Analysis of the Effects of Economic and Social Infrastructure on Economic Growth in Indonesia

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Analysis of the Effects of Economic and Social Infrastructure on Economic Growth in Indonesia

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ABSTRACT

This study aims to analyze the effect of economic and social infrastructure on economic growth in Indonesia. The independent variables used in this study are road infrastructure, electricity infrastructure, health infrastructure and education infrastructure. Data were processed using panel data analysis with the best regression model in accordance with the characteristics of the data in this study, the fixed effect model. The results showed that economic and social infrastructure simultaneously had a significant effect on economic growth. Partially road infrastructure, electricity infrastructure, health infrastructure have a positive and significant effect on economic growth while education infrastructure has a positive but not significant effect on economic growth in Indonesia.

Keywords: Road Infrastructure, Electricity Infrastructure, Health Infrastructure, Education Infrastructure, Economic Growth

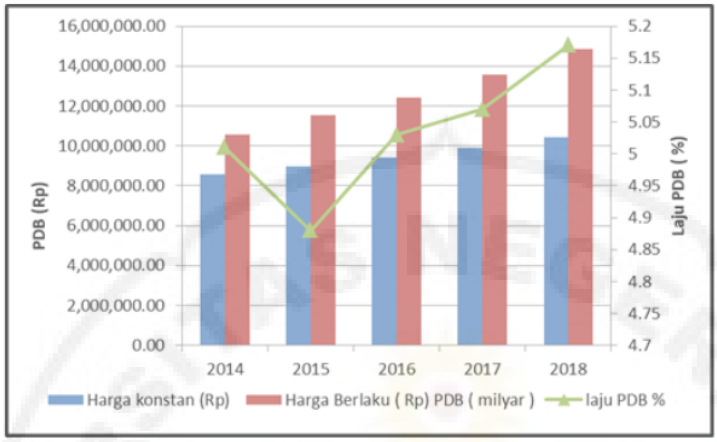
INTRODUCTION

Each country seeks to carry out development. Development in Indonesia which is carried out continuously aims to improve the welfare of the community. Development policies are carried out to achieve high economic growth by utilizing existing potential and resources. Economic development in Indonesia officially began since the start of the five-year development plan (Repelita I) in 1969 and the process went smoothly over the decades of the 1970s and 1980s (Tambunan, 2012:39).

Economic development or commonly referred to as gross domestic product (GDP) can be seen with two approaches, namely the expenditure approach and the production approach. In the expenditure approach, economic actors in an economy can be divided into the household sector, namely consumers (C), investment (I), government expenditure (G), foreign sectors namely exports (X) and imports (M). In terms of the production approach, economic growth itself is influenced by labor (L) and capital (K).

According to classical economic theory proposed by Solow and Swam economic growth depends on the supply of factors of production (labor, capital accumulation and natural resources) and the level of technological progress. Economic growth can be measured among other things by a quantity called gross domestic product (GDP). Indonesia's economy in 2018 grew 5.17% (yoy), the highest since 2014 as seen from Indonesia's GDP based on constant prices in 2010 and current prices. As for Figure 1 we can see the rate of economic growth in 2014-2018.

Indonesia's economic slowdown in 2015 was influenced by cyclical and structural factors. The cyclical factors stemmed mainly from the economic slowdown in China, the continued decline in commodity prices, and the uncertainty of normalizing US monetary policy. Meanwhile, structural factors mainly occurred in developed countries, which originated from the decline in potential output due to demographic factors and the decline in investment levels after the global financial crisis.



Source: BPS Indonesia 2014-2018 (Data Processed)

Figure 1. Indonesia's Economic Growth Rate in 2014-2018

Based on a report on Indonesia's economic development by Bank Indonesia (BI.go.id, 2015) although the domestic economy slowed for the whole of 2015, the momentum of economic recovery began to be seen in the second half of 2015 driven by the government's fiscal stimulus. In the midst of low tax revenues, fiscal reform policies especially reduced subsidies have opened stimulus space for the economy. Fiscal stimulus is reflected in an increase in government spending specifically capital expenditure related to government infrastructure projects.

