



Regular article

The Labor Force, Foreign Investment (FI), and Domestic Investment (DI) on Economic Growth in North Sumatra Province from 2011 to 2023

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ABSTRACT

This research analyzes the influence of the Number of Workforce, Foreign Direct Investment (FDI), and Domestic Investment (DI) on the economic growth of North Sumatra Province during the period 2011–2023. Economic growth is measured using Gross Regional Domestic Product (GRDP) at constant prices. Secondary data from the Central Statistics Agency (BPS) and the Investment Coordinating Board (BKPM) are analyzed using multiple linear regression with natural logarithm transformation. The results indicate that, collectively, the three variables have a significant effect on economic growth. Partially, Domestic Investment (DI) has a positive and significant impact, whereas Foreign Direct Investment (FDI) and the Number of Workforce do not show significant effects. These findings emphasize the importance of domestic investors and highlight the need for improving workforce quality and more effective management of foreign investments. Further research is recommended to include additional variables such as infrastructure, government expenditure, or technology to provide a more comprehensive analysis

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Email address: tohonantr@gmail.com**Introduction**

North Sumatra Province, as one of the largest provinces in Indonesia, possesses abundant natural resources, including the agricultural, plantation, and developing industrial sectors, which play a strategic role in contributing to the national economy. According to Priyono & Ismail (2019), economic growth is a primary indicator of a government's success in managing and operating the economic wheel of a country. This indicator reflects the success of economic development within a region, which is closely linked to the process of economic growth, as both mutually influence each other in creating sustainable economic progress. However, economic dynamics do not always move steadily or continuously upward; instead, they experience fluctuations characterized by periods of economic activity increases and decreases, especially under the pressures experienced during the COVID-19

pandemic. As the post-pandemic recovery phase begins, the government of North Sumatra continues to promote various efforts to stimulate economic growth, including increasing investments and optimizing local labor resources.

Sustainable and positive economic growth is a key indicator of regional development success. An increase in a region's capacity to produce goods and services continuously reflects a stable economic dynamic and active productivity across various sectors such as industry, trade, agriculture, and services. Therefore, understanding the factors that drive economic growth is essential for regional governments to formulate effective and targeted development policies. In the context of regional economics, economic growth also plays an important role in reducing disparities between regions and promoting equitable development outcomes.

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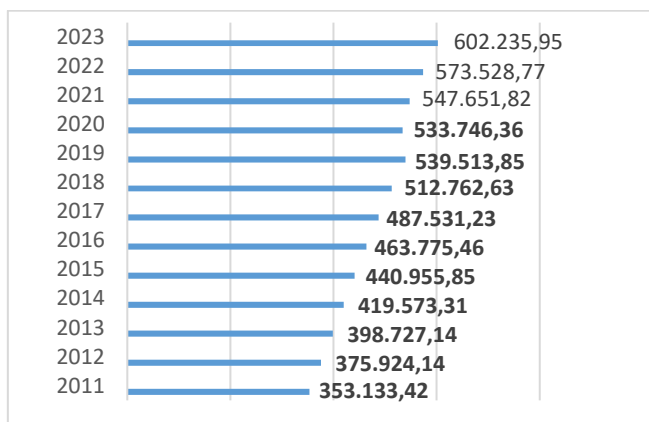


Figure 1. Gross Regional Domestic Product (GRDP) at Constant Prices of North Sumatra Province (billion rupiah) 2011-2023

This graph presents information regarding the Gross Regional Domestic Product (GRDP) of North Sumatra Province based on constant prices over the period from 2011 to 2024, with the unit expressed in billion rupiah. Overall, the GRDP values demonstrate a continuous upward trend each year, reflecting positive and stable economic development within the region.

