

Analysis of Factors Affecting the Poverty Gap Index in Aceh Province 2017-2019

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Received : Sept 09, 2021

Revised : Nov 25, 2021

Accepted : Dec 13, 2021

Abstract

The poverty gap index in Aceh Province during the 2017-2019 period tends to decrease. This study aims to determine the appropriate modelling in finding the factors that affect the poverty gap index in Aceh Province. The data used is secondary data obtained from the Central Statistics Agency for Aceh Province from 2017-2019. The dependent variable used is the poverty gap index (PI). Meanwhile, the independent variables are the open unemployment rate, crime rate, dependency ratio and sex ratio. The best model obtained is the Fixed Effect Model (FEM). The factors that influence the poverty gap index are the dependency ratio, while the open unemployment rate, crime rate and sex ratio do not affect the poverty gap index.

Keywords

Poverty Gap Index, Open Unemployment Rate, Crime Rate, Sex Ratio, Dependency Ratio, Fixed Effect Model

1. Introduction

The low poverty rate indicates that development has been successful. Indonesia itself has developed in a relatively long time span. However, in Indonesia, especially in the province of Aceh, poverty is still a classic problem that has not been fully resolved. There are two indicators that can measure the severity of inequality. The disparity between the poverty line and the expenditure of the poor can be measured using the poverty gap index. Where the higher the poverty gap index, the higher the average population expenditure from poverty. Meanwhile, the distribution of expenditure among the poor can be measured by the poverty severity index. The higher the poverty severity index, the inequality between the poor (Badan Pusat Statistik, 2019)

At the beginning of the Reformation, Aceh Province was often recognized as one of the poorest provinces in Indonesia. In 1999, the percentage of poor people in Aceh was 14.75%. This number almost doubled to 29.83% in 2002. This situation is presumably due to the deteriorating security situation in Aceh which worsened due to the rebellion initiated by the Free Aceh Movement (GAM) in mid-2002. After the rebellion was suppressed, the economy in Aceh Province is gradually improving. Poverty alleviation in Aceh for the last 17 years (2002-2019) has reached 49%, from 29.83% to 15.32%. This decline is the second highest on the island of Sumatra.

Table 1. Percentage of Poor Population in Aceh Province 2017-2019

No	City / Regency	2017	2018	2019
1	Simeulue	20.20	19.78	18.99
2	Aceh Singkil	22.11	21.25	20.78
3	South Aceh	14.07	14.01	13.09
4	Southeast Aceh	14.86	14.29	14.43
5	East Aceh	15.25	14.49	14.47
6	Central Aceh	16.84	15.58	15.50
7	West Aceh	20.28	19.31	18.79
8	Aceh Besar	15.41	14.47	13.92
9	Pidie	21.43	20.47	19.46
10	Bireuen	15.87	14.31	13.56
11	North Aceh	19.78	18.27	17.39
12	Southwest Aceh	18.31	17.10	16.26
13	Gayo Lues	21.97	20.70	19.87
14	Aceh Tamiang	14.69	14.21	13.38
15	Nagan Raya	19.34	18.97	17.97
16	Aceh Jaya	14.85	14.16	13.46
17	Bener Meriah	21.14	20.13	19.30
18	Pidie Jaya	21.82	20.17	19.31
19	Banda Aceh	7.44	7.25	7.22
20	Sabang	17.66	16.31	15.60
21	Langsa	11.24	10.79	10.57
22	Lhoksueumawe	12.32	11.81	11.18
23	Subulussalam	19.71	18.51	17.95
24	Aceh	16.73	15.97	15.32

Source: (BPS Aceh, 2021a)

When viewed as a whole, Aceh Singkil Regency has a percentage of poor people when compared to Regencies/Cities in Aceh Province with the highest percentage of poor people in 2017 which is 22.11% and only decreased by no more than two percent in 2019 to 20.78. The poor population of Aceh Province is also dominated by four other districts, namely Simeulue, Bener Meriah, Pidie Jaya and Pidie districts.

Not only has that, the measurement of poverty inequality, which is measured by the poverty gap index, tended to show a decline from year to year. The poverty gap index of Aceh Province in 2017 was 2.98%. Then in 2018 it became 2.84 percent and in 2019 it became 2.64 percent. This decrease shows that the expenditure of the poor is getting closer to the poverty line and the inequality in the expenditure of the poor is decreasing.