Nowadays infrastructure is one of the government's priority programs for development. Infrastructure development is an integral part of national development and a driving force for economic growth (Bappenas, 2009). Infrastructure development programs in Indonesia are prioritized for basic or basic needs of the community starting from human or economic needs such as electricity, and transportation such as roads, while in the context of social infrastructure through school and health facilities in each region.

Based on data on the ratio of the quantity of economic infrastructure, the length of roads to the volume of vehicles shows a declining number. While the ratio of energy infrastructure (electricity) shows getting better.

Table 1. Ratio of Economic Infrastructure (Road and Electricity) to Users in Indonesia in 2014 and 2018

No.	Condition of Indonesia's Infrastructure	2014	Ratio	2018	Ratio
1	Long Road (Km)	517,753	1:220	539,353	1:257
2	Vehicle Volume (Unit)	114,209,260		138,556,669	
3	Power Connected (MVA)	100,030.53	1:575	130,280.55	1:552
4	Number of Customers	57,493,234		71,917,397	

Source: BPS and ESDM Statistics (Data Processed)

Based on Table 1 in general, the development of infrastructure conditions in Indonesia in 2014 and 2018 showed increasingly worrisome conditions. This indicator can be seen from the magnitude of the infrastructure ratio with its users which tend to get bigger. This means that the availability of road length with a number of vehicles is increasingly inadequate. The ratio of energy infrastructure (electricity) shows a better ratio. In 2014, the ratio per MVA with a number of subscribers of 1:575 in 2018 increased to 1:552, which means that the provision of energy which is a social investment to support the development and improvement of community welfare both in cities and in rural areas is getting better even though the

number is still too large in efficient electricity for each user. The delay of Indonesia in building electricity infrastructure has made electricity availability inadequate to meet the level of its needs. As a result, electricity has not really been optimized to play a role in driving economic development.

In addition to economic infrastructure, what is considered to be supportive in enhancing the economy of an area is education and health facilities. According to Mankiw (2007) human resource development can be done by improving the quality of human capital. The increase in human capital can refer to facilities and infrastructure in the field of education, other than that what is considered important is investment that drives towards a healthy population, namely facilities and infrastructure in the health sector.

Table 2. Ratio of Social Infrastructure (Education and Health) to Users in Indonesia in 2014 and 2018

No.	Condition of Indonesia's Infrastructure	2014	Ratio	2018	Ratio
1	Education Infrastructure (Unit)	26.237	1:615	30.093	1:540
2	Number of Students (Person)	16.128.783		16.245.870	
3	Health Infrastructure (Unit)	20.891	1:12070	25.244	1:10498
4	Total Population (Person)	252.164.800		265.015.300	

Source: BPS, PDDIKTI, Kemendikbud, Kemenag (Data Processed)

The ratio of social infrastructure in the form of education and health with its users generally increased between 2014 and 2018. This indication shows the educational and health facilities and infrastructure in Indonesia need to be improved. Conditions like this will cause low quality of human capital which will ultimately result in low levels of productivity resulting from each economic activity.

From the identification of some of the problems and facts above, it can be seen that economic and social infrastructure contribute to Indonesia's economic growth, there is a tendency for changes in economic growth towards infrastructure development in Indonesia, therefore researchers are interested in proving scientifically whether economic and social infrastructure have an influence on growth the economy.

LITERATURE REVIEW

Theories of Economic Growth

Classical Economic Theory was advanced by economic figures such as Adam Smith and David Ricardo. According to Smith, economic growth is classically influenced by two main factors namely total output growth and population growth. Economic growth is strongly influenced by the productivity of sectors in using production factors. Productivity can be increased through various means of education, training and better management (Sukirno, 2010).

