism, where electrification will encourage the entry of companies and industrialization and of course will increase output. Therefore, electrification will also have an impact on increasing the number of workers through increasing industrial activities in the area. However, the economic growth indicated in the estimation results will increase income inequality (Gini ratio). This indicates that the benefits of economic growth which are supported by electrification have not been able to feel the benefits fairly and evenly in most provinces in Indonesia.

4. Conclusions

This study shows that the electrification ratio, the previous year's domestic investment, foreign investment, and the number of workers effectively drive economic growth as measured by GRDP. Furthermore, the GRDP clearly has a negative and significant effect on poverty, supported by unemployment which has a positive and significant effect on poverty. On the other

hand, the electrification ratio, education, and minimum wage policies also have a positive effect on the number of workers.

Based on the results of this study, economic growth will increase as a result of increased electrification, domestic investment and foreign investment. This will reduce the level of poverty following the increase in economic growth. Increased electrification will also increase the number of workers in an area. This means that electrification is able to increase the creation of new jobs and reduce unemployment for regions that have a large workforce. However, this study finds that economic growth will actually increase income inequality as well. If it is related to electrification, the increased electrification is actually indicated to increase income inequality. This also indicates that economic growth is not enjoyed equally by people with low electrification ratios, but only by certain groups, so that it will have an impact on reducing the effectiveness of economic growth in alleviating poverty and income inequality. The opposite occurs in communities with high electrification ratios. Most of the population will experience economic growth and poverty will also decrease.

Currently, one of the government projects to encourage equitable distribution of electricity is Bright Indonesia 35 thousand MW which has been realized between 2015 and 2019, which is one of the government's good intentions in overcoming the problem of electrical energy shortages and meeting the electrification ratio target which is expected to be at 99.9 percent in this 2021. However, the priority of development is only in urban areas, not evenly distributed throughout the country. In addition, electricity development must pay attention to three aspects, namely, sufficient quantity, good quality, and reasonable price. Among the targets that should be prioritized are the poor; construction of electric power supply facilities in underdeveloped areas; electric power development in remote and border areas; and rural electricity development. Inequality in the provision of electricity infrastructure between regions requires strong political will from the government and councils in each region.

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