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Effect of Access to Electricity, Access to Sanitation, Decent Drinking Water, Education, GDP, Population and Capital Expenditure on The Percentage of Poor People

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Research article

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Abstract: This study analysis of the percentage of poor people in eastern Indonesia: regencies/cities in East Nusa Tenggara, Maluku and Papua. This study used panel data regression analysis techniques with Pooled least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). This study used panel data for 2010-2019 from 82 regencies/cities in East Nusa Tenggara, Maluku and Papua. Research has two objectives where, the first goal is to find a representative panel data regression model against the research data. The purpose of the second study was to find variables that affect the percentage of poor people in East Nusa Tenggara, Maluku and Papua. The results of the study found that the fixed effect model (FEM) is the best model for analyzing the percentage of poor people. The GDP of regencies/cities and education are variables that have a significant effect on reducing the percentage of poor people in East Nusa Tenggara, Maluku and Papua.

Keywords : percentage of poor people; panel data; pooled least square (PLS); fixed effect model (FEM); random effect model (REM).

1. Introduction

Poverty is a problem found in all countries of the world. Poverty is the failure to access the primary need for survival (Payne, 2012). Primary needs consist of food (nutrition), shelter and basic infrastructure (access to electricity, sanitation, and adequate drinking water) which are limited to poverty. Limited access to primary needs leads to low capacity and competence of the population in the labor market. This is low income and correlates with poverty (Sanz *et al*., 2017: Alkire and Santos, 2014).

Indonesia's poverty is measured by the percentage of the poor to determine the percentage of poor people in an area (Statistics, 2019). An increase in the percentage of the poor population means great poverty in a particular area. Meanwhile, a decrease in the percentage of poor people means that welfare increases, or the percentage of poverty decreases. The percentage of poor people in Indonesia varies. Indonesia is distinguished by time zone. Each zone has a time difference. The regional division consists of western Indonesian time, central Indonesian time, and Eastern Indonesian time. The percentage of poor people is found in all regions of Indonesia. Papua Province has a high percentage of poor people every year and the lowest percentage of poor people are in DKI Jakarta Province (Widodo *et al*., 2019).

The eastern part of Indonesia consists of: East Nusa Tenggara, Maluku, and Papua. The total regencies/cities in eastern Indonesia consist of 224 regencies/cities. Papua Province (Yalimo regency and Deiyai regency) with a high poverty rate (more than 40 percent) in 2019. The poverty rate is low in North Maluku Province (Ternate city) and Maluku Province (Ambon city). The poverty rate was low (less than 5 percent) in 2019 (BPS, 2019).

Previous research related to the percentage of poverty was specifically carried out also in the Papua region. Wahyuni and Damayanti, (2014) found that land area, irrigation techniques, drinking water sources, and electricity have an influence on poverty in Papua Province. Harianja and Findi, (2018) said that the GDP variables in the mining sector, the quarrying sector, the construction sector, and the education variable had a significant effect on the poverty rate on Papua Island. Salamah, (2019, April) in his research found that the variables of economic growth, human development index, population and government expenditure have a significant impact on reducing the poverty rate in Papua.

Previous and specific poverty percentage studies in Indonesia and in the Papua region used various variables. This study uses economic variables consisting of GDP and capital expenditure from district/city governments. The population and nine-year compulsory education are social variables. Meanwhile, infrastructure variables are: access to electricity, access to sanitation and access to decent drinking water. These variables will be used as independent variables. The dependent variables in the study consisted of the percentage of poor people in East Nusa Tenggara, Maluku and Papua. This research consists of several objectives including:

1) Knowing a representative analysis model of poor population percentage data.
2) Knowing the factors that affect the percentage of poor people in East Nusa Tenggara, Maluku and Papua.

2. Literature Review

2.1. Percentage of Poor People

The causes of the increase in the percentage of poor people vary so much that research is needed to measure and determine the variables that most influence poverty. Economic, social and infrastructural variables can lead to an increase in the percentage of the poor population. Economic variables consist of relatively low capital, economic inequality between the population, Gross Regional Domestic Product (GDP), allocation of village funds and the amount of village funds. Economic variables have a significant influence on reducing poverty (Nanga, 2018: Purwono et al., 2021: Hasibuan et al., 2019: Nathasya *et al*., 2021: Fardilla & Masbar, 2020*)*. GRDP affects the percentage of poor people in the regency/city area. The allocation and amount of village funds affect the poverty of rural areas.