Table 2 Index of City/Regency Poverty Depth in Aceh Province 2017-2019

No	City / Regency	2017	2018	2019
1	Simeulue	2.78	3.11	3.05
2	Aceh Singkil	5.94	4.85	3.83
3	South Aceh	2.44	1.78	1.58
4	Southeast Aceh	1.80	2.23	2.37
5	East Aceh	2.85	2.03	1.89
6	Central Aceh	3.54	1.75	2.08
7	West Aceh	4.74	3.91	3.53
8	Aceh Besar	3.42	3.40	2.56
9	Pidie	4.18	4.02	2.99
10	Bireuen	2.99	2.31	1.77
11	North Aceh	3.22	3.20	2.44
12	Southwest Aceh	2.88	2.15	1.97
13	Gayo Lues	4.66	3.61	3.95
14	Aceh Tamiang	2.26	1.54	1.65
15	Nagan Raya	2.53	3.70	3.17
16	Aceh Jaya	2.29	2.40	2.49
17	Bener Meriah	3.68	2.88	3.09
18	Pidie Jaya	3.26	2.60	2.85
19	Banda Aceh	1.54	1.22	1.34
20	Sabang	2.99	2.64	2.71
21	Langsa	1.67	1.34	1.78
22	Lhoksuemawe	1.68	1.72	1.51
23	Subulussalam	3.20	2.67	3.15
24	Aceh	2.98	2.84	2.64

Source: (BPS Aceh, 2021b)

Table 2 explains that the poverty gap index in the District/City of Aceh Province is decreasing. Although there were some areas that experienced an increase in the index, the overall poverty gap index in the province experienced a decline. There are two areas that have the highest poverty gap index, namely Aceh Singkil Regency and Gayo Lues Regency, then Banda Aceh City has the lowest poverty gap index percentage.

Previous research by Sa'adah et al. (2019) using secondary data and multiple regression research methods. The variables used are poverty gap index (Y1), poverty severity index (Y2), school participation rate (X1), open unemployment rate (X2), percentage of married women aged less than 16 years (X3), literacy rate (X4), life expectancy (X5), main lighting in the form of PLN electricity (X6), percentage of households using laptops (X7). The results of this study are the open unemployment rate, the percentage of married women aged less than 16 years, life expectancy, literacy rates, primary lighting in the form of PLN does not significantly affect the depth index and poverty severity index. Meanwhile, the school participation rate and the percentage of households using laptops have a significant effect on the depth index and poverty severity index.

Factors that influence poverty are aspects of education, economy and demography. This study focuses more on the demographic aspect. The demographic aspect is represented by the open unemployment rate, crime rate, sex ratio, and dependency ratio. This study aims to determine the appropriate modeling in finding the factors that affect the poverty gap index in Aceh Province.

2. Literature Review

2.1 Poverty gap index

Poverty is a condition in which a person does not have all kinds of options and opportunities to fulfill one's basic needs, such as lack of respect, self-respect, freedom, a good standard of living and lack of health. Like a dark nation, the future of the nation and other people (Suripto & Subayil, 2020). Meanwhile, the problem of poverty is the limitations of welfare itself. The Central Statistics Agency (BPS) and the Ministry of Social Affairs stated that poverty is the inability of a person to fulfill his basic needs at least to live a decent life (both food and non-food). BPS set a poverty line, namely for each individual to be able to meet food needs, the amount of expenditure needed is equal to 2,100 calories per person per day and non-food needs which include transportation, education, health, clothing, housing and so on.

The Poverty Severity Index (P2) is an indicator that provides information regarding the distribution of expenditure by the poor (Ferezagia, 2018). The higher the value of this indicator, the greater the disparity in expenditure between the poor. The Poverty gap index can be defined as, a measure of the average expenditure gap of the poor on the poverty line. The higher the index value, the more distant the average population expenditure is from the poverty line.

2.2 Open Unemployment Rate

Unemployment is a person who is actively belonging to the labor force looking for a job with a certain salary but cannot find the job he wants (Alhudori, 2017).

