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The Influence of Economic Growth and Inflation on oil and gas Imports with the Exchange Rate as a Moderating Variable in Indonesia During the 2020–2024 Period

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Abstract
This study aims to analyze the influence of economic growth and inflation on oil and gas imports, with the Rupiah-to-US Dollar exchange rate serving as a moderating variable in Indonesia during the period from January 2020 to December 2024. The study is motivated by Indonesia's high dependence on oil and gas imports amidst fluctuations in economic growth, inflation, and exchange rates—factors that potentially affect the volume and value of these imports. A quantitative approach with a causal research design was employed. The study utilizes secondary data in the form of a monthly time series covering January 2020 to December 2024, comprising 60 observations. The independent variables consist of economic growth and inflation; oil and gas imports serve as the dependent variable, while the Rupiah-to-US Dollar exchange rate acts as the moderating variable. Data analysis was conducted using the Moderated Regression Analysis (MRA) method. The results indicate that economic growth has a significant influence on oil and gas imports in Indonesia. This suggests that increased economic activity raises energy demand, thereby driving up oil and gas imports. Conversely, inflation was found to have no significant effect on oil and gas imports during the study period. The Rupiah-to-US Dollar exchange rate was shown to significantly influence oil and gas imports, demonstrating that exchange rate fluctuations affect import values by altering international trade transaction costs. However, the moderation analysis revealed that the exchange rate does not moderate the relationship between economic growth and oil and gas imports, nor the relationship between inflation and oil and gas imports.

Keywords: Economic Growth, Inflation, Exchange Rate, Oil and Gas Imports, Moderating Variable, Moderated Regression Analysis (MRA)

Introduction

Oil and gas resources constitute one of Indonesia's abundant natural riches and serve as a vital commodity, acting as a key source of revenue for the State Budget (APBN). This endowment positions Indonesia as an energy powerhouse, with reserves distributed across various regions—including Maluku and Papua, South Sumatra, East Kalimantan, Natuna (Riau Islands), West Java, Sulawesi, and North Sumatra. Beyond oil and gas, Indonesia possesses significant non-oil-and-gas natural wealth—such as coal, minerals, and renewable energy sources—which are no less abundant than its hydrocarbon reserves.

Oil and gas resources play a highly strategic role in the Indonesian economy. Furthermore, the National Medium-Term Development Plan (RPJMN) for 2020–2024—mandated by Presidential Regulation (Perpres) No. 18 of 2020—aims to realize an Indonesia that is independent, advanced, equitable, and prosperous (President of Indonesia, 2020) [30]. These resources serve as a significant source of state revenue and economic income, while also fostering the growth of Indonesia's industrial and trade sectors.

In 2020, economic and population growth drove Indonesia's fuel imports to 1.2 million barrels per day, with the transportation sector serving as the country's largest fuel consumer. A surge in natural gas demand prior to 2020 was driven by critical electrification and industrialization efforts aimed at meeting national energy targets; meanwhile, the transition toward renewable energy remains in its early stages and will proceed gradually amidst this rising demand for natural gas.

As domestic demand for oil and natural gas rises in tandem with population growth, Indonesia has implemented a strategy of importing these resources from abroad to meet its energy needs—a measure taken despite the country's own abundant oil and gas reserves. The World Health Organization's (WHO) declaration in March 2020 regarding the COVID-19 outbreak—which was classified as a global pandemic—impacted Indonesia just as it did other nations. The economic impact was particularly acute, as social interaction was severely restricted, leading to a drastic decline in interpersonal activities. Impacts were also felt in the education and social sectors, creating serious challenges at the time. Consequently, the Indonesian government was compelled to implement policies such as Large-Scale Social Restrictions (PSBB) and Distance Learning (PJJ); these measures severely restricted movement and economic activity, while the shift to online platforms created challenges regarding internet access. The oil and gas industry in Indonesia experienced a drastic downturn, characterized by falling demand, price drops, and oversupply—even as production levels declined.

This drastic decline in the oil and gas industry stemmed from several factors, including dwindling reserves, aging fields or natural production decline, a lack of investment and new exploration, rising domestic demand, surging international prices, energy price fluctuations, policy and regulatory frameworks, the COVID-19 pandemic (along with PSBB or lockdown measures), operational constraints, and import dependency. As a result, domestic oil and gas production has been unable to meet local demand, necessitating imports to satisfy the country's needs. According to Statistics Indonesia (BPS), oil and gas imports have shown an upward trend in recent years, following a sharp decline caused by the 2020 pandemic. Meanwhile, the Ministry of Energy and Mineral Resources (ESDM) notes that domestic energy consumption continues to exceed domestic production, thereby driving the need for these oil and gas imports.

