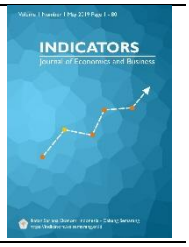
INDICATORS Vol (8) (1) (2026)

INDICATORS

Journal of Economics and Business

http://indicators.iseisemarang.or.id/index.php/jebis



DETERMINANTS OF REGIONAL ECONOMIC GROWTH: THE ROLE OF INFRASTRUCTURE AND LABOR IN INDONESIAN PROVINCES

Raihan Muzaki[1]✉ Hastarini Dwi Atmanti[2]

[1,2] Universitas Diponegoro, Semarang, Indonesia

Article Information

History of Article:
Received 1 July 2025
Accepted 25 April 2026
Published 5 May 2026

Keywords:
Road Infrastructure, Water Infrastructure, Electricity Infrastructure, Economic Growth (GRDP), Panel Data Regression.

Abstrak

Infrastruktur merupakan salah satu hal yang dibutuhkan dalam mencapai pertumbuhan ekonomi yang diinginkan. Infrastruktur merupakan salah satu aspek yang vital dalam proses mempercepat pembangunan nasional. Infrastruktur adalah salah satu faktor penting yang mempengaruhi PDRB. Jenis data yang digunakan dalam penelitian ini adalah data sekunder time series dan cross section atau data panel, yaitu 34 provinsi di Indonesia pada tahun 2017-2023. Penelitian ini menggunakan variabel independen yaitu infrastruktur jalan (JLN), infrastruktur listrik (LSK), infrastruktur air (AIR), dan tenaga kerja (TK). Metode analisis yang digunakan dalam penelitian ini adalah regresi data panel. Hasil penelitian ini menunjukkan bahwa infrastruktur listrik, air dan tenaga kerja berpengaruh positif signifikan terhadap pertumbuhan ekonomi. Namun, hasil pengamatan menunjukkan bahwa infrastruktur jalan tidak berpengaruh terhadap pertumbuhan ekonomi.

Abstract

Infrastructure is one of the essential elements required to achieve desired economic growth. Infrastructure is a vital aspect in accelerating national development. Infrastructure is a crucial factor influencing Gross Regional Domestic Product (GRDP). The type of data used in this research is secondary data, combining time series and cross-sectional data, specifically from 34 provinces in Indonesia from 2017-2023. This study utilizes independent variables including road infrastructure (JLN), electricity infrastructure (LSK), water infrastructure (AIR), and labor (TK). The analytical method employed in this research is panel data regression. The results of this study indicate that electricity infrastructure, water infrastructure, and labor have a positive and significant effect on economic growth. However, observations show that road infrastructure does not affect economic growth.

✉Correspondence:
Prof. Soedharto SH St, Tembalang, Semarang, Central Java 50239
E-mail: raihanmuzaki@students.undip.ac.id

INTRODUCTIONS

The success of economic growth can be measured by one of its indicators, namely the Gross Regional Domestic Product (GRDP). This is because GRDP fundamentally represents the total value added of goods and services produced by economic activities in a specific region over a certain period, thus serving as an indicator for measuring economic growth. GRDP is also used to assess the success of a region's development over a specific period and serves as a basis for determining future development policy directions (Prasetya et al, 2021).

The fluctuating conditions of economic growth can be attributed to several factors. One such factor is the insufficient availability of adequate infrastructure. The availability of infrastructure significantly determines the efficiency level of economic activities, as infrastructure serves as the driving force for economic growth. Infrastructure conditions that tend to be constant or stagnant can indicate insufficient infrastructure to influence output. In other words, economic growth depends on the accumulation of physical capital (Zhang and Cheng, 2023). Infrastructure that can support community economic activities and facilitate the distribution and production flow of goods and services can include road infrastructure, electricity supply, and water supply.

Roads are one of the most frequently used infrastructures for a region to achieve increased economic growth (Iriyanti and Iriana, 2016). Thus, road infrastructure can play a significant role in the economy, influencing the rise and fall of economic growth in a region (Bappenas, 2019). However, reports from BPS (Badan Pusat Statistik) indicate that the condition of provincial roads is on a stagnant or even declining trend, which can disrupt economic activities. Besides road infrastructure, the need for electricity supply is also a driving force in the economy. This indicates that quantitatively, electricity demand can be met or well-responded to by the government, because as a region develops and its population grows, electricity becomes a primary necessity, not only for households but also for economic sectors, especially industry. Modernizing lifestyles, household appliances, office equipment, and community activities increasingly rely on electricity as an energy source (Nugraheni, 2013 As economic activity increases, the demand for clean water also rises because water infrastructure is a fundamental and supporting infrastructure for consumption and production activities in households and industries (Dangui and Jia, 2022).