In the Harrod-Domar theory aims to explain the conditions that must be met so that an economy can achieve steady growth or steady growth in the long run. (Sukirno, 2010). Basically, the economy must reserve or set aside part of its national income to add or replace capital goods that have been depreciated.

The Solow Neoclassical Theory was developed by Solow. According to Neo Classical growth theory, economic growth depends on increasing the supply of factors of production and the level of technological progress. This view is based on the assumptions obtained by the Classical School which states that the economy is in a full employment condition so that the production factors have been used fully (Sukirno, 2010).

The Solow Neoclassical growth model uses the following standard aggregate functions:

$$Y = K^{a}(AL)^{1-a}$$

Infrastructure

According to Prapti (2015) infrastructure in general includes public facilities prepared by the central and regional governments as public servants (as

a result of market mechanisms not working) to support and encourage economic and social activities of a community. The World Bank (1994) suggests that infrastructure can provide great benefits in economic growth, poverty alleviation, and environmental sustainability but only when providing these services effectively and efficiently.

Road infrastructure is access to drive economic growth. Through the project, the road infrastructure sector can create jobs that can absorb millions of workers in Indonesia. in addition, road infrastructure can determine the flow of goods, services, people, money and information from one area to another.

The existence of electricity is always identical with the presence of industrial activity in an area. Fedderke & Bogetic (2009) say that the distribution of electricity in an industry will be crucial for the industry to develop its industry in the long run. This is because electricity and its distribution are important for the welfare of the industry and the workforce to be more secure. Besides industry, electricity is also a source of energy for household activities. Electricity is also one of the important inputs in achieving the Millennium Development Goals (MGDs) goal of poverty alleviation.

Todaro (2006) states that basically health is one aspect that determines the high or low standard of living. Therefore, a relatively good health status is needed by humans to sustain all activities of his life. So to achieve good health conditions, good health facilities are also needed.

Education has a primary role as a means of improving welfare through the utilization of existing employment opportunities. Through education a quality workforce will be created that is able to use new technology from the mastery of science and technology in schools (formal education). Every additional year of school is expected to increase one's productivity and income, so that in addition to reducing poverty it can also improve income distribution (Todaro & Smith, 2006).

Prior Research

Prasetyo & Firdaus (2012) in the research journal "Influence of Infrastructure on Regional Economic Growth in Indonesia" states that electricity, roads, and clean water have a positive influence on the economy in Indonesia. Electricity has the most important role in the production process. Therefore, infrastructure development policies to improve the Indonesian economy in the face of the global crisis are very appropriate and need to get support from various parties.

Novi Maryaningsih, Oki Hermansyah, and Myrnawati Savitri (2014) in the research journal "Influence of Infrastructure on Indonesia's Economic Growth". Mention that electricity infrastructure and roads have a positive and significant impact on Indonesia's economic growth. Port loading and unloading infrastructure has no significant and significant effect on Indonesia's economic growth. Real investment has a positive and significant impact on economic growth in Indonesia.

RESEARCH METHODS

This study uses a quantitative approach and panel data regression analysis. Panel data is a combination of time series data and cross section data. The data is in the form of panels with a period of 5 years namely 2014-2018 in each province in Indonesia.

Panel data regression analysis has three types of models namely: Common Effect, Fixed Effect and Random Effect models (Gujarati, 2004).

