The Influence of Population Size and Poverty on Economic Growth in Aceh Province

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Abstract

This study is motivated by the dynamics of population and poverty in Aceh Province, which have the potential to influence regional economic growth. Increases in population and reductions in poverty do not always correspond with optimal acceleration of economic growth, necessitating an empirical study to understand the relationship among these three variables. The objective of this research is to analyze the influence of population size and poverty on economic growth in Aceh Province, both partially and simultaneously. This study employs a quantitative approach using secondary time-series data from 1995 to 2024, obtained from the Central Statistics Agency. The analysis is conducted using a multiple linear regression model, complemented by classical assumption tests and hypothesis testing. The results indicate that, partially, population size has a significant effect on economic growth, with a regression coefficient of 6.546. Similarly, poverty significantly affects economic growth, albeit with a lower coefficient of 1.079. Simultaneously, population size and poverty together have a significant impact on economic growth, with a coefficient of determination (R^2) of 0.942. These findings suggest that increasing population and addressing poverty in an integrated manner are important factors in promoting economic growth in Aceh. This study recommends that local governments design balanced development policies, optimize demographic potential, and strengthen poverty alleviation programs to support sustainable economic growth.

Keywords: *Population size; poverty and economic growth.*

I. INTRODUCTION

Economic development in Indonesia evolves alongside changes in societal structure, particularly concerning population growth and improvements in welfare. Changes in economic activities, population distribution, and demand for public services significantly influence the direction of national economic development [1]. The interaction between social and economic dynamics illustrates how the development process unfolds while generating new challenges as societal needs increase [2].Population growth in Indonesia shows an increasing trend from year to year [3]. The rise in population leads to higher demand for employment opportunities, basic services, and the capacity of regions to support economic activities. Population growth also exerts pressure on available resources, making demographic factors critical in understanding patterns of national economic change [4]Aceh Province has experienced consistent population growth. From 2020 to 2024, the population increased from approximately 5.27 million to 5.55 million. This growth reflects increasing annual development needs, including public services and economic support. Moreover, the population increase indicates expanding social activity while simultaneously intensifying pressure on regional resources.Poverty serves as a key indicator in understanding the relationship between population growth and the economic capacity of the community.

Changes in poverty levels reflect the extent to which society can meet basic needs and participate in economic activities [5]. In Aceh, although the population continues to grow, poverty levels show a declining trend. The number of poor people decreased from approximately 834 thousand in 2020 to around 719 thousand in 2024. This decline demonstrates improvements in community economic conditions, although welfare challenges remain, and indicates that economic activity and social development impact the community's ability to meet daily needs.Economic growth is closely linked to population development and changes in poverty levels [6]. An increasing population accompanied by improved welfare can stimulate the

expansion of production and consumption activities, whereas high poverty levels may hinder economic activities. In Aceh, the Gross Regional Domestic Product (GRDP) at constant prices gradually increased from approximately IDR 131.6 trillion in 2020 to IDR 153.8 trillion in 2024. This growth reflects continuously rising economic activity alongside population dynamics and improvements in community welfare, illustrating a sustainable economic development process.

However, the development of population, poverty, and economic growth in Aceh does not always follow a synchronized pattern. High population growth should serve as potential to boost economic activities, while poverty reduction ideally allows the community to participate more actively in economic development. Yet, increases in population and improvements in welfare do not always lead to significant acceleration in economic growth.This phenomenon indicates a gap between the conditions that should occur and the reality on the ground. Population growth and poverty reduction do not automatically lead to optimal economic growth. Therefore, this study is important to understand the relationship between demographics, welfare, and the economy, as well as to provide a basis for formulating more targeted development policies in Aceh.Based on this context, this study analyzes the influence of population size and poverty levels on economic growth in Aceh Province using a quantitative approach based on time-series data. The study aims to provide empirical insights into the extent to which population growth and changes in poverty levels affect regional economic development, while also contributing to the literature on regional economic dynamics and the social factors influencing economic growth in Aceh.

II. METHODS

The analytical techniques employed in this study were selected based on their suitability for examining quantitative relationships among population, poverty, and economic growth in Aceh Province [7]. Since the objective of this study is to assess the influence of population size and poverty level on economic growth, the statistical methods adopted must adequately capture the dynamics of time-series data while satisfying the assumptions required for model reliability. Accordingly, multiple linear regression was chosen as the primary analytical approach [8].This study utilizes secondary time-series data obtained from Statistics Indonesia. The observation period covers the years 1995 to 2024 [9]. Economic growth, represented by the value of the Gross Regional Domestic Product (GRDP) at constant prices, serves as the dependent variable, while population size and the number of poor people function as the independent variables [7]. The empirical model was constructed using a multiple linear regression framework, expressed as $Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e$, where Y represents economic growth (GRDP at constant prices), X_1 is population size, X_2 is the number of poor people, α is the constant, β_1 and β_2 are the regression coefficients of the independent variables, and e denotes the error term.