In 2011, the GRDP was recorded at Rp353,133.42 billion, which increased to Rp375,924.14 billion in 2012. Subsequently, the GRDP experienced gradual growth, reaching Rp398,727.14 billion in 2013 and peaking at Rp539,513.85 billion in 2019. In 2020, a decline was observed to Rp533,746.36 billion due to the impact of the COVID-19 pandemic, which affected economic activities across various sectors. However, from 2021 to 2023, the economy of North Sumatra Province showed signs of strong recovery, with the GRDP rising from Rp547,651.82 billion in 2021 to Rp602,235.95 billion in 2023. This condition indicates that the economic structure of North Sumatra Province possesses resilient characteristics against external pressures and demonstrates high adaptability in the post-pandemic recovery process.

The economic growth in North Sumatra Province is influenced by several key factors such as labor force, education level, and investment. These three variables play strategic roles in strengthening the regional economic structure. The labor force contributes through increased productivity, education influences the quality of human resources, and investment drives capacity expansion and the creation of new employment opportunities. Nonetheless, challenges remain in optimizing these factors to ensure they can deliver a significant and sustainable impact on economic growth.

The number of the labor force has experienced a steady upward trend with minor fluctuations each year. In 2011, the labor force was recorded at 6,314,239 individuals. This number slightly decreased in 2012 to 6,131,664 individuals. Subsequently, the labor force increased again to 6,311,762 in 2013 and continued to rise to 6,270,283 in 2014.

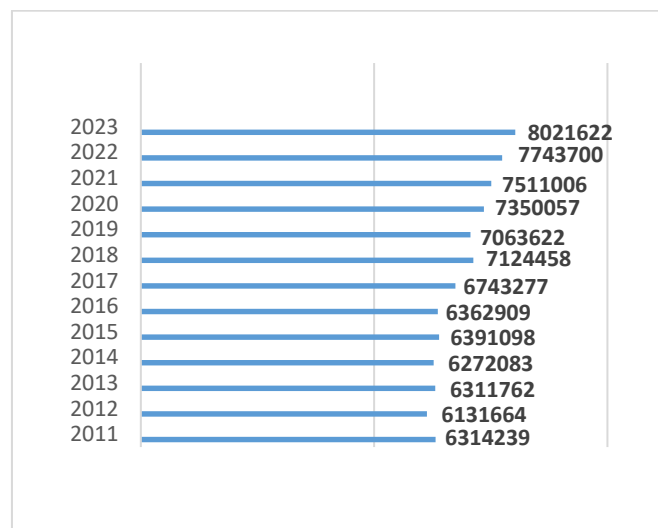


Figure 2. Data regarding the labor force in North Sumatra Province for the period 2011–2023

During 2015 and 2016, the labor force remained relatively stable within the range of approximately 6.36 to 6.39 million, with figures of 6,391,098 and 6,362,909, respectively. A significant increase was observed in 2017, reaching 6,743,277, followed by a further rise in 2018 to 7,124,458. Between 2019 and 2021, the labor force continued its growth trajectory, with figures of 7,063,622 in 2019, 7,350,057 in 2020, and 7,511,006 in 2021. The upward trend persisted in 2022, with the number increasing to 7,743,700, and peaked in 2023 at 8,021,622. Investment is a crucial factor that plays a significant role in enhancing the economic growth of a region. Through investment activities, there is a process of capital accumulation that enables an increase in production capacity, employment absorption, and improvement in community income.

According to Priyono and Ismail (2019) in their book *Economic Theory*, investment is defined as expenditure or the allocation of funds into various factors of production to gain future profits and to expand productive economic activities. In other words, a higher level of investment correlates with a greater potential for economic activity growth within the region.

The Province of North Sumatra, in terms of increasing investment values from both Domestic Investment (PMDN) and Foreign Investment (PMA) from 2011 to 2023, demonstrates positive economic dynamics. These investments not only strengthen strategic sectors such as industry, trade, and infrastructure but also create new employment opportunities and enhance the region's economic competitiveness. Therefore, promoting increased investment becomes an essential step for local governments to accelerate inclusive and sustainable economic growth. Investment plays a crucial role in enhancing regional economic growth. Through investment activities, capital accumulation occurs, which enables increased production capacity, employment absorption, and improved income levels for the community. The number of highly

educated workers has experienced a significant increase year by year. In 2011, the number of higher education graduates absorbed into the workforce was recorded at 8,938,129 individuals, which then increased to 10,485,326 individuals in 2012 and further to 11,301,641 individuals in 2013. This upward trend indicates an improvement in the capacity of workforce absorption, as well as reflecting an enhancement in the quality of human resources in the region.