The definition of unemployment according to the International Labor Organization (ILO) includes:

1. Open unemployment is people who have not worked in their productive age for a certain period of time, besides that they are looking for work and are willing to accept work.
2. Underemployment is forced, i.e. workers are forced to do their work less than normal working hours, usually employees and independent workers, who are still trying to find other work or additional work (Badan Pusat Statistik, 2001).

Types of unemployment by function, namely:

1. Open Unemployment
Workers without a job. This is because someone has not gotten a job even though they have tried their best and there is also someone who is lazy to work or look for work.
2. Disguised Unemployment
Too much labor for a unit of work where labor is reduced by a certain amount but the amount of output is not reduced. In addition, it is also caused by someone not working according to their abilities and talents, resulting in inefficiency.
3. Under Unemployment

Workers whose performance is not optimal because there is no work within a certain period of time. Some of these underemployed workers call them workers who work less than 7 hours a day (less than 35 hours a week). For example, a construction worker who has finished his work

so he is unemployed for a while waiting for the next job. So, it can be concluded that the open unemployment rate is the percentage of the number of unemployed to the total workforce.

2.3 Crime Rate

Crime is all actions that are economically and psychologically detrimental and violate religion, social norms and applicable laws in the territory of the Indonesian province. Not surprisingly, crime is a violation of the law and a violation of social norms, and people oppose it (Putra et al., 2021). According to Becker (1968) a sensible criminal will act if the expected cost is less than the expected benefits and vice versa.

The crime rate is the risk of the population experiencing a crime per 100,000 population, indicating the opportunity for the population to be at risk of being exposed to the crime. Generally mentioned 100,000 inhabitants. The formula is as follows (Badan Pusat Statistik, 2018)

$$\text{Crime Rate} = \frac{\text{Number of Crime Events Year } t}{\text{Number of Population Year } t} \times 100.000$$

2.4 Sex Ratio (SR)

In order to determine the composition of the population by gender. SR is a comparison between the population and the sexes of men and women (Mantra, 2000). This figure is presented in the form of a comparison between the total population of women and men in an area.

The SR formula is:

$$SR = \frac{\text{Male}}{\text{Female}} \times 100\%$$

Description:

- Female = Total female population
- Male = Number of male population
- SR = Sex ratio

2.5 Dependency Ratio (DR)

The ratio between the total population aged 0-14 years, plus the total population aged 65 years and over (excluding the labor force) compared to the total population aged 15-64 years (labor force). This ratio can be roughly used as an indicator to know the economic condition of a country, whether it is classified as a developing or developed country. The dependency ratio is an important part of the demographic indicator. The higher the percentage of the dependency ratio, the productive population must bear a greater burden to support the lives of the unproductive and unproductive population. The dependency ratio is a value that determines the level of support for the working age population towards the non-working age population (Mantra, 2000).

The Dependency Ratio can be written by the formula:

$$DR = \frac{\text{Number of Unproductive Population}}{\text{Number of Productive Population}} \times 100$$

3. Method

The author obtains relevant, accurate, and factual documents by using the literature study method, which is collected from economic journals, reference books, related agencies. This research data is secondary data, where the researcher does not collect the data himself.

3.1 Research variable

Types of variables used:

1. Dependent Variable

Variables that are influenced by independent variables. The dependent variable, namely the poverty gap index, is a measure of the average expenditure inequality of each poor person from the poverty line. The data used is the poverty gap index of cities and districts in Aceh Province in 2017-2019.

2. Independent Variable

Variables that make changes or occurrences of dependent variables. The independent variables are the open unemployment rate, crime rate, sex ratio and dependency ratio on cities and districts in Aceh Province in 2017-2019.