Based on data from Statistics Indonesia (BPS), the value of oil and gas (oil and gas) imports tends to fluctuate depending on global oil import values and domestic demand. Following the 2020 pandemic, trends in Indonesia's oil and gas and non-oil and gas trade between 2019 and 2024 exhibited fluctuations driven by global and domestic economic dynamics. Annual economic growth calculations reveal significant volatility in oil and gas imports; Specifically, these imports fell by 34.9% compared to 2019. This decline reflected the drop in economic activity caused by the impact of COVID-19, which reduced energy demand. In contrast, non-oil and gas import growth remained relatively more stable. In 2020, non-oil and gas imports declined by 11.2%, reflecting a general weakening of international trade activity.

A significant recovery occurred in 2021, with oil and gas imports surging by 79.1% and non-oil and gas imports rising by 34.1%. This growth was driven by the reduction of economic activity and an increased need for energy and industrial raw materials.

Import growth continued in 2022, albeit at a more moderate pace; oil and gas imports grew by 58.3%, while non-oil and gas imports increased by 15.7%. These figures reflect sustained domestic demand and the impact of rising global energy commodity prices.

However, 2023 saw a slowdown—and even a decline—in imports, with oil and gas imports falling by 11.04% and non-oil and gas imports decreasing by 5.2%. This indicates a normalization process following the surges of the previous period, as well as potential improvements in energy efficiency and adjustments in domestic demand. In 2024 (Statistics Indonesia (BPS) – Foreign Trade Statistics, 2025b and 2025c), imports showed positive—albeit relatively limited—growth; oil and gas imports grew by 1.24%, while non-oil and gas imports increased by 6.22%. This indicates that economic activity remained stable but did not experience the significant surges seen during the post-pandemic recovery period. Overall, fluctuations in the value of Indonesia's oil and gas and non-oil and gas imports reflect a high sensitivity to changes in global economic conditions, energy prices, and the level of domestic economic activity.

The value of oil and gas and non-oil and gas imports showed fluctuating trends between 2019 and 2024. In 2019, oil and gas imports stood at US$21,885.3 million and non-oil and gas imports at US$143,390.4 million, bringing the total import value for the year to US$165,275.7 million. Import values declined in 2020; oil and gas imports fell to US$14,256.8 million and non-oil and gas imports to US$127,312.0 million, resulting in a total import value of US$141,568.8 million. A significant increase in both oil and gas and non-oil and gas imports occurred in 2021; oil and gas imports rose to US$25,529.2 million and non-oil and gas imports to US$170,694.1 million, bringing the total to US$196,223.3 million.

This upward trend continued in 2022, with oil and gas imports reaching US$40,417.3 million and non-oil and gas imports totaling US$197,518.0 million, resulting in an aggregate import value of US$237,935.4 million. However, import values declined again in 2023. Oil and gas imports were recorded at US$35,831.0 million and non-oil and gas imports at US$187,276.5 million, bringing the total import value to US$223,107.5 million. In 2024, imports showed an upward trend again, with oil and gas imports totaling US$36,276.8 million and non-oil and gas imports reaching US$198,922.8 million, bringing the total import value to US$235,199.6 million. Overall, the dynamics of Indonesia's imports between 2019 and 2024 exhibited a fluctuating pattern: a decline in 2020, a significant increase from 2021 to 2022, another decline in 2023, and a subsequent rise in 2024.

In addition to the Gross Domestic Product (GDP) growth rate, the inflation rate is a significant factor influencing oil and gas imports. Beyond its impact on the rupiah exchange rate, stable inflation can act as a catalyst for economic growth. High inflation can suppress public purchasing power while simultaneously driving up import costs. Fluctuations in the rupiah against the US dollar also affect the value of oil and gas imports; a weakening rupiah raises import costs, whereas a strengthening rupiah lowers them.

Literature Review

Economic Growth

Economic growth theory—specifically within the Keynesian perspective (Bortis, 2023) [11], which underpins modern macroeconomics—explains that an increase in aggregate output, as reflected in Gross Domestic Product (GDP), signifies a rise in a nation's aggregate income and expenditure. According to Mankiw (2019) [25], GDP is influenced by the accumulation of factors of production such as capital and labor, as well as technological advancement. Therefore, in this study, economic growth is operationalized based on changes in GDP.

Economic growth drives production, consumption, investment, and the distribution of goods, ultimately increasing national energy demand. In countries that remain dependent on energy imports, rising economic growth has the potential to increase the need for oil and gas imports if domestic production capacity is unable to meet demand.

Empirically, there is a strong correlation between rising GDP and increased energy consumption. Gao *et al*. (2021) [16] explain that energy demand is positively influenced by rising income; increased economic activity and public income drive up energy requirements. However, the response of energy demand to income growth tends to be inelastic, meaning the percentage increase in energy consumption is generally smaller than the percentage increase in income or GDP. This indicates that economic growth remains a primary driver of a nation's rising energy demand. GDP reflects the growth of aggregate income and economic activity within a country (Blanchard, 2020) [10]. Economic growth (GDP) can also be viewed as a proxy for the expansion of domestic purchasing power.

