



Analysis of the Effect of Working Age Population, Unemployment and Education on GRDP in Central Sulawesi Province 2017-2024

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ABSTRACT

This study aims to analyze the influence of the working-age population, the open unemployment rate, and the level of education on the GRDP of districts/cities in Central Sulawesi Province in 2017-2024. The method used is explanatory research to explain the relationship between variables. Panel data analysis techniques (pooled data) are used as an analysis tool with the help of Eviews 10 software. The results of the study indicate that the working-age population, the open unemployment rate, and the level of education simultaneously have a significant influence on GRDP. Partially, the unemployment rate has a negative but insignificant effect on the independent variable. The variables of the working-age population and the average length of schooling have a positive and significant effect on GRDP in 12 districts and 1 city in Central Sulawesi Province in 2017-2024. Further research is recommended to add variables such as poverty levels, human development index, or regional investment. This aims to provide a more comprehensive understanding of the factors that influence GRDP in Central Sulawesi Province.

Keywords: GRDP, Labor Force Participation, Open Unemployment, Years of Schooling

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INTRODUCTION

Gross Regional Domestic Product (GRDP) is the primary indicator used to assess the performance and level of economic activity in a region. GRDP reflects the added value generated from all production activities of goods and services within a specific period, thus providing a realistic picture of economic conditions. A positive GRDP indicates increased economic activity and production growth, while a negative GRDP indicates a slowdown or economic contraction in a region (Munandar, 2017).

The development of Central Sulawesi Province's GRDP (Gross Domestic Product) in recent years has shown a fluctuating pattern. The GRDP growth rate declined in 2017, then increased sharply in 2018, before declining again from 2019 to 2020. Economic recovery began in 2021 and continued into 2022, but declined again in 2023. This condition indicates that regional economic growth remains unstable and is influenced by various structural and demographic factors (Central Statistics Agency, 2024).

A region's GRDP is influenced by the dynamics of the working-age population, unemployment rate, and education level. An increase in the working-age population has the potential to increase production capacity if balanced by adequate job availability. Conversely, this can lead to increased unemployment, negatively impacting GRDP. A higher level of education reflects higher quality human resources, thereby increasing labor productivity and driving regional economic growth (Purnamasari, 2024).

Previous research has shown a significant relationship between demographic variables and GRDP. Population and education level have been shown to have a positive effect on GRDP, while the unemployment rate has a significant negative effect. These findings suggest that



controlling unemployment and improving the quality of education are important factors in strengthening regional economic performance (Purnamasari, 2024; Maulana et al., 2023).

The population aged 15 and over in Central Sulawesi Province has fluctuated significantly in recent years. This reflects changes in the labor supply, which can present both opportunities and challenges for the regional economy. An under-utilization of the working-age population has the potential to increase unemployment and depress the labor force's contribution to GRDP (Khatima, 2021).

The open unemployment rate in Central Sulawesi Province has also fluctuated over the past decade. A relatively high unemployment rate can reduce people's purchasing power and hinder economic growth. Stable unemployment rates are crucial for maintaining sustainable GRDP growth, especially amidst the annual increase in the working-age population (Aziz et al., 2020).

Education is a strategic factor in driving regional economic growth. Increasing average years of schooling reflects improvements in the quality of human resources, which in turn increases labor productivity. Data shows that average years of schooling in Central Sulawesi Province have consistently increased in recent years, which is expected to positively contribute to increasing GRDP and sustainable community welfare (Nugroho, 2014; Central Sulawesi Statistics Agency, 2024).

Based on these conditions, this study aims to analyze the influence of the working-age population, open unemployment rate, and education level on the GRDP of districts/cities in Central Sulawesi Province during the period 2017–2024. The results of this study are expected to provide academic contributions to the development of regional economic studies and serve as considerations for local governments in formulating effective policies to increase GRDP and the quality of regional economic development.