Infrastructure such as roads, electricity, and water plays a fundamental role in economic activities. If this infrastructure is adequate, it will enhance economic growth. Furthermore, infrastructure development will stimulate the real sector and increase labor absorption (Nugraheni, 2013). According to Bappenas (2014), government-provided infrastructure access offers opportunities for the community to work and achieve a decent life. Additionally, access to roads, electricity, health facilities, clean water, and street lighting provides opportunities for people to work longer hours or start businesses, supporting the acceleration of infrastructure development.

Population growth and labor force growth (which occur several years after population growth) are traditionally considered fundamental factors for economic growth. A larger labor force implies an increase in productive individuals. However, labor supply must be balanced with the availability of job opportunities, as an excess labor force does not necessarily have a positive impact on economic development. Labor is a potential human resource needed in the development process during the era of globalization (Todaro, 2003).

RESEARCH METHOD

The data used in this study is secondary data obtained from the Bureau of Statistics/ Badan Pusat Statistik(BPS). This research utilizes panel data from 34 provinces in Indonesia for the period 2017-2023.

The analytical method employed in this research is panel data regression analysis, using secondary data from 34 Indonesian provinces for the period 2017-2023, sourced from BPS.

Table 1. Operational Variables

Variable	Description	Unit
GRDP	GRDP at constant prices for 2017-2023 with a base year of 2010	Rp

Variable	Description	Unit
Roads	The total provincial road length	Km
Electricity	The total distributed by province	GWh
Water	The amount of water distributed by water companies to customers.	M^3
Labor	The total labor force in the employed category	Population

All variables in this study were transformed into logarithmic form, so the equation takes the following form:

$$\log PDRB = \beta_0 + \log\beta_1 JLN_{it} + \log\beta_2 LSK_{it} + \log\beta_3 AIR_{it} + \log \beta_4 TK_{it} + e_{it}$$

Table 2. Model Description

Parameter	Description
JLN	roads
LSK	electricity
AIR	water
TK	labor
B	intercept
e	error

RESULTS

The data analysis in this study commenced with the Selection of the Panel Data Model. The first step involved conducting a Chow Test to determine between the Common Effect Model (CEM) and the Fixed Effect Model (FEM). The criterion used was that if the probability (Prob.) value was less than 5%, then the use of FEM was more appropriate. The Chow test results showed a Prob. Value of 0.0000, which, at a 5% significance level, indicated that FEM was the chosen model.

The Hausman Test was performed to determine between the Random Effect Model (REM) and the Fixed Effect Model (FEM). Similar to the Chow Test, if the Prob. Value was less than 5%, FEM was considered the appropriate model. The Hausman test results showed a Prob. Value of 0.0158 at a 5% significance level, again confirming that FEM was the selected model for this research.

Following the model selection, Classical Assumption Deviation Detection was carried out.

Normality Detection was performed using the criterion that if the probability value of the Jarque-Bera test was greater than 0.05, the data was considered normally distributed. The normality test results showed a Jarque-Bera test probability value above 0.05, indicating that the research data was normally distributed.

Multicollinearity Detection was conducted by examining the correlation coefficients of each independent variable. If the correlation coefficient was less than 0.8, then multicollinearity was not present. The detection results showed that the correlation coefficients between independent variables were below 0.8, thus indicating no multicollinearity.

Heteroskedasticity Detection was performed using the Glejser test. A model is considered homoscedastic if the Prob. T-statistic value of the independent variables is greater than 0.05. The heteroskedasticity detection results showed that the Prob. T-statistic values for each independent variable were greater than 0.05, indicating no heteroskedasticity.

Autocorrelation Detection employed the Durbin-Watson statistic test. The decision criterion was that if the Durbin-Watson statistic value was between -2 and 2, it meant there was no autocorrelation in the regression model obtained. The autocorrelation detection results indicated that this condition was met, signifying the absence of autocorrelation.

After the classical assumption tests, Hypothesis Testing was proceeded with partial and simtaneous test.

The t-test (partial test) was used to determine the effect of each independent variable on the dependent variable. The decision was made by comparing the t-calculated value with the t-table value at a 5% significance level. If the t-calculated value was greater than the t-table value (1.65), the alternative hypothesis (H1) was accepted.

The t-test results showed that:

1. The road (JLN) variable had a t-calculated value smaller than the t-table, leading to the conclusion that it did not significantly affect GRDP.
2. The electricity (LSK) variable had a t-calculated value greater than the t-table, indicating a positive and significant effect on GRDP.
3. The water (AIR) variable also had a t-calculated value greater than the t-table, indicating a positive and significant effect on GRDP.

4. The labor (TK) variable had a t-calculated value greater than the t-table, indicating a positive and significant effect on GRDP.

The F-test (simultaneous test) was used to demonstrate the ability of independent variables to collectively explain the dependent variable. If the F-calculated value was greater than the F-table value (2.41) at a 5% significance level, then the independent variables simultaneously affected the dependent variable. The F-test results showed an F-statistic value significantly larger than the F-table, indicating that the variables of roads, electricity, water, and labor simultaneously affected GRDP.