Inflation

Inflation is a condition characterized by a widespread and sustained increase in the prices of various goods and services over a period of time. The impact of inflation on imports can vary depending on the characteristics of the traded commodities. For strategic commodities such as oil and gas, import requirements are driven more by national energy supply needs than by changes in inflation rates, given that energy serves as a key input for production, transportation, and other economic activities. Theoretically, inflationary pressure can stem from the demand side (demand-pull inflation) and supply-side factors (cost-push inflation). The quantity theory of money provides a framework by explaining the fundamental relationship between the growth of the money supply, the level of output (GDP), and the price level in the long run (Mishkin, 2007) [26].

From the perspective of the short-run Phillips Curve, increased economic activity can heighten inflationary pressure due to a rise in aggregate demand. This mechanism operates as the domestic currency weakens, thereby raising the prices of imported inputs and capital goods—including crude oil and gas—in local currency terms; this drives up production costs and consumer prices (Campa & Goldberg, 2005) [12]. High inflation, regardless of its source, erodes the real purchasing power of both the public and the industrial sector.

With shrinking real budgets, demand for goods—including oil and gas imports—may be suppressed. Thus, inflation can act as a transmission channel that propagates the effects of economic growth and exchange rate volatility onto the demand for oil and gas imports in the post-pandemic era. Theoretically, inflation influences consumption and production activities through changes in price levels. However, for strategic commodities like oil and gas, import requirements are influenced not only by domestic price changes but also by the need to ensure national energy supply availability. Therefore, the relationship between inflation and oil and gas imports requires empirical verification.

Rupiah Exchange Rate Against the USD

The theory underlying the relationship between exchange rates and international trade is the Purchasing Power Parity (PPP) theory. According to Feenstra & Taylor (2017) [15], in its relative form, PPP theory explains that fluctuations in exchange rates between countries are influenced by the difference in inflation rates between them. Countries with higher inflation rates will generally experience a depreciation of their currency compared to countries with lower inflation rates. A depreciation of the Rupiah against the US Dollar can lead to an increase in the prices of imported goods—or products purchased using foreign currency, including oil and gas—thereby raising import costs. This can affect import demand in accordance with the law of demand, where a price increase tends to reduce the quantity of goods demanded (*ceteris paribus*). This phenomenon is known as the "price effect" of exchange rate changes.

According to the relative form of PPP theory, exchange rate movements follow the difference in inflation rates between two countries (Taylor & Taylor, 2004) [40]. Exchange rates influence international trade transaction costs because the majority of import payments are settled in foreign currency. A weakening domestic currency increases import costs, working capital requirements, and the financial risks faced by companies engaged in international transactions. A weak exchange rate raises oil and gas prices; however, through the pass-through mechanism, it can reduce the quantity of imports demanded in accordance with the law of demand (the price effect). Consequently, the strength of the price effect transmission—stemming from exchange rate depreciation and affecting oil and gas imports in the context of inflation and economic growth—requires empirical verification for the 2020–2024 period. The exchange rate is a key factor influencing international trade transaction costs, given that oil and gas imports are predominantly conducted using the US Dollar. Therefore, changes in the exchange rate are expected to influence the value of oil and gas imports as well as the relationship between macroeconomic variables and oil and gas imports.

Value of Oil and Gas Imports

A country's oil and gas imports depend on domestic demand, relative prices, and government policy. These imports are influenced by domestic factors such as industrial growth, population size, and national energy policy. Within the framework of energy demand theory, increased economic growth drives up energy demand due to the expansion of production, distribution, and consumption activities. Gao *et al*. (2021) [16] demonstrated a positive relationship between energy demand and income growth; consequently, an increase in GDP tends to be accompanied by a rise in energy demand. For countries that remain reliant on foreign energy supplies, this dynamic can lead to an increase in the value of oil and gas imports. Energy demand theory links energy consumption to economic growth and energy prices. In the Indonesian context, oil and gas imports are determined not solely by domestic demand but also by global market price trends, exchange rates, and national energy policy.

Decisions regarding oil and gas imports are increasingly complex; they are determined not only by internal factors—such as economic growth, national energy demand, industrial activity, and subsidies—but are also significantly influenced by external factors, including international energy price fluctuations and exchange rate movements. Gunawan and Suripto (2023) [19] explain that Indonesia's oil and gas imports are influenced by the interplay between economic growth (GDP), inflation, and exchange rate movements, noting that when domestic production capacity cannot meet rising

domestic demand, oil and gas imports increase.

Research Methods

This study employs a quantitative approach with a causal research design based on time-series data. This design is used to analyze the direct impacts among the research factors and to examine the role of a moderating variable in the relationship between the independent and dependent variables. Classified as explanatory research, the study aims to explain the causal relationships among economic growth, inflation, and exchange rates with the value of oil and gas imports in Indonesia.

This study focuses on the relationship between economic growth (GDP) (X1), inflation (X2), and the Rupiah-to-USD exchange rate (X3) and the value of oil and gas imports (Y) in Indonesia during the period from January 2020 to December 2024. Specifically, it analyzes the role of the Rupiah exchange rate as a moderating variable in the relationship between economic growth and inflation regarding oil and gas imports in Indonesia.