The growth trend continued in subsequent years, with the number of highly educated workers rising to 13,348,491 in 2015, and further increasing to 15,272,336 in 2017, and 15,444,432 in 2018. The peak of this increase occurred in 2020, when the number of employed graduates reached 17,368,490 individuals. This was followed by a slight decline to 16,932,951 in 2021, then an increase again in 2022 to 17,086,449. However, in 2023, the number decreased to 15,954,664, which could be associated with economic conditions, industrial restructuring, or a mismatch between graduate competencies and labor market demands.

The movement of data provides an overview that the Education Level—particularly higher education—plays a strategic role in shaping a productive workforce, thereby potentially driving regional economic growth. However, fluctuations in the most recent year indicate that an increase in the number of graduates alone does not guarantee a high employment absorption rate. Consequently, policies aimed at improving the quality of education and ensuring curriculum relevance to industry needs are necessary. This forms a strong basis for researching the influence of Education Level, Foreign Direct Investment (FDI), and Domestic Investment (DI) on the economic growth of North Sumatra Province.

Education is one of the critical factors in the economic development process. The availability and quality of the workforce directly impact productivity, economic growth, and the welfare level of society. Therefore, analyzing the development of the labor force is essential to understanding the economic dynamics of both regional and national levels. Investment is a vital factor in enhancing economic growth within a region. Through investment activities, there is a process of capital addition that enables increased production capacity, employment absorption, and higher income levels among the community.

According to Priyono and Ismail (2019) in their book Economic Theory, investment is the expenditure or placement of funds into various factors of production to obtain future profits and expand productive economic activities. In other words, the higher the level of investment, the greater the potential for economic activity growth in the region.

The Province of North Sumatra has demonstrated a positive economic dynamic through the increase in investment values from both Domestic Investment (PMDN) and Foreign Investment (PMA) during the period from 2011 to 2023. These investments have not only

strengthened strategic sectors such as industry, trade, and infrastructure but also created new employment opportunities and enhanced the regional economic competitiveness. Therefore, promoting increased investment is a crucial step for local governments to accelerate inclusive and sustainable economic growth.