2.2. Social Variables that Affect Poverty

Social variables that affect poverty consist of: differences in political views, population, living conditions, level of education and schools and human development index (Nanga, 2018: Hasibuan et al., 2019: Nathasya et al., 2021: Azizah, 2018: Mardiana *et al*. , 2017: Fardilla & Masbar, 2020). Political views determine policies that impact the percentage of the poor. The increase in the number of inhabitants significantly increases the percentage of the poor. Decent housing provides the health of the population and has an impact on increasing productivity and income. The educational variable is seen from the level of education and the ability of the population to read.

2.3. Infastructure Variable

Infrastructure variables are an important aspect for the percentage of the poor. Infrastructure is an engineering, physical, system, hardware and software facility needed to provide services to the community. Infrastructure encourages economic and social growth of the community so that it is free from poverty. Infrastructure variables consist of: access to electricity, access to adequate drinking water, access to sanitation, highways (Mardiana *et al*., 2017: Nathasya *et al*., 2021: Fardilla & Masbar, 2020). Based on previous research on the increase in variables of access to electricity, access to adequate drinking water, access to sanitation, highways managed to significantly reduce the percentage of the poor.

3. Research Methods

3.1. Data

This study used secondary data obtained from the central statistics agency. Research with panel data for 2010-2019. The object of study consists of 82 regencies/cities in East Nusa Tenggara, Maluku, and Papua. The research data was obtained from the Indonesian central statistics agency.

3.2. Variable Operationalization

This study uses the variable percentage of poor people as the dependent variable. The independent variables consist of sanitation analysis, electricity access, access to clean water, Gross Regional Domestic Product (GDP), education, education and capital expenditure. The measurement of each variable is described as follows:

1) Percentage of poor people (Y_1) Measurement of poverty rate with *headcount index* expressed in units of percent.
2) Electricity access (X_1) is the proportion of households that use electricity from PLN in units of percent.
3) Access to adequate drinking water (X_2) is the proportion of households that have sustainable access to adequate drinking water sources. Calculation of access to drinking water is feasible in units of percent.
4) Access to adequate sanitation (X_3) is the proportion of households that have access to adequate sanitation services in units of percent.
5) Gross regional domestic product (X_4) is the GDP of districts / cities based on constant prices in 2010, expressed in units of million rupiah.
6) Number of inhabitants (X_5) is the total population of the district / city, expressed in thousand inhabitants.
7) Capital expenditure (X_6) is capital expenditure made by the district/city government. Capital expenditure uses units of monetary (Rp) in billion rupiah.
8) Education (X_7) is based on the number of people who completed nine years of compulsory education calculated in units of thousand people.

4. Research Methodology

This study used secondary data obtained from the central statistics agency. Research with panel data for 2010-2019. The object of study consists of 82 regencies/cities in East Nusa Tenggara, Maluku, and Papua. This study is a regression of panel data with a research model in the equation below:

$$Y_{it} = a + b_1X_{electricity} + b_2X_{Sanitation} + b_3X_{Decent\ Drinking\ water} + b_4X_{GDP} + b_5X_{Education} +$$

$b_6X_{Population} + b_6X_{Capital\ Expenditure} + e_{it}$.

Where:

Y_{it}	= Percentage of poor people
$X_{electricity}$	=Proportion of households that use electricity from PLN
$X_{Sanitation}$	= Proportion of households that have access to adequate sanitation
$X_{Decent\ drinking\ water}$	= Proportion of households that have sustainable access to adequate drinking water sources.
X_{GDP}	= GDP of districts / cities based on constant prices in 2010
$X_{Education}$	= Number of people who completed nine years of compulsory education
$X_{Population}$	=Total population of the district / city
$b_6X_{Capital\ Expenditure}$	= capital expenditure made by the district/city government
b	= Regression coefficient

The first stage is the econometric procedure of panel data regression using *pooled least square* (PLS) tests, fixed effect model (FEM), and *random effect model* (REM) (Gujarati and Porter, 2012). The three tests above can be carried out simultaneously to obtain the results of the analysis using panel data. Regression analysis of panel data according to figure 1.