The sample used in this study consists of monthly time-series data spanning the period from January 2020 to December 2024, resulting in a total of 60 observations. A total sampling technique was employed, utilizing all available data from the study period. The criteria for data selection included the availability of complete data from official sources (BPS and BI). The 60-month time-series data comprise observations recorded sequentially at monthly intervals over five years (60 months).

This study employs the Moderated Regression Analysis (MRA) method to examine the direct effect of the exchange rate—acting as a moderating variable in the relationship between economic growth and inflation—on oil and gas imports.

Results and Discussion

Table 1: Hypothesis Test Results

Model	Variable	B	Std. Error	Beta	t	Sig.
1	Constant	7.769	0.564	—	13.778	0.000
1	X1	3.492E-5	0.000	1.000	16.421	0.000
1	X2	-0.019	0.089	-0.011	-0.215	0.831
1	X3	-8.843E-5	0.000	-0.129	-2.206	0.031

Note: Dependent Variable: **Y**

Regression

Model: $Y = 7.769 + 3.492 \times 10^{-5} X_1 - 0.019 X_2 - 8.843 \times 10^{-5} X_3 + \varepsilon$

The table above shows a constant value of 7.769, indicating that when variables X_1, X_2, and X_3 are held constant or set to zero, the estimated value of the dependent variable Y is 7.769.

Variable X_1 has a positive regression coefficient of 3.492×10^{-5} with a significance level of 0.000, which is less than 0.05. This result indicates that variable X_1 has a positive and significant influence on variable Y; thus, any increase in the value of X_1 tends to be followed by an increase in the value of Y, assuming other variables remain constant.

Variable X_2 has a negative regression coefficient of -0.019 with a significance level of 0.831 (> 0.05). This result indicates that X_2 has a negative relationship with Y, but the influence is not statistically significant. Therefore, changes in X_2 do not yet yield a meaningful impact on changes in Y. On the other hand, variable X_3 has a negative regression coefficient of -8.843×10^{-5} with a significance level of 0.031 (< 0.05).

This result indicates that X_3 has a negative and significant influence on Y. In other words, an increase in the value of X_3 tends to cause a decrease in the value of Y, assuming other variables remain constant. Overall, the analysis results show that variables X_1 and X_3 have a significant influence on the dependent variable Y, whereas variable X_2 does not show a significant influence on Y.

Table 2: Partial Test Results (t-Test)

Model	Variable	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	Constant	7.800	0.569	—	13.714	0.000	—	—
1	X1	3.477E-5	0.000	0.995	16.090	0.000	0.574	1.742
1	X2	-0.022	0.090	-0.013	-0.244	0.808	0.759	1.318
1	X3	-9.042E-5	0.000	-0.132	-2.236	0.030	0.631	1.584
1	X1X3	0.000	0.000	-0.052	-1.085	0.283	0.973	1.027
1	X2X3	1.724E-10	0.000	0.003	0.054	0.957	0.958	1.044

Based on the partial test results presented in the Coefficients table, the constant value is 7.800, which is significant at the 5% level (p=0.000). This indicates that when all independent variables are zero, the estimated value of Y is 7.800. Variable X1 has a positive and significant regression coefficient with respect to Y (β=0.995; p=0.000), implying that an increase in X1 leads to a significant increase in the value of Y. Meanwhile, variable X2 has a negative regression coefficient that is not significant (p=0.808), indicating that X2 does not exert a meaningful influence on Y.

On the other hand, variable X3 shows a negative and significant influence on Y (β=-0.132; p=0.030), meaning that an increase in X3 tends to significantly decrease the value of Y.

Furthermore, the interaction variables X1X3 and X2X3 have significance values of 0.283 and 0.957, respectively. Since both significance values exceed 0.05, it can be concluded that X3 does not moderate the relationship between X1 and Y, nor the relationship between X2 and Y. Thus, variable X3 does not function as a moderator variable in this model.

Table 3: Simultaneous Test Results (F-test)

Model	Source	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.969	5	2.194	80.213	0.000
1	Residual	1.477	54	0.027	—	—
1	Total	12.446	59	—	—	—

Based on the ANOVA results, an F-value of 80.213 was obtained with a significance level of 0.000 ($p < 0.05$). These results indicate that the regression model—incorporating variables X1, X2, and X3, as well as the interaction variables X1X3 and X2X3—exerts a significant simultaneous influence on variable Y. Therefore, the regression model developed in this study is considered adequate and suitable for explaining the relationship between the independent variables and the dependent variable.

Discussion

1. The Effect of Economic Growth on Oil and Gas Imports

The discussion of the hypothesis in this study refers to the results of the Partial Test table, which shows that the economic growth variable (X1) has a significance value of 0.000. Since this value is lower than the significance level of 0.05, H1 is accepted. These results indicate that economic growth significantly affects oil and gas imports (Y) in Indonesia during the period from January 2020 to December 2024. Consequently, the multiple linear regression model for the first hypothesis can be formulated as $Y = \alpha + b1\ X1 + e$.

