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Impact of Foreign Investment on Infrastusture Connections in Countries (Malaysia, Nigeria, India)

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Abstrac : This study aims to analyze the effects of global interest rates, global commodity prices, and global stock markets on access to electricity in developing countries during the period 2018–2022. Using a quantitative approach with panel data analysis, this study finds that global interest rates have a significant effect on electricity access, with a negative coefficient indicating that an increase in global interest rates can reduce electricity access. In contrast, global commodity prices do not show a significant effect on electricity access, while the global stock market has an effect that is close to significant. These findings indicate that global economic uncertainty, as reflected in changes in interest rates and stock markets, can worsen electricity infrastructure financing, especially in developing countries that rely on foreign investment. This study uses secondary data from international and national sources and analysis using STATA 17 software with classical assumption tests and panel data regression. The results of this study provide insight into the importance of considering global economic factors in planning electricity access development policies.

Keywords : Electricity Access, Global Interest Rates, Global Commodity Prices, Global Stock Markets, Developing Countries, Panel Data Analysis.

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1. Introduction

Infrastructure is a fundamental component that plays a strategic role in driving economic growth and improving social welfare in various countries, both developing and developed. The existence of adequate infrastructure, such as transportation networks, port facilities, energy systems, and telecommunications infrastructure, has a direct impact on a country's economic competitiveness. Efficient infrastructure not only increases productivity and operational efficiency, but also expands people's access to basic services such as education, health, and clean water, thereby contributing to improving the overall quality of life [1]. Effective infrastructure development can reduce logistics costs, speed up distribution times, and improve connectivity between regions. For example, well-connected highways and modern ports can reduce the cost of transporting goods and speed up delivery, thereby supporting the competitiveness of local products in domestic and global markets. In addition, investment in energy infrastructure, such as reliable power plants and efficient distribution networks, allows the industrial sector to operate stably without interruption, supporting the sustainability of national economic growth [2].

Sustainable economic growth through infrastructure development also requires an inclusive and long-term approach. Foreign investment is one of the important solutions to address financing challenges in developing countries that often face capital constraints due to factors such as economic uncertainty and limited natural resources. The presence of foreign investors not only provides significant sources of funding, but also brings the latest technology and technical expertise that can accelerate development and improve the quality of infrastructure. By utilizing this strategic partnership, developing countries can optimize efficient infrastructure development, improve connectivity between regions, and increase the competitiveness of local products in the international market. This ultimately contributes to achieving inclusive economic growth and improving the welfare of society at large[3]. The experiences of Malaysia, Nigeria, and India show that local factors greatly influence the success of foreign investment in infrastructure development [4]. In Anyanwun's (2011) research, Malaysia was successful thanks to political stability, pro-investment policies, and a conducive business environment [5]. While Nigeria and India, Udo et al.'s (2008) research, these countries face obstacles such as political instability, inconsistent regulations, and economic crises, which reduce investor interest and hinder infrastructure development. This emphasizes the importance of stability and supportive policies to attract foreign investment effectively[6].

Previous studies have shown that foreign direct investment (FDI) has a significant impact on infrastructure development in developing countries. For example, a study by Smith et al. (2020) showed that FDI plays a significant role in the development of transport infrastructure in Southeast Asia, including Malaysia, by accelerating the completion of large projects through technology and management transfer[7]. However, in other countries such as Nigeria, different challenges arise, such as low transparency in FDI contracts, weak local institutional capacity, and the risk of economic dependency, as expressed by Adebayo (2019) [8]. In addition, India faces obstacles to foreign investment due to political instability and unfavorable regulations, but there is potential for improvement if pro-investment policies are implemented, as stated by Ncube (2018). Meanwhile, a study by Abdullah et al. (2021) shows significant social benefits from infrastructure connections through FDI in Malaysia, such as increased community mobility, access to markets, and productivity of the local economic sector[9].