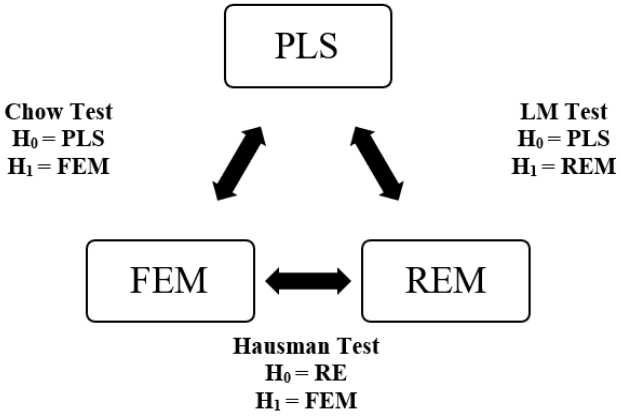

Figure 1. Econometric Procedures
Source: (Gujarati and Porter, 2012)

The second stage is to choose a representative model using the Chow test, Hausman test and Lagrange Multiplier (LM) test. The purpose of the second step is to find a representative model of the data on the percentage of the poor. The third stage is the test of classical assumptions. The purpose of the classical assumption test is to determine whether the model is free from the problem of multicollinearity and the symptoms of heteroskedasticity.

5. Results and Discussion

Poverty rate analysis was carried out in eastern Indonesia consisting of: East Nusa Tenggara, Maluku, and Papua. This research uses aggregate data from 82 regencies/cities in Indonesia. The percentage of poor people in eastern Indonesia is at the highest national level to reach 40 percent in 2019. The highest percentage is in Papua Province. The research area is blue on the map. Figure 2 is a research area in Indonesia.

Figure 2. Map of Indonesia

Descriptive statistical data from East Nusa Tenggara, Maluku, and Papua Island with 82 Regencies/Cities. The average score of the percentage of poor people of 25.05 ranked second nationally. The value of 62.35 percent is the worst average access to electricity in Indonesia. The value of access to sanitation was 55.19 percent and access to adequate drinking water was at the lowest level of 45.43 percent. GDP with an average value of 14.35 is the lowest gain in Indonesia. Primary education was successfully completed by society with an average score of 8,543 thousand people. The total population is 11.63 thousand people, and the average capital expenditure is 26.02 million rupiah.

The first analysis is a panel data regression test performed simultaneously. The results of pooled least square (PLS), fixed effect model (FEM), and random effect model (REM) tests found different results. The highest R-squared value of 0.582 was obtained from the pooled least square (PLS). A random effect model (REM) with an R-squared value of 0.390 is the smallest value among the three models. Table 1 is the output of regression.

Tabel 1. Regression Analysis Results

VARIABLES	1 PLS	2 FEM	3 REM
Electricity	-0.201***	-0.0168**	-0,0305***
	(0.0144)	(0.00796)	(0,00789)
Sanitation	0.0748***	-0,00784	-0,00919
	-0.0153	(0,00891)	(0,00897)
Decent Drinking Water	-0.0759***	0,00273	-0,00573
	-0.0179	(0,00960)	(0,00971)
GDP	0.0913***	-5,245***	-4,614***
	(0,447)	(0,690)	(0,566)
Education	-2,309***	-5,831***	-4,876***
	(0,451)	(1,144)	(0,785)
Population	-1,243**	-0,688	0,0546

VARIABLES	1 PLS	2 FEM	3 REM
	(0,592)	(0,705)	(0,657)
Capital Expenditure	1,155**	0.277	0,196
	(0.531)	(0,220)	(0,218)
Constant	39,76***	152,7***	130,2***
	(14.04)	(9,625)	(8.433)
VARIABLES	**1 PLS**	**2 FEM**	**3 REM**
Observations	812	812	812
Number of Codekab	82	82	82
R-squared	0.582	0,418	0,390

*** *p<0.01, ** p<0.05, * p<0.1*

Pooled least square (PLS) found access to electricity, access to adequate drinking water, education and population were variables that had a significant effect on the percentage of the poor. In the *fixed effect model* (FEM) analysis, there are three independent variables (access to electricity, GDP and education) that affect the percentage of the poor. The results of the *random effect model* (REM) have three variables (access to electricity, GDP, and education) that have a significant effect on reducing the percentage of the poor.