LITERATURE REVIEW

Economic Growth

Economic growth describes the increase in a region's ability to produce goods and services in the long term. This process is influenced by the interaction between capital, labor, and technology, which drives increased productivity and output. The development of thinking on economic growth is divided into two main schools of thought: classical and neoclassical (Supriadi, 2018). Classical thought, put forward by Adam Smith, David Ricardo, Thomas Malthus, and Karl Marx, emphasizes the role of natural resources, population, capital, and technology as determinants of economic growth. Adam Smith highlighted the importance of the division of labor, capital accumulation, and market expansion in increasing productivity. David Ricardo emphasized the limitations of land and the law of diminishing returns as factors inhibiting growth. Thomas Malthus viewed population growth faster than food production as a threat to welfare. Karl Marx highlighted the relationship between production and capital accumulation in a capitalist system, which has the potential to create economic inequality (Suryono, 2001). The neoclassical school, developed by Harrod-Domar and Solow-Swan, places investment, labor, and technological progress as the main factors of economic growth. The Harrod-Domar theory emphasizes the importance of capital formation and the role of government in encouraging investment to achieve stable growth. The Solow-Swan model adds the role of labor and technology and suggests that long-term growth is largely determined by technological progress that increases labor productivity (Lestari, 2019; Thusahra, 2023).

Working Age Population

The working-age population is the population aged 15 years and over who has the potential to work and serves as the basis for labor market analysis. This group plays a strategic role in economic development because it determines the size of the workforce and the production capacity of a region (Prasetyoningrum, 2021). A large working-age population can create an



opportunity for a demographic bonus if balanced with the availability of jobs and improvements in the quality of human resources. Conversely, this condition has the potential to increase unemployment and create socio-economic problems. The quality of education and skills are key factors in determining the contribution of the working-age population to increasing GRDP (Yusuf & Reswita, 2020). Purnamasari (2024) states that population size has a significant positive effect on GRDP. Yuniartika (2022); Maulana et al. (2023) emphasize the importance of the workforce in driving GRDP, although there are differences in results regarding the influence of population size and labor force participation. Amin et al. (2024); Oktaviani et al. (2024) emphasize that the influence of population size is contextual and depends on regional conditions.

Unemployment

Unemployment is a condition where someone in the workforce is unemployed or actively seeking work. The unemployment rate indicates the percentage of the workforce that has not been absorbed in economic activities and is an important indicator in assessing the economic performance of a region (Basrowi et al., 2018). Unemployment can be caused by a decline in GRDP, changes in economic structure due to technological advances, and the time required to find suitable employment. High unemployment rates impact people's purchasing power and hamper production processes, thus potentially suppressing the GRDP growth rate (Hariyanto, 2021). Amin et al. (2024); Oktaviani et al. (2024); Putri et al. (2024) found that the unemployment rate had a significant negative effect on GRDP. Meanwhile, Purnamasari (2024) showed that unemployment had a significant negative effect on GRDP. Paembonan et al. (2024) emphasized that the quality of human resources plays a role in reducing unemployment, although the partial effect on GRDP is not significant.

Average Length of Schooling

Average years of schooling is an indicator that describes the number of years of formal education completed by the population aged 15 and over. This indicator reflects the quality of human resources and is a key component in calculating the Human Development Index (Rasnino et al., 2022). An increase in the average years of schooling indicates improved access to and equity in education, which impacts skills and workforce productivity. Regions with a higher average years of schooling tend to have a workforce better prepared to meet job market needs and technological developments, thereby driving sustainable economic growth and GRDP (Sudaryati et al., 2021). Putri et al. (2024) found that education level had no significant effect on GRDP. Meanwhile, Purnamasari (2024) showed that education level had a significant positive effect on GRDP. Yuniartika (2022); Maulana et al. (2023) emphasized the importance of education in driving GRDP.

METHOD

This study uses an explanatory research approach to explain the influence of the working-age population, the open unemployment rate, and average years of schooling on changes in Gross Regional Domestic Product (GRDP). This study uses secondary data in the form of panel data for districts/cities in Central Sulawesi Province. The data are sourced from the Central Sulawesi Statistics Agency (BPS) and other supporting documents such as government reports, books, scientific articles, and previous research.