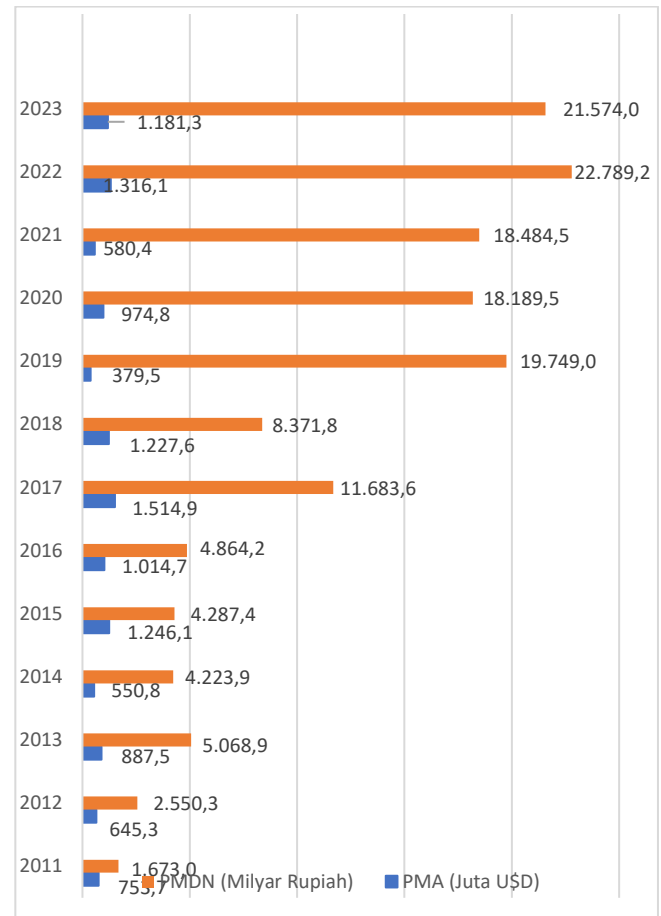


Figure 3. The above table illustrates the growth in the realization of Domestic Investment (PMDN) in Rupiah and Foreign Investment (PMA) in USD in North Sumatra Province over the period from 2011 to 2023.

Overall, the investment values in this region demonstrate an upward trend, despite experiencing fluctuations in certain years. The PMDN value increased significantly from Rp4,223.9 billion in 2014 to Rp21,574.0 billion in 2023. The highest increase occurred in 2017, when investment values more than doubled compared to the previous year, reflecting growing confidence among domestic investors in the investment climate of North Sumatra Province. Meanwhile, PMA showed more variable movements, with the highest value reaching USD 1,514.9 million in 2017, before experiencing a sharp decline in 2019 to USD 379.5 million, and subsequently rising again in the following years to USD 1,181.3 million in 2023. These fluctuations in PMA values indicate the influence of global and national economic conditions, including political stability, government policies, infrastructure availability, and the quality of human resources, all of which play roles in affecting the attractiveness

of foreign investment in the region. Overall, the data suggest that North Sumatra Province possesses high investment potential, supported by a continuously developing domestic sector, although external dynamics still influence foreign investment activities.

According to Priyono and Ismail (2019) in Economic Theory, investment is a crucial component in capital formation that directly contributes to increasing the production capacity of an economy. The higher the level of investment, the greater a region's ability to produce goods and services, thereby driving long-term economic growth. Both public and private sector investments serve as the main drivers in accelerating regional economic development by creating employment opportunities, expanding industrial bases, and enhancing regional competitiveness.

The increase in Domestic Investment (PMDN) indicates that the domestic private sector is becoming more active in regional economic activities. Meanwhile, Foreign Direct Investment (FDI), which tends to be more fluctuating, remains an important source for technology transfer and improving production efficiency. Consequently, improving investment policy quality, providing adequate infrastructure, and maintaining macroeconomic stability are key factors in sustaining continuous investment growth within the region.

In the context of North Sumatra Province, it is essential to conduct empirical studies to assess the extent of influence that the number of labor force, education levels, and investment have on economic growth over a specific period. Such studies can offer a more accurate understanding of the effectiveness of economic development policies implemented by local governments and serve as valuable input for formulating more targeted development strategies in the future. Furthermore, amid global economic dynamics, technological advancements, and post-pandemic challenges, North Sumatra faces the need to improve workforce quality, expand employment opportunities, and attract more investments to ensure stable and sustainable economic growth.

Based on the background outlined above, the economic growth achieved by North Sumatra Province is largely attributable to the contribution of Gross Regional Domestic Product (GRDP) and is influenced by several factors, such as education level, Foreign Direct Investment (FDI), and Domestic Investment (DI) in each region. Most previous studies have focused on the national level or other provinces, whereas research examining the influence of education level, FDI, and DI on economic growth specifically in North Sumatra Province remains limited. Furthermore, earlier research has not extensively utilized empirical data based on GRDP, university graduates employed, and the realization of FDI and DI simultaneously, especially during the post-COVID-19 pandemic period. This study aims to address these gaps and provide an overview of the factors affecting economic growth in North

Sumatra from 2011 to 2023. Therefore, the author intends to conduct research with the title: "The Influence of Education Level, FDI, and DI on Economic Growth in North Sumatra Province from 2011 to 2023."