Therefore, the results of this study are expected to provide strategic recommendations for the government and related stakeholders in managing the impact of foreign investment on infrastructure connectivity in Malaysia, Nigeria, and India. With a deeper understanding of the challenges and potentials, this study can help design policies that support effective foreign investment management, strengthen local institutional capacity, and mitigate the risk of excessive dependence on foreign resources. In addition, this study also contributes to accelerating infrastructure development that can encourage inclusive and sustainable economic growth in these countries.

Research Problem

The formulation of the problem in this study is: What is the impact of foreign investment on infrastructure connectivity in developing countries, especially in Malaysia, Nigeria, and India, and the factors that influence its effectiveness in supporting economic growth and social development?

Research Objective

The purpose of this study is to analyze the impact of foreign investment on infrastructure connectivity in Malaysia, Nigeria and India, and to identify factors that influence the effectiveness of such investment in supporting economic growth and social development.

2. Theoretical Framework

Foreign Direct Investment

Foreign Direct Investment (FDI) is the investment by individuals or companies from one country into economic entities in another country with the aim of gaining long-term profits. FDI generally includes direct ownership or control of a business or asset in the host country, such as establishing a subsidiary, acquiring a majority stake, or building a production facility[10]. FDI helps developing countries overcome budget constraints by providing capital, technology, and modern management. Good infrastructure increases competitiveness, attracts new investment, and supports social

development, such as access to education and health. Dependency theory sees FDI as a way for developed countries to influence the economies of developing countries, creating dependency.

Global Stock Market

The stock market is a platform where investors buy and sell shares of public companies. This market plays an important role in the economy because it helps companies obtain funds for business expansion while providing investors with the opportunity to have a share of ownership in the company[11]. Sulistyowati (2020) said in her research in developing countries, the stock market has a major contribution to the economy, with a close relationship between stock market growth and economic development, even after taking into account other economic factors that influence growth[12]. Purnomo (2021) stated that the stock market is a vital component in a free market economic system, allowing companies to access capital by selling their shares. This market consists of various exchanges that regulate stock trading globally.

Interest rate

Interest rates are influenced by the dynamics of savings and loan needs. According to classical theory, interest rates are determined through the interaction between savings and investment, while Keynesian theory highlights the role of demand and supply of money. Both provide an understanding of interest rate fluctuations in Indonesia, which are influenced by savings, investment, and monetary policy factors[13]. In addition, Akbar's research (2008) said that inflation and monetary policy are also important factors that shape interest rates. Related research shows that interest rates play a strategic role in the Indonesian economy, with influences from internal and external factors interacting with each other.

Energy Commodity Prices

Global energy commodity prices play an important role in determining the performance of energy companies. Changes in the prices of oil, gas, and other energy sources affect revenue, profitability, business strategy, long-term investment, and operational sustainability. When energy prices increase, companies gain greater profits that can be used for expansion, technological innovation, or product diversification. Conversely, declining energy prices often raise challenges, such as decreasing profit margins, reducing investment, or labor efficiency[14]. In a global context, energy price fluctuations are influenced by geopolitical factors, market demand, and environmental policies, which add complexity to the management of energy companies, including in Indonesia[15].

Infrastructure as the Foundation of Economic Growth

Infrastructure is one of the key elements in sustainable economic development. Adequate infrastructure development not only functions as a support for economic activity, but also supports equitable development and improves the quality of life of the community. Infrastructure such as highways, ports, electricity networks, and telecommunications play a vital role in improving connectivity, facilitating trade, and attracting further investment [16]. In the context of developing countries, infrastructure development often faces challenges of budget and technology limitations. Therefore, foreign investment is one of the main solutions to overcome the infrastructure deficit. For example, a study by Saputro et al. (2020) revealed that the development of transportation infrastructure in Indonesia has increased accessibility between regions and encouraged the growth of the local economic sector. However, the effectiveness of infrastructure also depends heavily on strategic planning and good project management capabilities [17].