Data analysis using panel data regression with the help of EViews 10 software. The regression model is formulated as follows:

$$\text{LogYit} = \beta_0 + \beta_1 \text{LogX1it} + \beta_2 \text{X2it} + \beta_3 \text{LogX3it} + \varepsilon_{it}$$



Where Y is the Dependent Variable, X is the Independent Variable, β_0 is a constant, $\beta_1, \beta_2, \beta_3$ are the regression coefficients, $i_{1,2,3,\dots,n}$ is cross section data, $t_{1,2,3,\dots,t}$ is time series data, e is the residual.

The approaches used include 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, the Hausman Test, and the Lagrange Multiplier (LM) Test. Furthermore, the Coefficient of Determination (R^2) analysis was conducted to measure the model's explanatory power, the F-test for simultaneous effects, and the t-test for partial effects of each variable. Classical assumption tests included multicollinearity and heteroscedasticity tests using the White Test.

RESULTS AND DISCUSSION

Research Results

The Random Effects Model (REM) approach assumes that differences between individuals or cross-sectional units are random and uncorrelated with the independent variables in the model. Individual effects are included as part of the error term, allowing for efficient estimation if the assumption of no correlation is met. Model selection is based on the results of testing using the Chow and Hausman tests, which indicate that the REM model is the most appropriate model and is used as a reference in estimating the panel data regression equation.

$$YLogit = -6.943616 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

Based on the REM model equation, the estimation results show that the constant value of -6.943616 indicates that when all independent variables are zero, the GRDP value is estimated to be -6.943616 in logarithmic units. The coefficient value of the working age population variable ($LOGX_1$) of 1.199147 indicates that every 1 percent increase in the working age population will increase GRDP by 1.199147 percent assuming other variables remain constant. The coefficient value of the open unemployment rate variable (X_2) of -0.065275 indicates that every 1 unit increase in the open unemployment rate will decrease GRDP by 0.065275 units. The coefficient value of the average length of schooling variable ($LOGX_3$) of 4.939988 indicates that every 1 percent increase in the average length of schooling will increase GRDP by 4.939988 percent assuming other variables remain constant.

The equations for each Random Effects model in 12 Districts and 1 City in Central Sulawesi Province are as follows:

$$YBanggai = 2.917.448 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YBangkep = 3.333720 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YBalut = 21.075 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YBuol = 2.685716 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YDonggala = 915.518 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YPalu = 3.167.292 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YMorowali = 5.839832 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YMorut = 9.978682 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YParimo = 2.665034 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YPoso = 2.144043 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YSigi = 2.870380 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YTouna = 4.285556 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

$$YTolitoli = 837.255 + 1.199147LogX1it - 0.065275X2it + 4.939988LogX3it$$

The estimation results show that each region has a different intercept value, while the coefficient (slope) for each independent variable remains the same. The differences in intercepts reflect the influence of specific characteristics that cannot be directly observed in each region and are assumed to be random, in accordance with the Random Effects approach.



This test is conducted to determine the effect of the independent variables on the dependent variable. To determine whether the independent variables influence the dependent variable, a probability significance test (t-statistic) can be used according to a predetermined α . In this study, an α of 5% (0.05) was used, and four independent variables were suspected of significantly influencing the dependent variable.

Table 1. REM Partial T-Test

Variable	Coefficient	t-Statistic	Prob.	Sig.
LOGX1	1.199147	4.178923	0.0001	Significant
X2	-0.065275	0.584899	0.5599	Non-Significant
LOGX3	4.939988	6.535510	0.0000	Significant

Source: Appendix 5

The results of the t-test in Table 1 show that the log variable of the working age population (LOGX₁) with a probability of 0.0001 has a positive and significant effect on the dependent variable, the unemployment rate variable (X₂) with a probability of 0.5599 has a negative but insignificant effect on the dependent variable, and the log variable of education (LOGX₃) with a probability of 0.0000 has a positive and significant effect on the dependent variable.