Based on the background above, the issues related to economic growth in North Sumatra are as follows: Do the labor force, foreign investment (PMA), and domestic investment (PMDN) simultaneously affect economic growth in North Sumatra Province during 2011–2023? Does the labor force affect economic growth in North Sumatra Province during 2011–2023? Does foreign investment (PMA) affect economic growth in North Sumatra Province during 2011–2023? Does domestic investment (PMDN) affect economic growth in North Sumatra Province during 2011–2023?

Economic growth is a fundamental indicator to evaluate the success of regional development. Sukirno (2002) defines economic growth as the process of increasing an economy's productive capacity, manifested through a sustained rise in the output of goods and services. Commonly, Gross Domestic Product (GDP) or Gross Regional Domestic Product (GRDP) at constant prices is used to measure economic growth.

According to Arsyad Licold (2020), economic development is a series of activities undertaken by a country to develop economic sectors and improve the quality of life of its population. It involves gradually increasing per capita income and improving institutional frameworks. Todaro and Smith (2011) identify three primary objectives of development: Improving the availability and distribution of basic needs such as food, housing, healthcare, and social protection; Enhancing living standards, not only through income growth but also by increasing employment, educational quality, and attention to cultural and human values; Expanding economic and social choices for individuals and the nation, reducing dependency on others, and eliminating factors that lead to poverty and deprivation.

Methods

This research employs a quantitative approach with a time series research design to analyze the influence of education levels, foreign direct investment (FDI), and domestic investment (DI) on economic growth in North Sumatra Province during the period from 2011 to 2023. The study focuses on the use of numerical data that can be directly measured, enabling an objective and structured analysis of the relationships between variables through statistical models. The population of the research includes all relevant data concerning education levels, FDI, DI, and Gross Regional Domestic Product (GRDP) as a representation of economic growth in North Sumatra Province.

The sample used consists of annual data obtained from official publications of the Central Statistics Agency (BPS) of North Sumatra Province for the years 2011 to 2023. The sampling method employed is purposive sampling, which involves selecting samples based on the

completeness of available data relevant to the research variables and consistency over the specified period. The data collected are sourced from publications such as "North Sumatra in Figures," "GRDP by Business Sector," and employment reports issued by BPS. The use of secondary data is preferred because it has undergone verification processes, ensuring its validity for academic analysis.

The data obtained are systematically processed and presented in the form of a time series to clearly observe the development trends of the variables each year. Descriptive analysis is employed to illustrate the conditions of Foreign Investment (PMA), Domestic Investment (PMDN), education levels, and Gross Regional Domestic Product (PDRB). Meanwhile, the influence among variables is tested using multiple linear regression. To produce more stable regression outputs that meet the normality assumptions, all quantitative variables are transformed into natural logarithms (LN). This transformation also facilitates the researcher in interpreting the results without the need to display complex mathematical formulas. Through this approach, the study aims to provide empirical insights into the extent of the contribution of education levels, Foreign Investment (PMA), and Domestic Investment (PMDN) in influencing the economic growth of North Sumatra Province.

Research Design

This study uses a quantitative approach with a time-series data analysis for 2011–2023 to examine the effect of labor force, FDI, and D.I. on economic growth in North Sumatra Province. Secondary data are collected from official publications by the Central Bureau of Statistics (BPS). Multiple linear regression is applied to analyze the relationships among variables. Data collection and analysis are planned from September 2025 to December 2025.

Population and Sample

Population: Annual data on labor, labor force, investments, and GRDP for North Sumatra from 2011–2023. Sample: Time-series annual data obtained via purposive sampling based on data completeness and relevance to research objectives.

Data Processing

Data are organized into tables and graphs for descriptive analysis and processed using multiple linear regression to determine the influence of labor, labor force, FDI, and D.I. on economic growth. Logarithmic transformation is applied for normalization and easier interpretation.

Variables and Operational Definitions

Independent Variables:

- Labor Force (X1): Measured by average years of schooling of the workforce (Diploma and Bachelor's degree), representing human capital quality.
- FDI (X2): Measured by the realized foreign investment in North Sumatra (billion IDR).