The findings of this study are consistent with research conducted by M. Iqbal Habib Bangun and Sirojuzilam (2024), who concluded that Gross Domestic Product (GDP) has a significant influence on oil and gas imports in Indonesia. Furthermore, these results align with the study by Lendongan *et al.* (2025) [23], which found that GDP significantly affects import levels in Indonesia.

Theoretically, these results support Demand Theory, which states that an increase in national income raises the demand for goods and services, including energy used for both production and consumption. From the perspective of economic growth theory, a rising Gross Domestic Product (GDP) reflects increased activity in production, investment, household consumption, and the movement of goods and services—all of which require energy supplies. Therefore, an increase in economic growth logically leads to a greater need for oil and gas as a primary energy source to sustain national economic activities.

The empirical results of this study demonstrate that this relationship indeed occurred in Indonesia between January 2020 and December 2024. After experiencing an economic contraction during the COVID-19 pandemic in 2020, Indonesia's economy began to recover in subsequent years, characterized by increased activity in industry, transportation, trade, infrastructure development, and public mobility.

This recovery has directly boosted the consumption of oil and gas, whereas domestic production capacity has not seen a commensurate increase. Consequently, the rising energy demand has been largely met through oil and gas imports. From a financial perspective, the increase in these imports has significant implications for Indonesia's fiscal and external conditions. Rising import values drive up the demand for US dollars, potentially straining foreign exchange reserves unless offset by increased exports. Furthermore, oil and gas imports contribute to widening the sector's trade deficit, which has already been under pressure in recent years. Regarding the state budget (APBN), rising energy consumption could increase the burden of energy subsidies and compensation payments that the government must allocate if international energy prices rise.

Thus, this study not only demonstrates a statistical link between economic growth and oil and gas imports but also illustrates that Indonesia's economic growth remains accompanied by a high reliance on imported energy, posing a challenge to fiscal sustainability and national energy security. The findings indicate that economic growth drives up oil and gas imports. The managerial implication is that the government needs to integrate economic growth policies with national energy security planning.

The rise in economic activity—and the resulting increase in imports—suggests that development planning must be accompanied by efforts to boost domestic oil and gas production capacity, develop new and renewable energy sources, and improve energy consumption efficiency. Additionally, from the perspective of public financial management, increased oil and gas imports could raise foreign exchange requirements, enlarge the sector's trade deficit, and increase the energy subsidy burden. Therefore, integrated fiscal management is essential to ensure economic growth targets are met without compromising the stability of the state budget or national energy security.

2. The Effect of Inflation on Oil and Gas Imports

Based on the partial test results, the inflation variable (X2) showed a significance value greater than 0.05. Therefore, the inflation variable was not proven to have a significant effect on oil and gas imports, leading to the rejection of the second hypothesis (H2). These findings indicate that inflation (X2) did not exert a meaningful influence on oil and gas imports (Y) in Indonesia during the period from January 2020 to December 2024. Consequently, the multiple linear regression equation for the second hypothesis can be formulated as $Y = \alpha + b2\ X2 + e$.

This study's results align with the findings of Lendongan *et al.* (2025) [23], who concluded that inflation did not significantly affect imports in Indonesia during the January 2020–December 2024 period. However, these findings differ from the study by Azzahra, Naidhisyia, and Lutfi Adi Kurniawan (2023) [1], which showed that inflation had a significant impact on oil and gas imports. Theoretically, inflation reflects a general rise in the prices of goods and services, which can reduce public purchasing power and curtail economic activity.

Based on aggregate demand theory, such a decline in purchasing power should reduce import demand due to the slowdown in consumption and production activities. Nevertheless, the results of this study indicate that inflation does not significantly affect oil and gas imports, suggesting that the theory does not fully apply to oil and gas commodities.

This situation can be explained by the nature of oil and gas as

strategic commodities that are price-inelastic. National energy needs must be met regardless of rising inflation because oil and gas serve as key inputs for the transportation, manufacturing, power generation, mining, and logistics sectors.

Thus, decisions regarding oil and gas imports are driven more by the need to ensure energy availability than by fluctuations in domestic inflation rates.

Real-world conditions in Indonesia during the study period also reinforce these results.

In 2022, a surge in inflation occurred due to rising global energy prices and global supply chain disruptions. However, the government implemented various stabilization measures—including fuel subsidies, energy compensation, price controls, and other fiscal policies—ensuring that the rise in inflation did not directly reduce the volume of oil and gas imports. The government continued to import to maintain the stability of the national energy supply.

From a financial perspective, these results indicate that inflation is not yet a primary factor influencing decisions regarding oil and gas imports. Procurement decisions prioritize operational needs and supply security over domestic price conditions. Consequently, even if inflation rises, both the government and importing companies must ensure sufficient liquidity and foreign exchange reserves to finance these imports. This demonstrates that the financial risks involved stem more from global oil price volatility and exchange rate fluctuations than from domestic inflation levels. Given the lack of a significant impact from inflation, the managerial implication is that controlling inflation is not a primary tool for curbing oil and gas imports. Therefore, more effective policies would involve enhancing energy efficiency, boosting domestic oil and gas production, and promoting energy source diversification. From a financial standpoint, the government and companies should focus budget management on controlling energy procurement costs and improving operational efficiency, rather than basing import decisions on inflation trends.