Based on the results of the multicollinearity test, the centered VIF value for variable X₁ is 1.149155, variable X₂ is 1.968919, and variable X₃ is 1.772177. VIF values that are less than the general limit of 10 indicate the absence of multicollinearity symptoms in this regression model. This shows that variables X₁, X₂, and X₃ do not have a very strong linear correlation with each other, which can affect the stability and validity of the regression coefficient estimates. The results of the heteroscedasticity test are Prob. F (3,100) value of 0.117, Prob. Chi-Square of 0.1162, and Prob. Chi-Square on Scaled Explained SS of 0.00000. Most of the probability values exceed the significance limit of 0.05, so the model does not show any symptoms of heteroscedasticity. The residual variance is constant or homoscedastic. This condition indicates that the regression model has fulfilled one of the important assumptions in classical regression and the estimation results can be used reliably for further analysis purposes.

The coefficient of determination of 0.463948 indicates that approximately 46 percent of the variation in the dependent variable can be explained by the independent variables used in the Random Effect model. The adjusted R-squared value of 0.447867 indicates that the model's explanatory power remains strong after adjusting for the number of independent variables and the research sample. This figure indicates a fairly good relationship between the independent and dependent variables, although approximately 54 percent of the variation is still influenced by factors outside the model.

The F-statistic value of 28.84974 with a probability of 0.000000 indicates that the regression model is simultaneously significant. A probability below 0.05 indicates that the independent variables simultaneously have a significant effect on the dependent variable. The Random Effects model can be used for analysis and decision-making because it meets the criteria for statistical significance.

Discussion

The Influence of Working Age Population on GRDP

The results of the study indicate that the log variable of the working-age population (LOGX₁) with a probability of 0.0001 has a positive and significant effect on GRDP. This finding proves that an increase in the working-age population can significantly boost GRDP. The working-age population, as a productive group, plays a crucial role in the development process because they have the potential to increase output through involvement in production activities. This relationship aligns with classical and neoclassical GRDP theories, which place labor as a key factor in driving capital accumulation and productivity (Supriadi, 2018; Lestari, 2019). The relationship



between the working-age population and GRDP can also be understood through the concept of the demographic bonus. A high population of productive age provides a significant opportunity for a regional economy to improve the production of goods and services. This condition will create a multiplier effect on national income if balanced with adequate employment opportunities and increased workforce skills. If optimally managed, the working-age population can be a driving force for sustainable GRDP (Prasetyoningrum, 2021; Yusuf & Reswita, 2020).

The findings of this study reinforce previous research that demonstrated a significant influence between the workforce or working-age population on GRDP. Purnamasari (2024) study revealed that population size had a positive and significant effect on GRDP in Java. Consistent results were also obtained by Yuniartika (2022), where the workforce was shown to have a positive effect on GRDP in East Java Province. Similar findings were demonstrated by Oktaviani et al. (2024) study, which confirmed that population had a positive influence on Indonesia's GRDP during the pandemic. However, there are differences with Amin et al. (2024) study in East Kalimantan, which found that population had no direct effect on GRDP. This difference may be due to local factors, such as labor quality and uneven job availability. These research findings also reinforce the Solow-Swan theory, which emphasizes the role of labor, capital, and technology in driving long-term GRDP, where the working-age population is a fundamental component in increasing national productivity.

Overall, the research findings confirm that increasing the working-age population has a positive impact on GRDP. Support in the form of improving the quality of human resources through education, training, and job creation that meets market needs is a crucial prerequisite for maximizing demographic potential. Without such efforts, an excess working-age population can actually lead to employment problems, such as unemployment and economic instability. Therefore, development policies need to be directed at managing the working-age population productively to ensure its contribution to GRDP remains optimal.

The Influence of the Open Unemployment Rate on GRDP

The Open Unemployment Rate (OUR) does not significantly impact GRDP in 12 districts and 1 city in Central Sulawesi Province. Based on the t-test results, the probability value of the OUR variable exceeds the 5 percent significance limit. This result indicates that fluctuations in the number of open unemployed have not played a significant role in influencing the increase in the region's gross regional domestic product. A high unemployment rate does not directly reduce GRDP as long as the majority of the population is still involved in informal activities or the subsistence sector. The dominant informal sector causes changes in unemployment rates not to reflect changes in real productivity. The unequal distribution of employment opportunities in Central Sulawesi also strengthens the weak relationship between the OUR and GRDP.