Access to Electricity

Access to electricity is essential to support economic and social development, especially in developing countries. In addition to being a basic need, electricity contributes to increasing economic productivity, the quality of health services, education, and digital infrastructure. Rahmawati et al. (2021) stated that the provision of reliable electricity can increase production efficiency and economic competitiveness. In rural areas, access to electricity also plays a role in reducing poverty by opening up business opportunities and creating jobs[18]. However, the development

of electricity access in developing countries faces challenges such as financing, geographical conditions, and dependence on fossil fuels. Setiawan et al. (2022) suggest collaboration between the public and private sectors to accelerate electrification, especially in disadvantaged areas. Foreign investment also plays an important role in the development of power plants and village electricity networks, as found by Anggraini (2021) in Indonesia.

3. Methods

This study uses a quantitative approach with panel data analysis to examine the effect of global interest rates (X1), global commodity prices (X2), and global stock markets (X3) on access to electricity (Y) in developing countries during the period 2018–2022. Secondary data used in this study include global stock market data, global interest rates, global commodity prices, and indicators of access to electricity obtained from international and national sources. The research sample was selected using the purposive sampling method, covering Malaysia-Nigeria-India that meet certain criteria based on available data.

The analysis was conducted using STATA 17 software, with descriptive tests, classical assumption tests, and panel data regression. The regression model used (Fixed Effect, Random Effect, or Common Effect) was determined through the Chow, Hausman, and Lagrange Multiplier (LM) tests. This study is expected to provide a better understanding of the relationship between these global factors and their impact on increasing electricity access, which plays an important role in supporting economic and social development in developing countries.

The framework of this study is as follows:

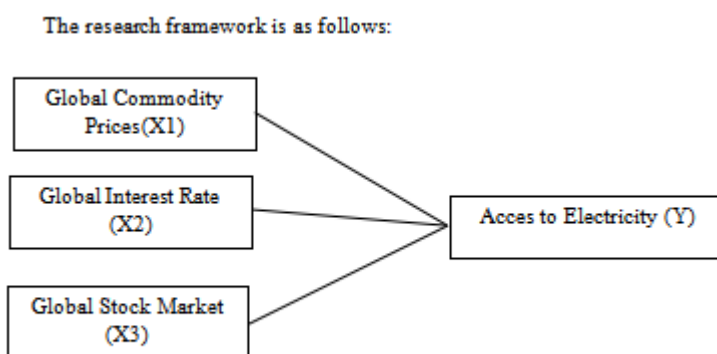


Figure 1. Research Framework

4. Results

1) Model Estimation Test

Chow Test

Table. 1 Chow Test

Prob> F
0.0007

Source: Data processed by Stata 17, 2024.

The Chow test results show a probability value (Prob > F) of 0.0007. Because this probability value is smaller than the commonly used significance level of 0.05, we can reject the null hypothesis (H_0) which states that the *Common Effect model* is more suitable. Thus, the results of this test indicate that the *Fixed Effect* or *Random Effect model* is more suitable for use in this panel data analysis. In general, a very low p-value (0.0007) indicates that the difference between the tested models is significant, which means that the *Fixed Effect* or *Random Effect model* can provide more accurate estimates than the *Common Effect model*.

Hausman Test

Table 2 Hausman Test

Chi2 (4)	14.74
Prob > Chi2	0.0053

Source: Data processed by Stata 17, 2024.

The Hausman test aims to compare the best estimation models between the Fixed Effect Model (FEM) and the Random Effect Model (REM). Based on the results of the Hausman test which shows a Chi² value = 14.74 with a probability (Prob > Chi²) = 0.0053, which is less than 0.05, then H₀ is rejected. This indicates that the Fixed Effect (FEM) model is a more appropriate choice than the Random Effect (REM) model. Thus, the FEM model was chosen because it provides a more consistent and unbiased estimate, in accordance with the Hausman test guidelines which indicate that a model with a probability value less than 0.05 is better to use.