Common Effect Model or Pooled Least Square (PLS)

The common effect or pooled least square (PLS) model is a simple model that combines all time series data with a cross section, then an estimation of the model using ordinary least square (OLS) can be formulated as follows:

$$y_{it} = \alpha + \beta_j X_{it}^{j} + \varepsilon_{it}$$

Fixed Effect Model (FEM)

The panel data model with the fixed effects model (FEM) assumes that fundamental differences between individuals can be accommodated through differences in their intercepts, but intercepts are the same time (time invariant).

$$y_{it} = \alpha_i + \beta_j X_{it}^j + \sum_{i=2}^{n} a_i D_i + \varepsilon_{it}$$

Random Effect Model (REM)

REM uses residuals that are suspected of having intertemporal and interpersonal relationships. REM assumes that each individual has a different intercept which is a random variable. The REM model is generally written as follows:

$$\hat{y}_{it} = \alpha + \beta_j X_{it}^j + \varepsilon_{it}$$
$$\varepsilon_{it} = u_i + v_t + w_{it}$$

$u_i \sim N(0, \sigma_u^2)$ = cross section error.
$v_i \sim N(0, \sigma_v^2)$ = time series error.
$w_t \sim N(0, \sigma_w^2)$= time series error dan cross section error

Model Selection Method

a. Chow Test (Common Effect Test with Fixed Effect)

This test is to determine the PLS/CEM method or FEM method that is most suitable in this study. With this F test the following hypotheses are drawn:

H_0 : Pooled Least Square (PLS) or Common Effect Model (CEM)
H_1 : Fixed Effect Model

If $F_{count} > F_{Table}$ or if the probability value < 0.05 (level of confidence 95%) in this F test, so H_0 rejected and receive H_1. If we receive H_1, this means we use the FEM method in this model, but we still need to test again whether using the FEM or REM method by doing the Hausman test.

b. Uji Hausman

Hausman test is conducted to determine which method is the most appropriate whether the fixed effect model or the random effect model. In this test the following hypotheses are drawn:

H_0 : Random Effect Model
H_1 : Fixed Effect Model

If the probability value < 0.05 so H_0 rejected and receive H_1 with level of confidence 95%.

Multiple regression is used to see how much influence the economic and social infrastructure has on economic growth in Indonesia. The equation used in this study is:

$PDRB_{it} = \alpha_{it} + \beta 1JLN_{it} + \beta 2LTK_{it} + \beta 3KSHT_{it} + \beta 4KPNDK_{it} + \mu_{it}$

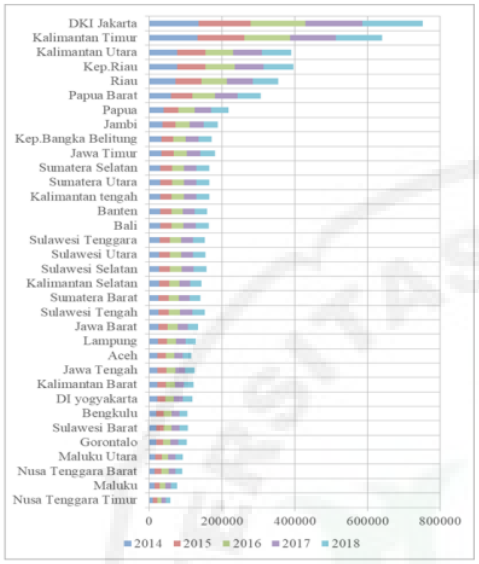
PDRB : Gross Regional Domestic Product
α : Constant
β1-β4 : Regression Coefficient
JLN : Road Infrastructure
LTK : Electricity Infrastructure
KSHT : Health Infrastructure
PNDK : Education Infrastructure
μ : error term.

All variables are in natural logarithm value. The data used in this study were 34 provinces in Indonesia for a period of 5 years (2014-2018).

RESULTS AND DISCUSSION

GRDP per capita in this study has the lowest value of Rp10,742.32 thousand/capita which is the GRDP per capita value of East Nusa Tenggara Province in 2014. The highest GRDP variable value per capita in this study was Rp165,863.33 thousand/capita which is the GRDP per capita value of the Province DKI Jakarta in 2018. The average value of per capita GRDP variable data is Rp39,376.53 thousand/capita. The median data or median PDRB variable per capita is Rp30,473.51 thousand/capita.