- Domestic Investment (D.I.) (X3): Measured by realized domestic investment in North Sumatra (billion IDR).

Dependent Variable:

- Economic Growth (Y): Measured by GRDP growth at constant prices (%).

Data Analysis Procedure

Data are processed quantitatively using descriptive statistics and multiple linear regression. Descriptive analysis provides trends for each variable, while regression assesses the magnitude of influence of independent variables on economic growth.

Data Analysis Method

Multiple linear regression is applied to examine both simultaneous and individual effects of independent variables on economic growth:

$$\log Y = \alpha + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \epsilon$$

Result and Discussion

The analysis employed in this study is multiple linear regression analysis using time series data, aimed at determining the presence or absence of a specific relationship or effect.

Table 1. Multiple Linear Regression Test Results

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
1 (Constant)	21,197	4,403		4,815	,001
Ln_Angkatan_Tenaga Kerja	,509	,346	,274	1,470	,176
Ln_PMA	,029	,034	,070	,852	,416
Ln_PMDN	,134	,035	,704	3,839	,004

a. Dependent Variable: Pertumbuhan Ekonomi

Based on Table 1 above, the multiple linear regression equation can be formulated as follows:

$$Y = \alpha + \beta_1 \text{Log}(X_1) + \beta_2 \text{Log}(X_2) + \beta_3 \text{Log}(X_3) + e$$

$$Y = 24,506 + 0,348 X_1 + 0,025 X_2 + 0,103 X_3 + e$$

The coefficient value of the constant (α) is 24.506. If the variables of Education Level, FDI (Foreign Direct Investment) in the form of Logarithm, and Domestic Investment (PMDN) are set to zero (logarithmic form), then the baseline economic growth rate (logarithmic) is approximately 24.5%.

The coefficient of Education Level (β_1) is 0.348, which is positive. This indicates that the Education Level variable has a positive influence on economic growth. Specifically, a 1% increase in the Education Level variable (which averages 14.18 million diploma and university graduates) will result in a 34.8% increase in economic growth, assuming other variables remain constant (*ceteris paribus*). This suggests that higher education levels among the population enhance workforce

capabilities, productivity, and overall economic output.

The coefficient of Log FDI (β_2) is 0.025, which is positive. This demonstrates that the FDI variable positively impacts economic growth. In practical terms, a 1% increase in the FDI variable, amounting to approximately 944.05 million USD (the average FDI value), will lead to a 2.5% increase in economic growth, assuming other variables are held constant.

The coefficient of Domestic Investment (β_3) is 0.103, also positive. This indicates that the Domestic Investment variable has a positive effect on economic growth. Specifically, a 1% increase in Domestic Investment, which averages 11,039.18 billion rupiah (the average value of domestic investment), will result in a 10.3% increase in economic growth, assuming other variables remain unchanged.

Table 1. Hypothesis Test Results (F-Test)

ANOVA ^a			
Model		F	Sig.
1	Regression	50,019	,0000006 ^b
	Residual		
	Total		
a. Dependent Variable: Pertumbuhan Ekonomi (Y)			
b. Predictors: (Constant), Angkatan Kerja (X2), PMDN (X2), PMA (X1)			

Based on Table 4.2 above, the significance value is $0.000 < 0.05$. This indicates that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_a) is accepted. Consequently, the independent variables, which consist of Log Education Level (X_1), Log Foreign Direct Investment (FDI) (X_2), and Log Domestic Investment (X_3), collectively have a significant effect on the dependent variable, Log Economic Growth (Y).