3. Impact of Exchange Rate on Oil and Gas Imports

Based on the partial test results, the exchange rate variable (X3) shows a significant relationship with oil and gas imports (Y) at a significance level of 0.05. Thus, the third hypothesis (H3) is accepted, indicating that the exchange rate influenced oil and gas imports in Indonesia during the period from January 2020 to December 2024. Consequently, the multiple linear regression equation for this hypothesis can be formulated as: $Y = \alpha + b3\ X3 + e$.

These findings are consistent with the study by Gunawan & Suripto (2023), which established a link between exchange rates and oil and gas imports in Indonesia. Furthermore, the results are supported by Satyatama (2025), who found that exchange rates significantly affect import prices and inflation in Indonesia. These research findings align with Purchasing Power Parity theory and international economic principles, which posit that exchange rate fluctuations influence the relative prices of imported goods. When the rupiah depreciates against the US dollar, the cost of purchasing oil and gas from abroad rises, as the vast majority of international trade in these commodities is denominated in dollars. Conversely, when the exchange rate appreciates, import costs decrease relatively, thereby enhancing import capacity.

The relevance of this theory is evident in Indonesia's situation between 2020 and 2024, a period marked by rupiah volatility driven by the COVID-19 pandemic, the Russia-Ukraine geopolitical conflict, rising global interest rates, and global economic uncertainty. These fluctuations impacted oil and gas import costs, forcing the government and business entities to allocate larger sums of money to secure the same volume of imports.

From a financial perspective, exchange rate volatility represents a primary financial risk in the oil and gas trade. A weakening rupiah drives up import costs, increases working capital and foreign exchange requirements, and potentially strains the cash flow of companies reliant on imported raw materials. For the government, currency depreciation can also inflate the energy subsidy burden and place greater pressure on the state budget (APBN) if the rise in import costs is not offset by adjustments to domestic energy prices.

Therefore, the results of this study demonstrate that exchange rate stability plays a crucial role in maintaining stable oil and gas import costs and ensuring national fiscal sustainability. Given the significance of the exchange rate, the managerial implications of these findings underscore the importance of maintaining exchange rate stability as part of the strategy for managing oil and gas imports. The government, Bank Indonesia, and oil and gas importing companies need to strengthen financial risk management through foreign exchange requirement planning, foreign currency cash flow management, and hedging strategies where necessary. Such measures are essential to minimize cost increases resulting from exchange rate depreciation and to maintain stable energy costs for the national economy.

4. The Moderating Role of the Exchange Rate on the Relationship between Economic Growth and Oil and Gas Imports

Interaction test results indicate that the relationship involving economic growth (X1) and the exchange rate (X3) with respect to variable Y yielded a significance value of 0.283, which exceeds the 0.05 threshold. Consequently, H4 is rejected because the exchange rate was not proven to moderate the relationship between economic growth and oil and gas imports; in other words, the interaction between X1 and X3 did not have a significant effect on variable Y. The moderation regression equation for the fourth hypothesis can be expressed as follows: $Y = \alpha + b1\ X1 + b3\ X3 + b4\ (X1\ X3) + e$. These findings align with research by Shang & Hamori (2024), which highlights the role of the exchange rate as an external factor in the relationship between macroeconomic and energy variables.

Although the exchange rate was not proven to function as a significant moderating variable in this study, this result indicates that exchange rate fluctuations were unable to either strengthen or weaken the relationship between economic growth and oil and gas imports during the study period. This situation can be explained by the fact that economic growth and exchange rates operate through different mechanisms. Economic growth primarily affects oil and gas imports by driving up production, transportation, and consumption activities as well as energy demand, whereas the exchange rate mainly influences relative prices and the domestic-currency cost of imports. Given the strategic nature of oil and gas and the fact that energy demand is relatively inelastic in the short term, exchange rate fluctuations do not automatically alter the fundamental energy requirements stemming from increased economic activity.

Conceptually, a moderating variable is used to determine whether a specific variable strengthens or weakens the relationship between independent and dependent variables. This study posited that exchange rate fluctuations could influence the strength of the relationship between economic growth and oil and gas imports. However, the results indicate that the interaction between economic growth and the exchange rate is statistically insignificant. These findings suggest that rising economic activity continues to drive the demand for oil and gas imports regardless of exchange rate volatility. In other words, the relationship between economic growth and oil and gas imports is driven more by actual energy needs than by exchange rate movements. As long as national energy demand continues to rise and domestic production remains insufficient to meet that demand, oil and gas imports will persist, even if import costs increase due to a weakening rupiah.