The development of GRDP in each province in Indonesia experienced a positive increase that tends to be stable from the beginning to the end of the study period. The increase in economic growth was mainly driven by private and government consumption. DKI Jakarta is the province with the highest rank among other provinces. While East Nusa Tenggara is the province with the lowest rank.



Source: BPS Indonesia 2014-2018 (Data Processed)

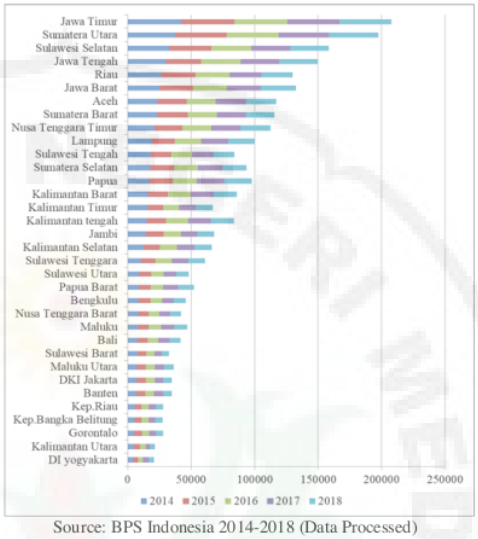
Figure 2. GRDP per Capita

Even though DKI Jakarta's GRDP is relatively high among other provinces' GRDP, if it is divided by the population, the GRDP value decreases, while other islands whose population is smaller are increasing, this is the situation that finally cuts the distance of the GRDP per capita between DKI Jakarta Province with other Provinces.

Road Infrastructure

The lowest value of the road infrastructure variable is 3,183 km which is the accessibility of roads in North Kalimantan Province in 2017. The highest value of the road infrastructure variable is 42,107 km which is the accessibility of roads in East Java Province in 2014. The average value of the road infrastructure variable data is 15,683,52 km. The median data or median variable for road infrastructure is 13,163.50 km.

The problems faced in road development include not yet optimal drivers in using the road properly, roads in poor condition due to the large volume of vehicles passing through the road without rules. Yet every year the government spends no small amount for the development and improvement of existing infrastructure in Indonesia.



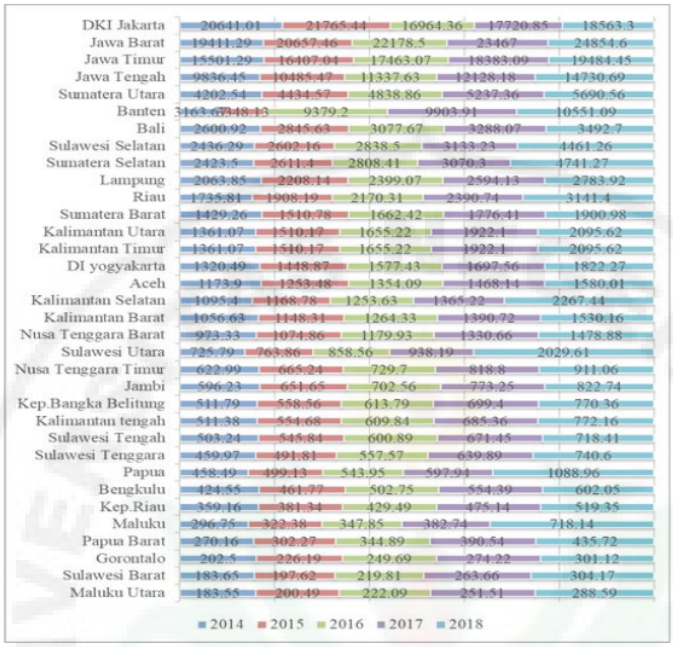
Source: BPS Indonesia 2014-2018 (Data Processed)

Figure 3. Road Infrastructure

Electricity Infrastructure

The lowest value of the electricity infrastructure variable is 183.55 MVA which is the electricity accessibility in North Maluku Province in 2014. The highest value of the electricity infrastructure variable is 234,670 MVA which is the amount of electricity accessibility in West Java Province in 2017. The average value of infrastructure variable data electricity is 17,091.41 MVA. The median data or median variable of the electric infrastructure is 12,924.10 MVA.