3.2 Analysis Technique

The analysis used is a panel data regression model with the Eviews 10 application. The secondary data used is a combination of cross sections from 23 districts / cities in Aceh Province and time series from 2017 to 2019. The data collection method uses documentation, data published by BPS Aceh Province published in various years of publication are collected by the authors. The model equation can be written:

$$Y = f(x_1 + x_2 + x_3 + x_4)$$
$$IKK: f(TPT + CR + SR + DR)$$
$$Y_{it} = \beta_0_{it} + \beta_1 TPT_{it} + \beta_2 CR_{it} + \beta_3 SR_{it} + \beta_4 DR_{it} + e$$

Description:

Y = Poverty gap index

TPT = Open Unemployment Rate

CR = Crime Rate

SR = Sex Ratio

DR = Dependency Ratio

β_0 = Constant

$\beta_1, \beta_2, \beta_3, \beta_4$ = Regression coefficient

i = Cities/Regencies in Aceh Province

t = Year (2017 – 2019)

e = Error term

The researcher uses the Balance Panel Method with data on the Open Unemployment Rate, Crime Rate, Gender Ratio and Dependency Ratio in Cities/Regencies in Aceh Province in the period 2018 to 2019. In the Balance Panel method there are 5 tests, namely:

3.2.1 Common Effect Model Test

The simplest technique for estimating the parameters of the panel data model is to combine cross-section and time series data without taking into account the existing time and individual inequalities. The most commonly used approach is the Ordinary Least Square (OLS) method.

3.2.2 Fixed Effect Model Test

Assume that the slope coefficient is considered constant over time and varies between individuals. Due to inadequate pooled least square assumptions, dummy variables were used to produce different slope coefficients for each individual. This model is known as Least Square Dummy Variable (LSDV).

3.2.3 Random Effect Model Test

Panel data are estimated in which the disturbance variables can be correlated with each other over time as well as between individuals. In this model, the different interpretations are adjusted for the error terms of each company. This model has the advantage of eliminating heteroscedasticity.

3.2.4 Hausman test

The aim is to find out the right model to use between the random effect model and the fixed effect model in estimating panel data. The hypothesis in this test, namely:

H_0 = "Random Effect Model is better"

H_a = "Fixed Effect Model is better"

By criteria:

- If $(Prob > 2) < 0$ is rejected

It means that it is better to use the fixed effect model when compared to the random effect model in estimating the panel data regression method.

- If $(Prob > 2) > 0$ is accepted

It means that it is better to use the random effect model than the fixed effect model to estimate the panel data regression method (Gujarati & Porter, 2013).

3.2.5 Chow test

Aims to choose the best Fixed Effect or Common Effect model used to estimate panel data.

The hypothesis is:

H_0 : "The right model is the Common Effect Model"

H_1 : "The right model is the Fixed Effect Model"

The hypothesis can be rejected by the F-statistical calculation method with the F-table. If the result of the calculated F is greater ($>$) than the F table, then a comparison is made, then the rejection of H_0 means that the most suitable model to be used is the Fixed Effect Model.

3.2.6 T-Statistic Test (Partial Test)

Test the significance of individual parameters. Individually, the magnitude of the influence of the independent variable on the dependent variable is indicated by the t-statistic value. The t-statistic test is also known as a partial test in the form of a regression coefficient (Purwanto & Sulistyastuti., 2017).

$$H_0: \beta_1, \beta_2, \beta_3 = 0$$

$$H_a: \beta_1, \beta_2, \beta_3 \neq 0$$

The t statistic is calculated from the following formula:

$$t\text{-test: } t = \frac{\beta_1}{se(\beta_1)}$$

Description:

β_1 = parameter coefficient

$se(\beta_1)$ = standard error coefficient parameter

The t-test method, namely t-count with the table, a comparison is made, if the t-count value > the t-table value, the rejection of H_0 means that the independent variable (X) has an influence on the dependent variable (Y), is the significant level and (nk) the degrees of freedom, namely the number of n observations minus the number of independent variables in the model (Ghozali, 2018).

The test is used to verify the hypothesis of each independent variable owned. The nature of the research is to reject H_0 and accept H_a . What is seen is the value of t-statistics and probability values from the results of the regression test. Variables that are considered significant if the prob t-statistic value of the regression test results is smaller than α (alpha).

3.2.7 F-Statistic Test (Simulation Test)

This test is used to see the importance of the model you have. What is seen in this test is the value of F-Statistics and the prob on the results of the regression test. The F test has a Goodness of fit reading method: the model is said to be feasible if the prob (F-Statistics) value in the regression test results is less than α (alpha) 1%, 5%, 10%.