From a financial perspective, these results indicate that exchange rate fluctuations have a greater impact on the magnitude of import costs than on the decision to import itself. The government must continue to allocate the necessary budget and foreign exchange to meet national energy needs; consequently, exchange rate risk primarily affects procurement costs rather than altering the underlying relationship between economic growth and oil and gas imports.

Thus, the function of the exchange rate in this study is more appropriately viewed as a cost factor rather than a factor that strengthens or weakens the impact of economic growth on oil and gas imports. The managerial implications of these findings suggest that exchange rate stability alone is insufficient to curb the rise in oil and gas imports driven by economic growth. Therefore, the government needs to prioritize policies aimed at increasing national oil and gas production capacity, constructing refineries, and accelerating the adoption of alternative energy sources. From a public finance perspective, such a strategy could reduce reliance on oil and gas imports, thereby mitigating the risks associated with exchange rate fluctuations regarding import financing and the fiscal burden in the long term.

5. The Moderating Role of the Exchange Rate in the Relationship between Inflation and Oil and Gas Imports

Based on the interaction test results between the inflation variable (X2) and the exchange rate (X3) regarding oil and gas imports (Y), a significance value of 0.957 was obtained. This value exceeds the 0.05 significance level; thus, the interaction between X2 and X3 was not proven to have a significant effect on variable Y. Consequently, the fifth hypothesis (H5) is rejected. These results indicate that the exchange rate does not act as a moderating variable in the relationship between inflation and oil and gas imports. In other words, the exchange rate has not significantly strengthened or weakened the impact of inflation on oil and gas imports. The moderation regression equation for the fifth hypothesis can be formulated as follows: $Y = \alpha + b2\ X2 + b3\ X3 + b5\ (X2X3) + e$.

These findings differ from those of Husaini & Lean (2021), who stated that the exchange rate could strengthen the impact of energy prices on inflation. Conversely, the results of this study indicate that the exchange rate does not play a significant moderating role in the relationship between inflation and oil and gas imports. The failure to establish the exchange rate as a moderating variable further demonstrates that exchange rate fluctuations have not been able to strengthen or weaken the relationship between inflation and oil and gas imports. This situation can be attributed to the nature of oil and gas imports, which are driven more by energy supply requirements than by changes in general domestic prices. Policies regarding subsidies, compensation, and energy pricing can dampen the transmission of international price and exchange rate fluctuations to domestic energy prices. Furthermore, oil and gas imports during the 2020–2024 period were influenced by various other factors, such as global oil prices, domestic oil and gas production (lifting), energy consumption, and government energy policies. These factors may have prevented the interaction between the exchange rate and inflation from being strong enough to produce a significant moderating effect.

According to moderation theory, the exchange rate should be capable of altering the strength of the relationship between inflation and imports if exchange rate fluctuations cause the impact of inflation on import activity to intensify or weaken. However, research findings indicate that the interaction between these two variables is not significant; thus, the exchange rate does not function as a moderating variable.

These conditions indicate that changes in inflation and exchange rates operate through distinct mechanisms regarding oil and gas imports. Inflation reflects domestic price level changes, whereas exchange rates influence the transaction costs of international trade. In practice, decisions regarding oil and gas imports in Indonesia are driven more by the need to ensure national energy supply security than by the interplay of inflation and exchange rate fluctuations. From a financial perspective, these results suggest that both companies and the government prioritize managing exchange rate risks and global oil price volatility over linking import decisions to domestic inflation trends. Even amidst rising inflation and exchange rate volatility, oil and gas imports proceed according to operational requirements to sustain national economic activity. Consequently, the combined effect of inflation and exchange rates has not exerted a significant additional influence on oil and gas imports during the study period.

The managerial implications of this study indicate that controlling inflation and stabilizing exchange rates have not simultaneously influenced the volume of oil and gas imports. Therefore, decision-making regarding national energy management should focus more on long-term strategies, such as increasing domestic energy production, diversifying energy sources, and strengthening national energy resilience. From a financial perspective, such strategies are expected to mitigate the risk of rising import costs, stabilize foreign exchange requirements, and enhance the efficiency of state budget management within the energy sector.

In conclusion, the study's findings imply that managing oil and gas imports in Indonesia cannot rely solely on macroeconomic policies but requires synergy between energy policy and state financial management. Economic growth accompanied by rising oil and gas imports underscores the importance of integrated energy planning—combining increased domestic production with energy diversification—to reduce import dependency. Furthermore, the significant impact of exchange rates on imports highlights the need for financial risk management through the control of foreign exchange requirements, exchange rate stability, and

import cost management; this ensures national energy resilience is maintained without placing undue pressure on the state budget (APBN) or the oil and gas trade balance.

Conclusion

Based on the research findings regarding the impact of economic growth and inflation on oil and gas imports—with the exchange rate serving as a moderating variable in Indonesia during the 2020–2024 period—it can be concluded that this study stems from Indonesia's situation: despite possessing abundant oil and gas natural resources, the country still faces limitations in meeting national energy needs through domestic production.