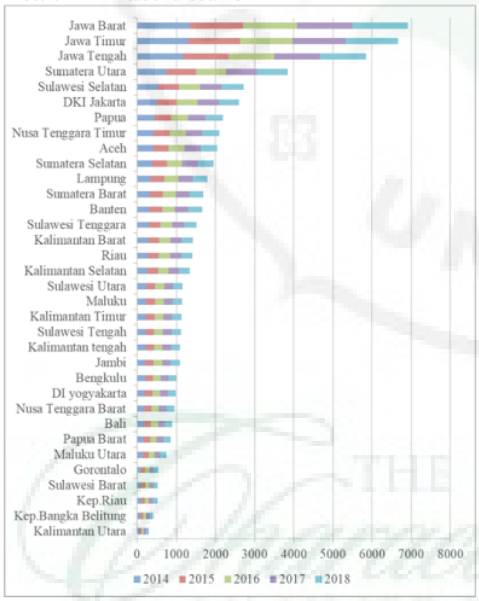
The amount of electricity infrastructure in the provinces on the island of Java, Bali is so large compared to other islands due to the dense population and high economic activity on the island of Java compared to other islands. The dense population of Java will automatically make the demand for electricity become large because in the modern era, every individual must need the help of electrical energy to carry out their daily activities.



Source: BPS Indonesia 2014-2018 (Data Processed

Figure 4. Electricity Infrastructure

Health Infrastructure



Source: BPS Indonesia 2014-2018 (Data Processed

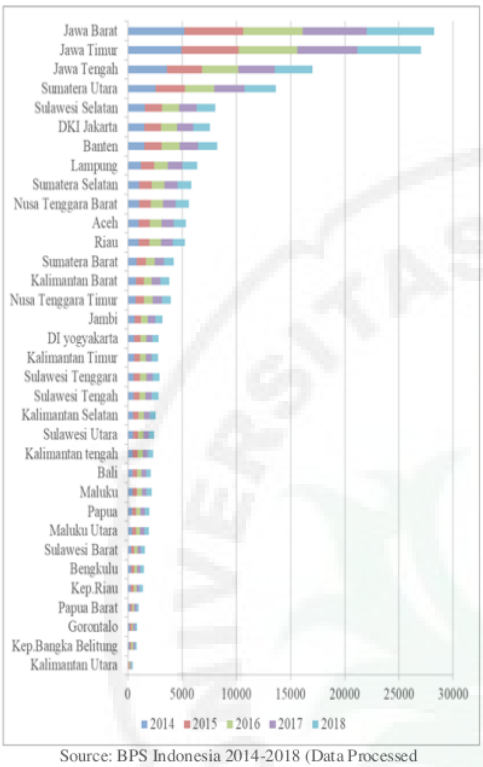
Figure 5. Health Infrastructure

The lowest value of the health infrastructure variable is 55 units which is the accessibility of health infrastructure in North Kalimantan province in 2014. The highest value of the health infrastructure variable is 1419 units which is the accessibility of the health infrastructure in West Java Province in 2018. The average value of the health infrastructure variable data is 365.61 units. The median data or median variable for health infrastructure is 251.5 units.

Health infrastructure development should not only be improved in urban areas, but needs to be reviewed for remote areas that are difficult to reach even by using vehicles.

Education Infrastructure

The lowest value of the education infrastructure variable is 9 units which is the accessibility of education infrastructure in North Kalimantan Province in 2014. The highest value of the education infrastructure variable is 6227 units which is the accessibility of education infrastructure in West Java Province in 2018. The average value of the education infrastructure variable data is 1102.25 units. The median data or median variable of the education infrastructure is 576 units.