Finally, the Coefficient of Determination (R^2) test was used to measure how well the model explained the variation in the dependent variable. The coefficient of determination ranges from 0 to 1 (or 0-100%). An R^2 value closer to 1 or 100% indicates a high ability of independent variables to explain the dependent variable. The coefficient of determination in this study was 0.9976, meaning that 99.76% of the variation in GRDP could be explained by the variables of roads, electricity, water, and labor, while the remaining portion was explained by other variables outside the model. Based on the panel data regression results, the selected model was FEM, and the classical assumption tests showed that the data possessed the characteristics of a Best Linear Unbiased Estimator (BLUE).

The result findings indicate that while road infrastructure has a positive impact, its influence on GRDP is not yet significant, with a t-statistic value lower than the t-table. This might be attributed to the relatively stable quantity of roads in some regions or an uneven distribution of infrastructure. Nevertheless, good road infrastructure remains crucial in reducing transaction costs and enhancing economic efficiency. In contrast to road infrastructure, both electricity and clean water infrastructure demonstrate a positive and significant impact on economic growth. The availability of adequate electricity and access to clean water are proven to stimulate economic activities, boost productivity, and support welfare. Indonesia's high electrification ratio and the importance of water for consumption and production underscore the crucial role of these two types of infrastructure. Furthermore, labor was also found to have a positive and significant impact on economic growth. An increase in the number of productive workers directly correlates with an increase in economic output. However, it is essential to ensure that labor growth is balanced with adequate job availability to maximize its contribution to the economy. Overall, these findings highlight that strategic investment in basic infrastructure such as electricity and water, along with human resource development, are key to fostering sustainable economic growth in Indonesia.

CONCLUSION

Based on the presentation of the results and analysis explained previously, several conclusions are drawn as follows:

1. Road infrastructure has a positive but not significant effect on GRDP in Indonesian Provinces. This is due to the provincial road data tending to be constant or stagnant during the observation year, and the impact of provincial expansion leading to a significant decrease in road quantity in Papua and West Papua provinces in 2023.
2. Electricity infrastructure has a positive and significant effect on GRDP in Indonesian Provinces. This is due to the increase in total distributed electricity and the electrification ratio during the observation year.
3. Water infrastructure has a positive and significant effect on GRDP in Indonesian Provinces. This is due to the assured water supply, as evidenced by the increasing quantity of clean water during the observation year.
4. The labor variable has a positive and significant effect on GRDP in Indonesian Provinces. This is because the quantity of the labor force in the employed category showed an increasing trend during the observation year.
5. The variables of roads, electricity, water, and labor simultaneously affect GRDP in Indonesian Provinces.

This research is not without limitations in answering all existing problems. The limitations of this study are: not explaining all 38 provinces

in Indonesia because there was no provincial expansion during the research observation year.

REFERENCES

Bappenas. (2014). Buku I Agenda Pembangunan Nasional: Rencana Pembangunan Jangka Menengah Nasional (RPJMN) 2015-2019. Jakarta: Bappenas.

Bappenas. (2019). Data Konsumsi Rumah Tangga. Diambil dari inklusif.bappenas.go.id

Dangui, K., & Jia, S. (2022). Water Infrastructure Performance in Sub-Saharan African Countries—The Case of the Gambia and Liberia. *International Journal of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences.*

Iriyanti, B., & Iriana, N. (2016). Pengaruh Investasi, Indeks Kesehatan Masyarakat Melalui Indeks Pembangunan Manusia Dan Tenaga Kerja Terhadap Pertumbuhan Ekonomi Di Jawa Tengah. *Jurnal Ekonomi dan Manajemen, 318-334.*

Nugraheni, S. (2013). Pengaruh Infrastruktur, PMDN dan PMA Terhadap PDRB di Indonesia. *Economics Development Analysis Journal, 1-12.*

Nugraheni, S. (2013). Analisis Pengaruh Belanja Modal Pemerintah, Tenaga Kerja Terhadap Output dan Indeks Pembangunan Manusia Terhadap Pertumbuhan Perekonomian di Provinsi Jawa Tengah. *Jurnal Bisnis dan Ekonomi, 131-141.*

Prasetya, J. D. I., Nuraini, S., & Kusuma, H. (2021). Pengaruh Pembangunan Infrastruktur Raya Terhadap Pertumbuhan PDRB Provinsi Jawa Timur. *Jurnal Ilmu Ekonomi, 233-246.*

Todaro, M. P. (2003). *Pembangunan Ekonomi di Dunia Ketiga*. Jakarta: Erlangga.

Zhang, Y., & Cheng, L. (2023). The role of transport infrastructure in economic growth: Empirical evidence. *Transport Policy, 223, 223–233.*