This finding is consistent with the research of Amin et al. (2024) which stated that the unemployment rate has no direct effect on GRDP. Research by Paembonan et al. (2024) in Central Sulawesi also showed that partially, GRDP was not significant for unemployment. These findings indicate that the relationship between OUR and GRDP is indirect and highly dependent on the quality of the workforce and the type of jobs available. The classical growth theory of Malthus and Ricardo, as explained by Suryono (2001), reveals that labor productivity is key in driving GRDP. High unemployment does not necessarily hinder growth if the active workforce has skills and works in the productive sector. This concept is in line with the law of diminishing returns, which states that adding labor without increasing capital and technology will reduce marginal returns. The Solow-Swan model places the role of labor within the framework of productive growth, not just in terms of quantity (Thusahra, 2023). Increased growth only occurs if the absorbed labor force is qualified and supported by investment and technology. Regional governments need to focus on policies that reduce structural and frictional unemployment, such as vocational training, expanding employment opportunities, and connecting education with industrial needs.



The Effect of Average Length of Schooling on GRDP

Average years of schooling significantly impacts GRDP in 12 districts and 1 city in Central Sulawesi Province. Based on the t-test results, the probability of this variable is below 5 percent significance. This value indicates that an increase in the average years of schooling has a significant impact on regional economic output. The low contribution of education to GRDP in this region may be due to suboptimal education quality. The average years of schooling only reflect the quantity of study time, not the competencies and skills developed. The mismatch between the educational curriculum and the needs of the labor market also results in graduates being unable to productively absorb available job opportunities.

These results align with the findings of Putri et al. (2024) who stated that education level had no significant effect on Surabaya City's GRDP. Paembonan et al. (2024) research in Central Sulawesi also showed that human resource quality, although important, did not have a significant partial effect on macroeconomic variables. Maulana et al. (2023) research in Aceh actually found that education had a significant positive effect, but local context can influence this relationship. The Solow-Swan growth theory explains that education will impact growth if accompanied by increased productivity and innovation (Thusahra, 2023). Education becomes a catalyst for growth when it encourages work efficiency, technological mastery, and the creation of added value in the economic sector. In the context of Central Sulawesi, the increase in schooling has not been accompanied by the creation of a skilled workforce ready to face the demands of modern industry. Adam Smith's classical thinking emphasized the importance of the division of labor and specialization to increase productivity, which is directly related to the quality of education (Suryono, 2001). Without relevant quality and skills, investment in education does not automatically generate economic impact. Regional governments need to focus on transforming the quality of education, not just the quantity of study time, in order to be able to produce competent and competitive human resources to drive regional GRDP.

CONCLUSIONS AND SUGGESTION

The variables of working-age population and education level provide a positive and significant contribution to the increase in GRDP, strengthening the quantity of productive labor and the quality of human capital *are* the main drivers of regional economic growth. Meanwhile, the open unemployment rate shows a negative but insignificant effect on GRDP, which indicates that fluctuations in unemployment rates during the observation period have not had a statistically strong pressure on aggregate economic output in the region. The integration of the variables of working-age population, unemployment rate, and education level has been shown to have a significant effect on GRDP, so that the implications of strategic policies in the future need to be focused on optimizing the absorption of educated labor and expanding employment opportunities to accelerate sustainable economic development in Central Sulawesi Province.

Based on the research findings, the regional government in Central Sulawesi Province should prioritize policies that expand productive employment opportunities for the working-age population and improve the quality of human capital through improved access and quality of education to encourage sustainable GRDP growth. However, this study has limitations because it only focuses on demographic and education variables without considering other macroeconomic factors such as investment, physical infrastructure, and the influence of the dominant mining sector in the region. Therefore, future researchers are expected to expand the scope of the analysis by integrating these variables and considering the use of spatial econometric models to examine the effects of interconnectedness or spillover impacts between regions in the regencies and cities of Central Sulawesi Province.



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