Table 2. Hypothesis Testing Results (T-Test)

Coefficients ^a			
Model		t	Sig.
1	(Constant)	4,815	,001
	Jumlah Angkatan Tenaga Kerja (X1)	1,470	,176
	PMA (X2)	,852	,416
	PMDN (X3)	3,839	,004
a. Dependent Variable: Pertumbuhan Ekonomi (Y)			

Based on Table 4.3 above, the partial tests on the independent variables yield the following data: According to the t-test results, the calculated t-value for the Workforce variable is 1.470 with a significance level of 0.176, which is greater than 0.05. This indicates that the null hypothesis (H_0) is accepted and the alternative hypothesis (H_a) is rejected, suggesting that, on a partial basis, the Workforce variable does not have a significant effect on Economic Growth. Therefore, the hypothesis stating that the Workforce significantly influences Economic Growth is not supported; The t-test results show that the calculated t-

value for the FDI variable is 0.852 with a significance level of 0.416, which exceeds 0.05. This means that H_0 is accepted and H_a is rejected, indicating that, on a partial basis, the FDI variable does not have a significant effect on Economic Growth. Consequently, the hypothesis asserting that FDI significantly impacts Economic Growth is not proven; The t-test results indicate that the calculated t-value for the DI variable is 3.839 with a significance level of 0.004, which is less than 0.05. This leads to the rejection of H_0 and the acceptance of H_a , demonstrating that, on a partial basis, the DI variable has a positive and significant effect on Economic Growth. Therefore, the hypothesis that Domestic Investment significantly influences Economic Growth can be confirmed as valid.

Table 3. Results of Hypothesis Testing (Coefficient of Determination)

Coefficients ^a			
Model	R	R Square	Adjusted R-Square
1	,971 ^a	,943	,925

- a. Predictors: (Constant), Log_PMDN, Log_PMA, Log_Jumlah_Angkatan_tenaga_Kerja
- b. Dependent Variable: Log_Pertumbuhan_ekonomi

Based on the table above, the R-squared value is 0.971, indicating that the influence of the independent variables, namely Workforce Age (X_1), Foreign Direct Investment (PMA) (X_2), and Domestic Investment (PMDN), on Economic Growth (Y) accounts for 90.71%. The remaining 9.29% is affected by other variables not explained within this study.

The study shows that the labor force, FDI, and domestic investment (PMDN) collectively have a significant effect on economic growth in North Sumatra. This indicates that these factors support each other: investments provide capital for expanding production and creating business opportunities, while a sufficient labor force is essential to meet growing employment demands. Limitations include reliance on secondary data and analysis of only three independent variables, suggesting future research should consider additional factors and longer periods.

The labor force alone does not significantly affect economic growth. A large workforce without improved skills and education cannot effectively enhance productivity. This finding aligns with previous studies showing that quality, not quantity, of labor is key to economic development.

FDI has an insignificant effect on regional growth. Factors include the capital-intensive nature, limited local labor absorption, and regulatory barriers. Investments not focused on sectors with high multiplier effects fail to significantly stimulate the local economy, consistent with prior research.

PMDN has a significant positive effect. Domestic investors better understand local economic needs, generate employment, expand production, and distribute income, making PMDN a more responsive and sustainable driver of regional economic growth.

Practically, the study highlights the importance of improving education quality, optimizing FDI absorption, and strengthening PMDN to enhance economic growth. Academically, the findings support theories emphasizing human capital and domestic investment as critical growth factors.

The study relies on secondary data and only examines three variables, omitting other potential influences like government spending, infrastructure, technology, and international trade. The observation period ends in 2023, limiting the analysis of recent economic developments.

Conclusion

Education, FDI, and PMDN jointly influence economic growth in North Sumatra. PMDN is significant and positively affects growth, whereas FDI and labor force have no significant partial effects. Quality education and skilled labor are crucial to maximizing the benefits of both domestic and foreign investments.

Recommendations

1. Improve the quality and accessibility of education to better prepare the workforce.
2. Optimize FDI by improving regulations, incentives, and targeting sectors with high multiplier effects.
3. Strengthen PMDN through financial support, a stable business climate, and infrastructure development.
4. Develop curricula and training programs aligned with market needs and technological skills.
5. Future research should expand variables and observation periods to provide a more comprehensive understanding of factors affecting economic growth.

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