This model allows for the examination of both the partial and simultaneous effects of population and poverty on economic growth.The model was evaluated through diagnostic tests of residual patterns to ensure statistical adequacy. Classical assumption testing included normality tests (Kolmogorov–Smirnov), multicollinearity detection (Tolerance and VIF), autocorrelation assessment (Durbin–Watson), and heteroskedasticity evaluation (Glejser test). When violations were identified, corrective measures were applied, such as data transformation, factor analysis, or first-difference transformation to address positive autocorrelation [8]. Once the model satisfied all diagnostic criteria, hypothesis testing was conducted. The t-test was used to examine the partial effects of each independent variable on economic growth, while the F-test assessed their joint significance. The Coefficient of Determination (R^2 and Adjusted R^2) was calculated to determine the proportion of variation in economic growth collectively explained by population size and poverty [8].

III. RESULT AND DISCUSSION

From 1995 to 2024, the population of Aceh experienced consistent growth, starting from approximately 3.847 million in 1995 and reaching 5.555 million in 2024, with accelerated growth observed following the five-year census updates. Poverty levels, although sharply increasing from 492 thousand in 1995 to a peak of 1.254 million in 2004, gradually declined to 719 thousand in 2024, reflecting an

improvement in public welfare during the latter part of the observation period. Economic growth in Aceh demonstrated a significant strengthening trend, beginning at around 9,900–11,400 billion rupiahs in 1995–2000, surging to 32,565 billion rupiahs in 2001, and reaching a peak of approximately 153,780 billion rupiahs in 2024, indicating sustained economic activity in line with population growth and the reduction of poverty in the province.Classical assumption tests were conducted to ensure that the regression model meets the required statistical conditions, so that the estimation results are valid and free from bias. These tests included assessments of normality, multicollinearity, heteroscedasticity, and autocorrelation. The original data, consisting of population size, poverty (in number of individuals), and economic growth (in rupiah), initially deviated from classical assumptions. Therefore, the data were transformed into logarithmic (log) form to normalize the distribution, reduce the influence of outliers, and make the data scale more proportional.

Table 1. Normality Test Results Using One-Sample Kolmogorov–Smirnov Test

		Unstandardized Residual
N		30
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.10286817
Most Extreme Differences	Absolute	.105
	Positive	.105
	Negative	-.079
Test Statistic		.105
Asymp. Sig. (2-tailed)		.200[c,d]

The normality test using the One-Sample Kolmogorov-Smirnov (KS) test indicated that the significance value, Asymp. Sig. (2-tailed), was 0.200, which is greater than the 0.05 significance level. This suggests that the residual distribution does not differ significantly from a normal distribution, and it can be concluded that the residuals are normally distributed.

Table 2. Multicollinearity Test Results

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Population Size	.948	1.055
	Poverty	.948	1.055

a. Dependent Variable: Economic Growth

The multicollinearity test results indicate that all independent variables have high tolerance values (0.948) and low VIF values (1.055), well below the common thresholds of VIF < 10 and tolerance > 0.1. This suggests that there is no multicollinearity problem between population size and poverty. Therefore, both variables can be used simultaneously in the regression analysis of economic growth without causing distortion in the coefficient estimates.

Table 3. Autocorrelation Test Results

Model	Durbin-Watson
1	1.610

a. Predictors: (Constant), Poverty, Population Size

b. Dependent Variable: Economic Growth

The autocorrelation test using the Durbin-Watson statistic yielded a value of 1.610. With the critical bounds of dl = 1.2837 and du = 1.5666, the Durbin-Watson value falls between du and 4-du (1.5666 < 1.610 < 2.434). This indicates that there is no significant positive autocorrelation in the model. In other words, the model residuals are independent, and the classical assumption of no autocorrelation is satisfied.

Table 4. Heteroscedasticity Test Results

Model		Standardized Coefficients Beta	t	Sig.
1	(Constant)		1.123	.271
	Population Size	-.229	-1.189	.245
	Poverty	.056	.291	.773

a. Dependent Variable: AbsRes

The heteroscedasticity test results show that the significance values for the Population Size variable and the Poverty variable are 0.245 and 0.773, respectively, both greater than the 0.05 significance level. This indicates that there is no significant relationship between the independent variables and the absolute residuals (AbsRes), and it can be concluded that the model is free from heteroscedasticity. The residual variance is constant across all observations, satisfying the classical assumption of homoscedasticity. Data analysis was conducted to examine the extent to which the independent variables influence the dependent variable through linear regression, while also evaluating the contribution of the independent variables to the dependent variable using the coefficient of determination (R^2).

