



Research Paper

The Effect of Population and Poverty Rate on Economic Growth in the Regencies/Cities of Aceh Province

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Abstract

This study analyzes the effect of population size and the poverty rate on the economic growth rate of the regencies/cities in Aceh Province, Indonesia. The study used panel data combining time-series and cross-sectional data for the 23 regencies/cities in Aceh Province over the period 2019–2023 (115 observations), obtained from Statistics Indonesia (BPS) of Aceh Province. The data were analyzed using panel data regression, and the best model was selected using the Chow, Hausman, and Lagrange Multiplier tests. The results show that the Fixed Effect Model is the most appropriate model. Population has a positive and significant effect on economic growth (coefficient 0.048845; $p = 0.0000$), and the poverty rate also has a positive and significant association with economic growth (coefficient 0.111714; $p = 0.0000$). Simultaneously, population and the poverty rate have a significant effect on economic growth (F-statistic 11.79192; $p = 0.0000$). The coefficient of determination (R^2) is 0.758717, meaning that the model explains about 75.9% of the variation in economic growth, while the remaining 24.1% is explained by other variables outside the model. The positive association between poverty and growth indicates that growth in Aceh has not yet been sufficiently pro-poor. The study recommends improving the quality of the productive-age population and focusing poverty alleviation on productive employment and economic empowerment. Further research should include other determinants of growth, such as investment, human development, and fiscal transfers.

Keywords: Population, Poverty Rate, Economic Growth, Panel Data, Aceh Province

1. Introduction

Economic growth is one of the primary indicators of the welfare of a region and of success in reducing poverty. It measures the effectiveness of development within the economy of a country or region, as economic progress is determined by the growth of output. Economic growth shows



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the extent to which economic activities generate additional income and improve public welfare within a certain period. It also has a significant impact on poverty, because higher growth often creates more employment opportunities, which can reduce unemployment and, consequently, poverty. Cross-country evidence shows that growth in average incomes is the main driver of income growth among the poorest households [1], and that growth and poverty are robustly and negatively related [2].

Population size is an important factor in this process. Classical economists, led by Adam Smith, regarded population as a potential input that can be used as a factor of production to increase the output of households and firms: the larger the population, the larger the labor force available. At the same time, uncontrolled population growth can hinder the achievement of development goals and worsen poverty, particularly in low-income regions [3]. Population issues are therefore closely related to development, and governments seek to manage population growth, for example through family planning programs, so that income grows faster than population [4].

Poverty is a condition in which individuals or groups in society lack adequate access to the resources and services needed to meet their basic needs, including economic resources, education, and healthcare, so that they cannot participate actively in social and economic life [5]. Poverty is a multidimensional problem that requires comprehensive handling by the government, the private sector, and society, through improvements in education, employment opportunities, and infrastructure. A high population growth rate, especially among low-income communities, can worsen poverty because poor families with many members bear a heavier dependency burden [4], [6].

In Aceh Province, welfare and poverty are of serious concern, given the history of conflict and the many aid programs provided by the government and international organizations. Although the province has recorded positive economic growth in recent years, its poverty rate remains among the highest in Indonesia [7], and the large special autonomy funds have not significantly reduced poverty [8]. Previous studies in Aceh have mostly examined the determinants of poverty [4], [6], [9], [10] or the factors affecting growth in a single regency [11], while studies elsewhere have reported mixed results on the effect of poverty on growth [12], [13], [14]. Studies that examine the effects of population and poverty on economic growth across all regencies/cities in Aceh using recent panel data remain limited. This study therefore aims to analyze the effect of population size and the poverty rate on the economic growth rate of the regencies/cities in Aceh Province in 2019–2023.

2. Literature Review

Economic Growth

Economic growth is a measure of the development of an economy over a certain period compared with the previous period [15]. It refers to a long-term increase in a country's or region's capacity to provide a wide variety of economic goods to its population, in line with technological progress and the necessary institutional and ideological adjustments. Economic growth is a continuous process of change in the economic conditions of a region toward a better state, reflected in an increase in the production of goods and services, and it is one of the key benchmarks in development analysis [14], [15].

Population

According to Statistics Indonesia (BPS), the population consists of all individuals residing in the territory of the Republic of Indonesia for six months or more, as well as those residing for less than six months who intend to settle permanently [7]. Population size is the result of demographic processes, namely fertility, mortality, and migration. Population can support economic growth by

providing labor and a larger market, but rapid population growth can also slow development in low-income regions if it is not accompanied by improvements in the quality of human resources [3]. Empirical studies have found that the productive-age population has a significant effect on economic growth in Bireuen Regency [11] and that population has a significant effect on economic growth in North Sumatra [12].

Poverty

Poverty can be viewed from various perspectives. In general, it refers to a condition in which an individual is unable to meet basic needs, including food, clothing, and shelter. BPS defines poverty as the inability to meet basic food and non-food needs, measured using the basic needs approach, so that the poor are individuals whose average per capita expenditure is below the poverty line [7]. Poverty is expected to hinder growth because poor households have limited human capital, savings, and purchasing power [2]. Studies in North Sumatra found that poverty had a negative and significant effect on economic growth [13], [14], whereas another study found a positive and significant effect [12].