Source: BPS Indonesia 2014-2018 (Data Processed

Figure 6. Education Infrastructure

Aside from the unequal education, the quality and facilities and infrastructure of education in cities and villages are very different. In urban areas, students will get a decent education in terms of quality and facilities and infrastructure, different from in rural areas.

Panel Data Estimation

1. Chow Test

The chow test is used to determine which model is most appropriate between PLS (CEM) or FEM in this panel data test.

Table 3. Chow Test Result

Redundant Fixed Effects Tests			
Test cross-section fixed effects			
Effects Test	Statistic		Prob.
Cross-section F	502.807324	(33,132)	0.0000
Cross-section chi-square	823.112211	33	0.0000

Source: Results of Data Processing Eviews 10.0 (2020)

Based on the Chow test table above, the two Cross Section F and Chi square probability values are 0.00, which means it is smaller than Alpha 0.05 so that it rejects the hypothesis H_0 and accepts H_1, so the panel data model used is (FEM).

2. Hausman Test

Hausman test is done to compare or choose which model is the best between fixed effect model (FEM) and random effect model (REM).

Table 4. Hausman Test Result

Correlated Random Effects - Hausman Test			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	63.302120	4	0.0000

Source: Results of Data Processing Eviews 10.0 (2020)

From the hausman test results table, the chi-square statistic value was 63.302120, with the chi-square table at df (4), so the chi-square statistic > chi-square table, or if the p-value < 0.05 then H_0 is rejected, so a good panel data model to use is the fixed effect model (FEM).

Estimation and Interpretation Results

The following research models will be estimated:

$$\text{Ln PDRB}_{it} = \alpha_{it} + \beta 1\text{lnJLN}_{it} + \beta 2\text{lnLTK}_{it} + \beta 4\text{lnKSHT}_{it} + \beta 3\text{lnPNDK}_{it} + \mu_{it}$$

Table 5. Fixed Effect Model Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.638877	0.905280	2.914983	0.0042
X_1	0.160906	0.059326	2.712230	0.0076
X_2	0.026435	0.010690	2.472828	0.0147
X_3	1.071568	0.147640	7.257968	0.0000
X_4	0.003911	0.023243	0.168272	0.8666

Source: Results of Data Processing Eviews 10.0 (2020)

Based on the test results in the estimation results table, the results of the test of Indonesia's economic growth are significant with the following equation:

$$Y = 2.638 + 0.160\ X_1 + 0.026X_2 + 1.071X_3 + 0.003X_4 + \mu_{it}$$

t-sig (0.0042) (0.0076) (0.0147) (0.0000) (0.8666)

The test results show that the adjusted r-squared value is 0.992662 which indicates that the independent variables are simultaneously able to explain the dependent variable by 99.26 percent while the remaining 0.74 is explained by other

factors. Furthermore, it is known that all independent variables simultaneously or jointly show a statistically significant effect on economic growth at a 95 percent confidence level or significance level α=5 percent. This is indicated by the value of Prob > F which is smaller than 0.05 (α=5 percent).

The interpretations of the results of the equation are:

a. Road Infrastructure Variable (X_1) = 0.160 and t-sig = 0.0042

Road infrastructure variable (X_1) has a positive and significant effect on economic growth at a significance level of 95 percent which can be seen with the value of t-sig < α = 0.05 from finished (0.0042 < 0.05). This means that for every increase in the road infrastructure variable (X_1) by 1 unit, the economic growth variable will increase by 0.160 percent. This research is in accordance with Solow's theory which states that roads have a positive and significant influence on economic growth, Solow's Theory states that there are only various types of capital. Private companies invest in ordinary forms of capital, while the government also invests in various forms of public capital, namely infrastructure such as roads, bridges and sewers.