Simultaneous: If the result of goodness of fit is significant, then the independent variable has the same effect on the independent variables that we have (declaration).

The F statistic test gives an idea of whether all of the independent variables in the model have the same effect on the dependent variable. H_0 is a general hypothesis that:

$\beta_1, \beta_2, \beta_3, \dots, \beta_k$ simultaneously equal to zero.

Decision making:

$H_0: \beta_1, \beta_2, \beta_3, \dots = 0$ simultaneously all coefficients are equal to zero.

$H_a: \beta_1, \beta_2, \beta_3, \dots \neq 0$ simultaneously all coefficients are not equal to zero.

Hypothesis testing is usually called the overall significance test of the regression line to be tested whether Y is linearly related to X1, X2, and X3. General hypothesis testing can be done by analysis of variance (ANOVA).

F statistics can be calculated by the formula:

$$Fh = \frac{R^2/k}{(1 - R^2)/(n - k - 1)}$$

If the calculated F value > F table means that H_0 is rejected and H_1 is accepted, then there is an effect of the independent variables simultaneously on the dependent variable. On the other

hand, if $F_{count} < F_{table}$, then H_0 is accepted and H_1 is rejected, simultaneously meaning that there is no effect of the independent variable on the dependent variable. This test as a whole measure the significance of the regression line can also be used to test the significance of R^2 , the F statistic test is the same as testing R^2 (Ghozali, 2018).

3.2.8 Coefficient of Determination (R^2)

The goal is to find out how well the model's ability to describe changes in the dependent variable is. Value ranges from R^2 at 0-1. The higher the number, the better the model built and vice versa. Basically, the coefficient of determination measures the probability of the model's ability to describe the variation of the dependent variable. Variation in the value of the coefficient of determination from zero to one. The ability of the independent variable to describe changes in the dependent variable is very limited with a small value. Meanwhile, almost all the required information is provided with independent variables to predict the variation of the dependent variable with a value close to one (Ghozali, 2018).

4. Results and Discussion

4.1 Model Selection

4.1.1 Hausman Test Results

Hausman test helps to find the best fit between the fixed effect model and the random effect model. The Hausman test can be seen from the probability value, if it is significant at the significance level $\alpha = 5\%$ or less than 0.05, it can be concluded that the correct model is used, namely the fixed effect model, if the p-value is not significant at the significance level $\alpha = 5\%$ or greater from 0.05, the conclusion is that the right model is the random effect model. Generating the hypothesis, namely:

H_0 = “*Random Effect Model* more appropriate to use than *Fixed Effect Model*”.

H_1 = “*Fixed Effect Model* more appropriate to use than *Random Effect Model*”.

Table 3. Hausman Test Results

Test Summary	Chi-Square. Statistic	Chi-Square. d.f	Probability
Cross-section random	23.359384	4	0.0001

Source: Data processing results Eviews 10

It can be seen that the probability is 0.000 less than 0.05 or 5%, so the conclusion is that it is more appropriate to use the Fixed Effect model than the Random Effect.

4.1.2 Chow Test Results

In this test, it is used to find the right model between the common effect model and the fixed effect model. The hypotheses include:

H_0 : “*Common Effect Model* more appropriate to use than *Fixed Effect Model*”

H_1 : “*Fixed Effect Model* more appropriate to use than *Fixed Effect Model*”

The Chow test can be seen from the probability value if it is significant at the significance level $\alpha = 5\%$ or less than 0.05, then it is concluded that the correct model is used, namely the fixed effect model, if the probability value is not significant at the significance level $\alpha = 5\%$ or more than 0.05, the model is concluded The right one to use is the common effect model.

Table 4. Chow Test Results

Effect Test	Statistic	d.f	Probability
Cross-section F	10.757784	(22,42)	0.0000
Cross-section Chi-Square	130.573055	22	0.0000

It can be seen that the probability is 0.000 less than 0.05 or 5%, so the conclusion is that this research is better at using the Fixed Effect model than the Common Effect.

4.1.3 Hausman Test Results and Chow Test

According to the results of the Hausman test and the Chow test, the conclusion is that the best model is the Fixed Effect Model.