Hypotheses

Based on the theory and previous studies, the hypotheses of this study are as follows: H1, population has a significant effect on economic growth in the regencies/cities of Aceh Province; H2, the poverty rate has a significant effect on economic growth in the regencies/cities of Aceh Province; and H3, population and the poverty rate simultaneously have a significant effect on economic growth in the regencies/cities of Aceh Province.

3. Method

Research Approach and Data

This study used a quantitative approach with panel data. The research covered all 23 regencies/cities in Aceh Province over the period 2019–2023, giving 115 observations. The data on economic growth, population, and the poverty rate were obtained from publications of Statistics Indonesia (BPS) of Aceh Province through its official website (<https://aceh.bps.go.id/>) [7]. The regencies/cities and years were selected purposively based on the availability of complete data for all variables.

Data Analysis

The effect of the independent variables on the dependent variable was analyzed using panel data regression with the following equation:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + e_{it}$$

where Y is the economic growth rate (%), α is the constant, β_1 and β_2 are the regression coefficients, X_1 is population, X_2 is the poverty rate (%), e is the error term, i denotes the regency/city, and t denotes the year. The model was estimated using the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). The best model was selected using the Chow test (CEM vs. FEM), the Hausman test (REM vs. FEM), and the Lagrange Multiplier test (CEM vs. REM) [16], [17]. The hypotheses were then tested using t-tests (partial) and an F-test (simultaneous) at a 5% significance level, and the coefficient of determination (R^2) was used to measure the explanatory power of the model.

4. Result and Discussion

Descriptive Statistics

The descriptive statistics of the variables are presented in Table 1.

Table 1. Descriptive statistics

Statistic	Economic growth (Y)	Population (X1)	Poverty rate (X2)
Mean	5.441565	20.45046	15.86948
Median	5.630000	16.77100	15.87000
Maximum	8.880000	58.87400	22.78000
Minimum	1.250000	2.970000	4.940000
Std. deviation	1.753723	12.56602	4.374919
Observations	115	115	115

Source: Data processed with EViews, 2025.

Economic growth has a mean of 5.441565, a maximum of 8.880000, a minimum of 1.250000, and a standard deviation of 1.753723. Population has a mean of 20.45046, a maximum of 58.87400, a minimum of 2.970000, and a standard deviation of 12.56602. The poverty rate has a mean of 15.86948, a maximum of 22.78000, a minimum of 4.940000, and a standard deviation of 4.374919, indicating considerable variation in poverty across regencies/cities in Aceh.

Panel Data Regression Estimates

The estimation results of the three panel data models are summarized in Table 2.

Table 2. Estimation results of the CEM, FEM, and REM

Variable	CEM	FEM	REM
Constant	1.424985 (3.025)	2.669807 (6.159)	2.247232 (5.142)
Population (X1)	0.062156 (6.293)	0.048845 (5.221)	0.054355 (6.246)
Poverty rate (X2)	0.173003 (6.098)	0.111714 (4.626)	0.131242 (5.645)
R ²	0.461324	0.758717	0.393301
F-statistic	47.95852	11.79192	36.30275
Prob(F-statistic)	0.000000	0.000000	0.000000

Note: *t*-statistics in parentheses; all coefficients are significant at the 1% level. R² for the REM is the weighted R². Source: Data processed with EViews, 2025.

In all three models, population and the poverty rate have positive coefficients with probability values below 0.05. The R² is 0.461324 for the CEM, 0.758717 for the FEM, and 0.393301 for the REM.

Selection of the Best Model

The results of the model selection tests are presented in Table 3.

Table 3. Results of the model selection tests

Test	Statistic	Prob.	Selected model
Chow test (cross-section F)	5.042250 (22; 90)	0.0000	FEM
Hausman test (chi-square)	9.013078 (2)	0.0110	FEM
Lagrange Multiplier test (Honda, cross-section)	5.857880	0.0000	REM

Note: degrees of freedom in parentheses. Source: Data processed with EViews, 2025.

The Chow test probability (0.0000) is less than 0.05, so the FEM is preferred to the CEM. The Hausman test probability (0.0110) is also less than 0.05, so the FEM is preferred to the REM. The Lagrange Multiplier test (0.0000) shows that the REM is preferred to the CEM; however, because both the Chow and Hausman tests select the FEM, the LM test does not change the final choice [16], [17]. Therefore, the Fixed Effect Model is the best model for this study.

Fixed Effect Model and Hypothesis Testing

The results of the selected Fixed Effect Model are presented in Table 4.

Table 4. Results of the Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	2.669807	0.433474	6.159099	0.0000
Population (X1)	0.048845	0.009356	5.220853	0.0000
Poverty rate (X2)	0.111714	0.024147	4.626398	0.0000
R ²	0.758717		Adjusted R ²	0.694375
F-statistic	11.79192		Prob(F-statistic)	0.000000
Durbin–Watson stat.	1.931691			

Note: cross-section fixed effects (dummy variables). Source: Data processed with EViews, 2025.