b. Electricity Infrastructure Variable (X_2) = 0.026 and t-sig = 0.0147

Electric infrastructure variable (X_2) has a positive and significant effect on economic growth at a significance level of 95 percent which can be seen with the t-sig value < α = 0.05 to (0.0147 < 0.05). This means that for every increase in the electricity infrastructure variable (X_2) by 1 unit, the economic growth variable will increase by 0.026 percent. The results of this study are in line with the results of research conducted by Hapsari, T. (2011). The Influence of Infrastructure Economic Growth in Indonesia. The results of the study showed that electricity infrastructure had a positive and significant effect on Indonesia's economic growth. Electrical energy is one of the very important energies to support various activities of modern community life.

c. Health Infrastructure Variable (X_3) = 1.071 and t-sig = 0.000

Health infrastructure variable (X_3) has a positive and significant effect on economic growth at a significance level of 95 percent which can be seen with the t-sig value < α = 0.05 so (0.000 < 0.05). This means that for every increase in the health infrastructure (X_3) variable by 1 unit, the economic growth variable will increase by 1.071 percent. At present Indonesia is at a development stage where human resource improvement is needed in the development process. Improving the quality of human resources, according to Mankiw, can increase economic growth. One aspect of supporting improvements in human resources can be done through development in the health sector. Health is the most dominant thing in contributing to the quality of human resources (HR). When the quality of health is good, the quality of human resources will be good.

d. Education Infrastructure Variable (X_4) = 0.0039 and t-sig = 0.8666

Educational infrastructure variable (X_4) has a positive and insignificant effect on economic growth at a significance level of 95 percent which can be seen with the t-sig value < α = 0.05 so (0.8666 > 0.05). This means that for every increase in the education infrastructure (X_4) variable by 1 unit, the economic growth variable will increase by 0.0039 percent. Education infrastructure is one of the government's priorities, where every year the Indonesian government continues to strive for the mandate of the constitution, namely the budget from the state budget for education of at least 20 percent can be realized properly but the improvement of the education budget cannot be felt directly by each province. Education infrastructure does not have a significant effect on economic growth in Indonesia, it is suspected that at present the number of high-level schools and tertiary institutions is no longer the only major supporter for improving human

resource capacity. Quality national education can improve the ability of human resources to manage existing resources more efficiently.

Based on the results of the estimation model, the panel analysis equation based on one province is as follows:

$\text{Ln PDRB}_{it} = \alpha_0 + \alpha_i + \beta 1 \ln JLN_{it} + \beta 2 \ln LTK_{it} + \beta 4 \ln KSHT_{it} + \beta 3 \ln PNDK_{it} + \mu_{it}$

$Y_{\text{North Kalimantan}} = 2.638 + 2.712 + 0.160\ X_1 + 0.026X_2 + 1.071X_3 + 0.003X_4 + \mu_{it}$

From each province in Indonesia, the province that has the most influence on economic growth is North Kalimantan, this is because North Kalimantan Province, the average economic growth in each year is always above the national economic growth. The increased economic growth is estimated to come from a variety of main business fields in North Kalimantan, namely the construction business field, driven by the acceleration of the construction of the Sei Kayan Hydroelectric Power Plant which has entered phase I for the project of 900 MW, the construction plan of 2 new PLBN (Pos Borderlands) in North Kalimantan region, continuing the construction of the Malinau-Krayan border road, as well as the construction of several office buildings and facilities in the North Kalimantan region by several agencies.

CONCLUSION AND SUGGESTION

Conclusion

Road infrastructure, electricity, health have a positive and significant impact on economic growth while education infrastructure has a positive but not significant effect on economic growth in Indonesia.

Suggestion

The government needs to encourage development in the field of road infrastructure, electricity, health and education because it can provide a significant multiplier effect to the people of Indonesia. Infrastructure development should be carried out evenly in each province so that it will facilitate economic activities that can increase provincial economic growth. Development of educational infrastructure should also pay attention to improving the quality of quality education, so as to produce a more competent human resource output.

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