Table 5. Fixed Effect Model Test Results

Variable	Coefficient	Std.Error	t-Statistic	Prob.	Desc.
TPT	0.074766	0.082449	0.906813	0.3697	Not significant
CR	-0.001438	0.000981	-1.465599	0.1502	Not significant
SR	-0.168397	0.170946	-0.985088	0.3302	Not significant
DR	1.243950	0.264607	4.701126	0.0000	Significant
C	-48.82315	21.69722	-2.250203	0.0297	
R-square	0.880240				
Prob (F-statistic)	0.000000				
F-statistic	11.87309				

Source: Data processing results Eviews 10, 2019

The results of the regression model estimation are:

$$Y_{it} = -48.82315_{it} + 0.074766_{it} - 0.001438_{it} - 0.168397_{it} + 1.243950_{it}$$

From the results of the regression equation that has been done, it can be interpreted:

α = If the variables X_1, X_2, X_3, X_4 are 0 then the poverty gap index will decrease by 48.8235.

β_1 = If the open unemployment rate increases by 1%, the value of the poverty gap index will increase by 0.074766 assuming X_2, X_3, X_4 are fixed.

β_2 = If the crime rate decreases by 1%, the poverty gap index value will decrease by 0.001438 with the assumption that X_1, X_3, X_4 remain.

β_3 = If the sex ratio decreases by 1% then the poverty gap index value will decrease by 0.168397 assuming X_1, X_2, X_4 remain.

β_4 = If the dependency ratio increases by 1%, the poverty gap index value will decrease by 1.243950 with the assumption that X_1 , X_2 , X_3 remain constant.

4.1.4 Determination Test (R^2)

The coefficient of determination is used with the aim of knowing how well the relationship between the independent variables can explain the dependent variable. The coefficient of determination or goodness of fit is 0.880240. This means that the contribution of all independent variables in explaining the dependent variable is 88.02%. The remaining 11.98% can be explained by other variables outside the model.

4.1.5 T-Statistic Test (Partial Test)

The F test is used to determine the relationship between the variable open unemployment rate, crime rate (CR), sex ratio (SR), dependency ratio (DR) to the dependent variable poverty gap index.

This test resulted in each independent variable having a significant effect on the related variables, except for the poverty variable. The following is an explanation of each independent variable:

1. Unemployment rate

Variable X_1 the unemployment rate is $0.3697 > 0.05$. In conclusion, this variable is not significant to the Y variable.

2. Crime rate

The variable X_2 crime rate is $0.1502 > 0.05$. In conclusion, this variable is not significant to the Y variable.

3. sex ratio

The variable X_1 sex ratio is $0.3302 > 0.05$. In conclusion, this variable is not significant to the Y variable.

4. Dependency ratio

Variable X_1 dependency ratio is $0.0000 < 0.05$. In conclusion, this variable is significant to variable Y.

4.1.6 F-Statistic Test (Simulation Test)

According to the results of the analysis using Eviews 10 software, the F-count value is 11.87309 and the probability F-0.000000. At a significant level of 5%, the F test can be declared significant. Therefore, in conclusion, all independent variables significantly affect the dependent variable. Based on these results, it means that the unemployment rate, crime rate, sex ratio and dependency ratio simultaneously have a significant effect on the poverty gap index and the model has also fulfilled the goodness of fit.

5. Conclusion

The first conclusion of this research is using panel data regression method, namely Random Effect, Fixed Effect, and Common Effect. The best model is selected by conducting two tests, namely Hausman Test and Chow Test. The two tests produce a probability of 0.000 which is less than 0.05, meaning that the best model is the Fixed Effect model.

The second conclusion is, after analyzing the panel data using the F-statistical test, t-statistical test, and determination test. From the F-statistical test, it is stated that the variables of the average unemployment rate, crime rate, sex ratio, and dependency ratio have a significant effect on the poverty gap index and the model has also fulfilled the goodness of fit. The t-statistic test states that only the dependent ratio variable has the most significant effect on Y because it has a value of $0.000 < 5$. The determination test then produces data on the coefficient of determination or goodness of fit which is 0.880240. This shows that the contribution of all independent variables in describing the dependent variable is 88.02%. The remaining 11.98% can be explained by other variables outside the model.

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