2) Classical Assumption Testing

Normality Test

Table 3 Normality Test

Variables	Obs	W	V	Z	Prob > z
Y	15	0.83045	4.013	2,801	0.00255
X1	15	0.84605	2.985	2.163	0.01527
X2	15	0.84184	3,067	2.216	0.01334
X3	15	0.77447	4.373	2,918	0.00176

Source: Data processed by Stata 17, 2024.

The results of the normality test in Table 3 show that the tested variables have probability values (Prob > z) that are smaller than 0.05, namely Y = 0.00255, X1 = 0.01527, X2 = 0.01334, and X3 = 0.00176. Probability values that are smaller than 0.05 indicate that the data distribution for each variable is not normally distributed, which means that the null hypothesis (H₀) stating that the data is normally distributed is rejected. Therefore, it can be concluded that the data on variables Y (access to electricity), X1 (global interest rates), X2 (global commodity prices), and X3 (global stock markets) are not normally distributed, so it is necessary to transform or use a robust estimation method against violations of the normality assumption.

Multicollinearity Test

Table 4 Multicollinearity Test

Variables	VIF	1/VIF
X3	1.32	0.755
X2	1.26	0.791761
X1	1.07	0.938633
Mean VIF	1.22	

Source: Data processed by Stata 17, 2024.

The results of the multicollinearity test in Table 4 show the Variance Inflation Factor (VIF) values for each variable as follows: X3 (global stock market) = 1.32, X2 (global commodity prices) = 1.26, and X1 (global interest rates) = 1.07. The Mean VIF value of 1.22 indicates that there is no significant multicollinearity problem in the model. In general, if the VIF value is greater than 10, it indicates a serious multicollinearity problem. However, in this study, the VIF values for all variables are far below that number, which means that there is no strong linear relationship

between the independent variables. Thus, it can be concluded that multicollinearity is not a significant problem in this model.

Heteroscedasticity Test

Chi2 (1)	1.23
Prob > Chi2	0.2678

Source: Data processed by Stata 17, 2024.

The results of the heteroscedasticity test shown in Table 5 show a Chi2 (1) value = 1.23 with Prob > Chi2 = 0.2678. Because the probability value (p-value) is greater than 0.05 (i.e. 0.2678), there is insufficient evidence to reject the null hypothesis (H0), which states that there is no heteroscedasticity in the model. In other words, the variance of the residuals of this model is constant, and the regression model used does not experience heteroscedasticity problems. Therefore, it can be concluded that the regression model used in this study is not affected by heteroscedasticity.

Autocorrelation Test

Table 5 Autocorrelation Test

F (1,8)	0.659
Prob > F	0.4403

Source: Data processed by Stata 17, 2024.

The results of the autocorrelation test shown in Table 5 show a value of F (1,8) = 0.659 with Prob > F = 0.4403. Because the probability value (p-value) is greater than 0.05 (i.e. 0.4403), there is insufficient evidence to reject the null hypothesis (H0), which states that there is no autocorrelation in the model. Thus, it can be concluded that the regression model used does not experience autocorrelation problems, which means there is no correlation between the residuals at different time periods. This regression model meets the assumption of residual independence.

3) Significance Test

Table. 6 Significance Test

y	Coefficient	Std. err .	t	P > t
X1	1.750997	0.2671958	-6.55	0.013
X2	-2.424471	1.454779	-1.67	0.130
X3	-0.3790075	0.1881336	-2.01	0.075
_cons	52.33324	1.047492	49.96	0.000

Source: Data processed by Stata 17, 2024.

- X1 (Global Interest Rate) has a coefficient of 1.750997 with a t-value of -6.55 and a p-value of 0.013. Since the p-value is less than 0.05, the variable X1 has a significant effect on Y (Access to Electricity) at a significance level of 5%. The negative coefficient (-6.55) indicates that an increase in the global interest rate tends to reduce access to electricity.
- X2 (Global Commodity Prices) has a coefficient of -2.424471 with a t-value of -1.67 and a p-value of 0.130. Because the p-value is greater than 0.05, the variable X2 does not have a significant effect on Y (Access to Electricity) at a

significance level of 5%. This shows that global commodity price fluctuations do not have a significant impact on electricity access.