The second analysis chose a model that was representative of the research model. Chow test results have a P-value of 0.000 less than the significance value (0.05). The value of F-count 122.70 thus, the decision to reject H_0 *pooled least square (PLS*) and received H_1 *Fixed Effect Model* (FEM). The results of the Chow Test are followed by the Hausman test to choose the best analysis model. Hausman test with *a chi square* value of 3583.29 and a probability value (P-value) of 0.0000 less than the signification value of 0.05. Thus, H_0 is rejected and accepting H_1 means that the *fixed effect* model (FEM) is the best model for the analysis of the percentage of the poor population. The Hausman Test and Chow test results got the same result where, *fixed effect* model (FEM) as the selected model and there is no need to continue with the Lagrange Multiplier test. The best model selection results are shown in table 2.

Table 2. Best Model Selection Table

Test	Result
Chow Test	1. Reject H_0 (*pooled least square* (PLS). 2. Receive H_1 (*Fixed Effect Model* (FEM).
Hausman Test	1. Reject H_0 (*pooled least square* (PLS). 2. Receive H_1 (*Fixed Effect Model* (FEM).

The third stage is the test of classical assumptions. The results of the classical assumption test on the FEM got a VIF value above 10 so that multicollinearity occurred. The probability value of 0.000 is smaller than the significance value of 0.05 so it can be concluded that heteroscedasticity occurs. On the test of classical assumptions multicollinearity and heteroscedasticity addressed through data transformation. The *generalized least square* (GLS) test transforms data to address multicollinearity and heteroskedasticity. FEM is a selected model with an estimator using GLS. FEM that is free from the problem of classical

assumptions is written in table 3.

Table 3. Selected Models (FEM)

VARIABLES	(1) NTT-MALUKU-PAPUA
Electricity	-0.0168
	(0.0121)
Sanitation	-0.00784
	(0.0120)
Decent Drinking Water	0.00273
	(0.0156)
GDP	-5.245***
	(1.325)
Education	-5.831***
	(2.041)
Population	-0.688
	(1.726)
Capital Expenditure	0.277
	(0.321)
Constant	152.7***
	(18.17)
Observations	812
Number of Codekab	82
R-squared	0.418

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Maluku-East Nusa Tenggara-Papua consists of 82 regencies/cities with a determinant coefficient value of 0.418. The ability of the independent variable explains the percentage of the poor population at 41.8 percent. Education and GDP have a significant effect of lowering the percentage of the poor. The increase in the number of people who complete compulsory education for a certain year and the number of GDP in regencies/cities can reduce the percentage of poor people.

Nine-year compulsory education is important to address the percentage of the poor. Education has increased due to the improvement of school buildings built by the government. An increase in the number of teachers tasked with educating the population in the nine-year compulsory education program. The school operational assistance program has a positive impact on education. Conditions of nine-year compulsory education improve the competence of the population. Residents have jobs earning income to make ends meet. The role of education overcoming poverty according to the results of this study is in accordance with the research of Nanga (2018), Hasibuan et al., (2019), Nathasya et al., (2021), Azizah (2018), Mardiana et al., (2017), Fardilla & Masbar (2020).

Another variable that has a significant effect on the percentage of poor people is GDP. The amount of GDP of regencies/cities mostly comes from the agricultural sector in Maluku-East Nusa Tenggara–Papua. Gold mines become a source of GDP in regencies/cities di Provinsi Papua. The mining sector creates jobs so that residents can increase their income and be free from poverty. An increase in the number of GDP reduces the percentage of the poor.

GDP has a significant effect on the percentage of the poor. The results of this study are in accordance with the research of Nanga (2018), Purwono et al., (2021), Hasibuan et al., 2019), Nathasya *et al*., (2021), Fardilla & Masbar (2020), Harianja and Findi, (2018).

6. Conclusion

The results of the study found that the fixed effect model (FEM) is the best model for analyzing the proportion of poor people in East Nusa Tenggara, Maluku, and Papua. There are two variables that influence the proportion of poor people, namely: district/city GDP and education variables. Increases in district/city GDP and education can reduce the proportion of poor people. While the variables of access to electricity, access to sanitation, access to decent drinking water, population and capital expenditure have no effect on the proportion of poor people in East Nusa Tenggara, Maluku, and Papua.

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