Based on Table 4, the panel regression equation is as follows:

$$Y_{it} = 2.669807 + 0.048845X1_{it} + 0.111714X2_{it} + e_{it}$$

The F-statistic is 11.79192 with a probability of 0.000000, which is less than 0.05; thus, H0 is rejected, meaning that population and the poverty rate simultaneously have a significant effect on economic growth in the regencies/cities of Aceh Province (H3 accepted). The R² of 0.758717 indicates that the model, including the regency/city fixed effects, explains about 75.9% of the variation in economic growth, while the remaining 24.1% is explained by other variables outside the model. Partially, population has a probability value of 0.0000 (H1 accepted) and the poverty rate has a probability value of 0.0000 (H2 accepted), so both variables have a significant effect on economic growth.

Effect of Population on Economic Growth

Population has a positive and significant effect on economic growth, with a coefficient of 0.048845. This means that a one-unit increase in population is associated with an increase in the economic growth rate of 0.048845 percentage points, assuming the poverty rate is constant. This finding is consistent with Hasibuan and Rukiah [12], who found that population has a positive and significant effect on economic growth in North Sumatra, and with Mawati and Anwar [11], who found that the productive-age population significantly affects economic growth in Bireuen Regency. A larger population provides more labor and a larger market for goods and services, which can increase regional output. However, the benefits of population for growth depend on the quality of human resources and the availability of employment; without them, population growth can become a burden for development [3].

Effect of the Poverty Rate on Economic Growth

The poverty rate has a positive and significant coefficient of 0.111714, meaning that a one-percentage-point increase in the poverty rate is associated with an increase in the economic growth rate of 0.111714 percentage points, assuming population is constant. This finding is consistent with Hasibuan and Rukiah [12], who also found a positive and significant coefficient for poverty in North Sumatra, but differs from studies that found a negative effect of poverty on growth [2], [13], [14]. The positive coefficient should not be interpreted as poverty driving growth. Rather, it suggests that regencies/cities with higher poverty rates in Aceh have recorded relatively high growth rates, for example because of catch-up growth from a lower base and the large fiscal transfers, including special autonomy funds, allocated to these regions. It also indicates that economic growth in Aceh has not yet been sufficiently pro-poor, because higher growth has not been accompanied by a corresponding reduction in poverty [4], [8]. Previous studies have shown

that rural and agricultural development is more effective in reducing poverty than other sources of growth [18], [19], which suggests that growth strategies in Aceh should be more oriented toward the sectors in which the poor work.

Limitations

This study has several limitations. It uses only two explanatory variables and a relatively short period (2019–2023), which includes the COVID-19 pandemic, so other determinants of growth, such as investment, human development, government expenditure, and fiscal transfers, are not captured. The relationship between poverty and growth may also be bidirectional, which could not be addressed with the static panel model used in this study. In addition, diagnostic tests for multicollinearity and heteroscedasticity were not reported [20]. The results should therefore be interpreted with caution.

5. Conclusion

Economic growth in the regencies/cities of Aceh Province in 2019–2023 is significantly influenced by population and the poverty rate, based on the Fixed Effect Model. Population has a positive and significant effect on economic growth (coefficient 0.048845; $p = 0.0000$), and the poverty rate has a positive and significant association with economic growth (coefficient 0.111714; $p = 0.0000$). Simultaneously, the two variables have a significant effect on economic growth (F-statistic 11.79192; $p = 0.0000$), and the model explains about 75.9% of the variation in economic growth ($R^2 = 0.758717$).

The local government is advised to optimize the potential of the productive-age population by expanding access to education, skills training, and entrepreneurship programs, so that a large population becomes a driver of economic growth rather than a burden. Poverty alleviation should focus on creating jobs in productive sectors, such as modern agriculture, micro, small, and medium enterprises (MSMEs), and tourism, and social assistance should be better targeted to promote economic independence rather than consumption alone. Future research should include other determinants of growth, such as investment, human development, and fiscal transfers, use a longer period, and apply dynamic panel models to account for the two-way relationship between poverty and growth.

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Authors' contributions and responsibilities

Hayatun Magfirah: conceptualization, data collection, formal analysis, writing – original draft. Yuliana: supervision, methodology, writing – review & editing. Edi Saputra: supervision, validation, writing – review & editing.

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Availability of data and materials

The data used in this study are secondary data published by Statistics Indonesia (BPS) of Aceh Province and are publicly available. The processed data are available from the authors upon reasonable request.

Competing interests

The authors declare no competing interest.

Ethical approval

Not applicable. This study used publicly available secondary data and did not involve human participants.

Additional information

No additional information from the authors.

Declaration of Generative AI and AI-Assisted Technologies

During the preparation of this manuscript, Claude (Anthropic) was used to improve the language and readability of the English text and to format the manuscript, tables, equations, and references according to the journal template. The tool was not used to generate research data, perform the analysis, or draw conclusions. The authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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