Table 5. Coefficient of Determination Test Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.971[a]	.942	.938	.10661

a. Predictors: (Constant), Poverty, Population Size

b. Dependent Variable: Economic Growth

The coefficient of determination test results indicate an R Square value of 0.942, meaning that approximately 94.2% of the variation in economic growth can be explained by the Population Size and Poverty variables, while the remaining 5.8% is influenced by other factors outside the model. The Adjusted R Square value of 0.938 further supports the conclusion that the regression model has a high predictive capability, with a standard error of 0.10661.

Table 6. Regression Test Results

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	-36.234	2.402	
	Population Size	6.546	.363	.858
	Poverty	1.079	.172	.299

a. Dependent Variable: Economic Growth

The regression analysis produced the following equation: Economic Growth = -36.234 + 6.546 (Population Size) + 1.079 (Poverty). The intercept value of -36.234 indicates that if both Population Size and Poverty are zero, the estimated economic growth would be -36.234. The coefficient for Population Size (β = 6.546) implies that a 1% increase in population is associated with a 6.546% increase in economic growth, assuming Poverty remains constant. Similarly, the coefficient for Poverty (β = 1.079) indicates that a 1% change in poverty affects economic growth by 1.079%, assuming Population Size remains constant. These results demonstrate that both Population Size and Poverty have a positive and significant influence on economic growth in the model.Hypothesis testing was conducted to examine the partial effects of each independent variable on the dependent variable using the t-test, as well as to assess the simultaneous effect of all independent variables on the dependent variable using the F-test.

Table 7. Partial Test Results (t-Test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-36.234	2.402		-15.083	.000
	Population Size	6.546	.363	.858	18.012	.000
	Poverty	1.079	.172	.299	6.266	.000

a. Dependent Variable: Economic Growth

The partial t-test results show that Population Size (t = 18.012; Sig. = 0.000) has a calculated t-value much greater than the critical t-value (18.012 > 2.051) with a significance level below 0.05, indicating a positive and significant partial effect on economic growth. Similarly, Poverty (t = 6.266; Sig. = 0.000) has a t-value exceeding the critical t-value (6.266 > 2.051) and a significance level below 0.05, demonstrating that it also exerts a positive and significant partial effect on economic growth.

Table 8. Simultaneous Test Results (F-Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.975	2	2.487	218.860	.000[b]
	Residual	.307	27	.011		
	Total	5.282	29			

a. Dependent Variable: Economic Growth

b. Predictors: (Constant), Poverty, Population Size

The F-test results indicate that the calculated F-value is much greater than the critical F-value (218.860 > 3.35) with a significance level of 0.000 < 0.05. This demonstrates that Population Size and Poverty simultaneously have a significant effect on economic growth, indicating that the regression model is appropriate and capable of explaining the variation in economic growth collectively.There is a positive and significant effect of Population Size on economic growth in Aceh during the period 1995–2024, as evidenced by a coefficient value of 6.546% for every 1% increase in Population Size and a t-value greater than the critical t-value (18.012 > 2.051) with a significance of 0.000. Similarly, Poverty has a positive and significant effect on economic growth in Aceh over the same period, with a coefficient of 1.079% for every 1% change in Poverty and a t-value exceeding the critical value (6.266 > 2.051) with a significance of 0.000.

Furthermore, Population Size and Poverty jointly influence economic growth in Aceh from 1995 to 2024. This is demonstrated by the F-test, where the calculated F-value is much greater than the critical F-value (218.860 > 3.35) with a significance of 0.000. The coefficient of determination (R^2) is 0.942, indicating that approximately 94.2% of the variation in economic growth can be explained by Population Size and Poverty, while the remaining 5.8% is influenced by factors outside the model.These findings are supported by the study conducted by Pitri [10], which found that Population Size and Poverty simultaneously affect economic growth in Jambi Province, confirming the significant relationship between these variables and regional economic growth in Indonesia. Furthermore, research by Rosi [11] in Kerinci Regency showed that Population Size and Poverty have a significant simultaneous effect on economic growth, contributing substantially to regional economic variation. In addition, Kasih and Yefriza [12] identified a positive correlation between Population Size and poverty levels in Sumatra, reinforcing the conclusion that demographic factors and poverty are critical determinants in the analysis of regional economic growth.

IV. CONCLUSION

The results of the study indicate that Population Size has a significant effect on economic growth in Aceh, with every 1% increase in population leading to a 6.546% increase in economic growth. Poverty also has a significant effect on economic growth, with every 1% change in poverty affecting economic growth by 1.079%. Simultaneously, Population Size and Poverty together have a significant effect on economic growth in Aceh, with a coefficient of determination (R^2) of 0.942, indicating that 94.2% of the variation in economic growth can be explained by these two variables.

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