- X3 (Global Stock Market) has a coefficient of -0.3790075 with a t-value of -2.01 and a p-value of 0.075. Although the p-value is slightly larger than 0.05, it is generally close to the significance value (p-value <0.1). This shows that the global stock market has a nearly significant effect on Y (Access to Electricity), but its effect is not fully significant at the 5% level.
- The constant (_cons) shows a coefficient value of 52.33324 with a very high t-value (49.96) and a very low p-value (0.000). This shows that the model constant has a significant effect and provides a large baseline value for Y (Access to Electricity).

5. Discussion

Based on the results of the significance test presented in Table 6, there are several findings that can be further explained regarding the influence of independent variables on Access to Electricity (Y):

First, X1 (Global Interest Rate) is proven to have a significant effect on electricity access with a p-value smaller than 0.05 (0.013). The negative coefficient obtained (-6.55) indicates that the increase in global interest rates tends to reduce access to electricity. This can be interpreted that when global interest rates increase, borrowing costs become higher, which in turn can reduce investment in the energy sector, including electricity infrastructure. Countries that rely on foreign investment and foreign financing to build electricity infrastructure will feel a greater impact from the increase in global interest rates, thereby slowing down projects related to electricity connections[19].

Second, X2 (Global Commodity Prices) does not have a significant effect on Access to Electricity (p-value 0.130). This shows that fluctuations in global commodity prices, although they can affect the energy sector in some ways, do not have a significant direct impact on electricity supply. Although commodity prices such as oil and gas play an important role in financing the energy sector, changes in these commodity prices may not be directly related to a country's ability to increase access to electricity, especially if the country has a greater dependence on renewable energy sources or domestic investment in the energy sector.

Third, X3 (Global Stock Market) shows a nearly significant effect on Access to Electricity with a p-value of 0.075. The negative coefficient (-0.379) indicates that a decline in the global stock market can worsen access to electricity, although its effect is not fully significant at the 5% level. This could be because a decline in the global stock market often indicates broader economic uncertainty, which can affect foreign investment flows and financing of energy infrastructure, including electricity connections.

Finally, the Constant (_cons) shows a highly significant result with a p-value of 0.000, indicating that there are other factors that strongly influence access to electricity in addition to the variables that have been tested in this model. These factors could include government policies, domestic infrastructure readiness, or socio-economic factors that are not included in this study. Overall, the results of this study indicate that global interest rates have a significant effect on electricity access, while global commodity prices do not show a significant impact. The global stock market has an effect that is close to significant, indicating that financial market instability can have an impact on electricity infrastructure development. Therefore, policy-making that considers the influence of global economic factors such as interest rates and stock markets is very important in designing strategies to expand electricity access, especially in developing countries that are highly dependent on foreign investment and foreign financing.

6. Conclusions

Based on the analysis results, it can be concluded that global interest rates have a significant impact on electricity access, with increases in global interest rates tending to reduce electricity access. In contrast, global commodity prices do not show a significant impact on electricity access, while the global stock market has an impact that is close to significant. This suggests that global economic instability, especially interest rates and stock markets, can affect the development of electricity infrastructure, which in turn impacts electricity access in developing countries that rely on foreign financing and foreign investment.

7. Suggestion

As a recommendation, governments and policymakers should consider global economic factors such as interest rates and stock markets in designing strategies to increase electricity access. To mitigate the negative impacts of global economic instability, it is important to seek alternative domestic financing and strengthen the renewable energy sector. In addition, policies that support investment in energy infrastructure should be designed by considering external factors to create resilience in the electricity sector and expand electricity access in underserved areas.

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