Indonesia's energy demand continues to grow alongside rising activity in the economic, industrial, transportation, trade, consumption, and public mobility sectors. When domestic production capacity falls short of meeting these total needs, oil and gas imports become a viable option to ensure the availability and continuity of the national energy supply. Thus, oil and gas imports represent not merely an international trade activity but are also intrinsically linked to the sustainability of Indonesia's economic activities and its energy security.

This issue gained particular significance during the 2020–2024 period as Indonesia navigated various economic dynamics: the economic contraction caused by the COVID-19 pandemic in 2020, the subsequent economic recovery, fluctuations in global energy prices, global supply chain disruptions, and the volatility of the rupiah against the US dollar. These conditions demonstrate that changes in oil and gas imports cannot be viewed in isolation from domestic economic conditions or external factors.

Economic growth has the potential to drive up energy demand, and inflation can influence price levels and purchasing power within the economy; meanwhile, the exchange rate affects import transaction costs, given that international oil and gas trade is generally conducted in US dollars. Against this backdrop, this study aimed to determine the impact of economic growth, inflation, and the exchange rate on oil and gas imports, and to test whether the exchange rate strengthens or weakens the relationship between economic growth/inflation and oil and gas imports.

This study was also motivated by a research gap identified in previous studies. Findings from earlier research on the impact of economic growth and inflation on imports—specifically oil and gas imports—have remained inconsistent. Some studies found a significant impact of economic growth on oil and gas imports, while others yielded different results. Similarly, the impact of inflation on oil and gas imports has not shown consistent findings.

Furthermore, previous studies have predominantly treated the exchange rate as an independent variable directly influencing imports, whereas research examining the exchange rate as a variable capable of strengthening or weakening the relationship between economic growth, inflation, and oil and gas imports remains limited. Therefore, this study seeks to address this gap by positioning the exchange rate not only as a variable that directly affects oil and gas imports but also as a moderating variable—specifically through the interactions of economic growth with the exchange rate and inflation with the exchange rate.

Ontologically, this study demonstrates that oil and gas imports constitute an economic reality closely linked to national energy needs and the limitations of domestic production in meeting those demands. Economic growth, inflation, and exchange rates are viewed as economic conditions that influence the dynamics of oil and gas imports, whether by driving up energy demand or by altering international trade costs. Consequently, the subject of this research is understood not merely as import value figures, but as a reflection of the relationship between Indonesia's economic development, its energy requirements, and its reliance on foreign energy supplies.

Epistemologically, this reality is substantiated through a quantitative approach utilizing monthly secondary data spanning January 2020 to December 2024, comprising 60 observations. The variables employed include economic growth (X1), inflation (X2), the Rupiah-to-US Dollar exchange rate (X3), and the value of oil and gas imports (Y), alongside interaction variables (X1X3 and X2X3) to test for moderating effects.

Data processing was conducted using IBM SPSS Statistics 24.0, incorporating descriptive statistics, classical assumption tests, regression analysis, Moderated Regression Analysis (MRA), partial tests, simultaneous tests, and the coefficient of determination. Results from the classical assumption tests indicate that the research model satisfies regression requirements: residuals are normally distributed, and there is no evidence of multicollinearity, heteroscedasticity, or autocorrelation. Thus, the study's conclusions are derived from empirical testing of the data collected during the research period.

The findings demonstrate that economic growth had a positive and significant impact on Indonesia's oil and gas imports during the 2020–2024 period. Partial test results yielded a significance value of 0.000 (below the 0.05 threshold), leading to the acceptance of H1. This finding indicates that increased economic activity in Indonesia is accompanied by a rise in the demand for oil and gas imports. Economic growth reflects expanded activity in production, consumption, investment, transportation, trade, and public mobility—all of which require increasingly large amounts of energy. When domestic oil and gas production cannot meet this rising demand, imports serve as a key source for fulfilling energy needs.

These results support Demand Theory and Import Demand Theory, which posit that rising income and economic activity drive up the demand for goods and services, including energy. The findings also reveal structural issues within the Indonesian economy; while economic growth reflects positive developments in economic activity, this expansion is simultaneously accompanied by a growing need for imported energy.

Consequently, Indonesia's economic growth during the study period has not been fully underpinned by adequate domestic energy supply capabilities. From a financial perspective, the rise in oil and gas imports driven by economic growth entails a greater need for funds and foreign exchange to finance energy procurement. This situation can exert pressure on the oil and gas trade balance and, under certain circumstances, increase the government's fiscal burden if rising energy costs must be offset through subsidies or compensation.

Suggestions

1. The government needs to integrate economic growth policies with energy security policies. Given that economic growth has been shown to drive up oil and gas imports, the rise in economic activity must be balanced

by an expansion of domestic energy production capacity to ensure that energy needs do not rely entirely on imports.
2. The government needs to boost domestic energy production and processing—including strengthening oil and gas production capacity and infrastructure—so that the increased energy demand resulting from economic growth can be met more optimally from domestic sources.
3. Energy source diversification must be accelerated through the development of new and renewable energy and by improving energy efficiency. This policy is crucial as a long-term strategy to reduce reliance on oil and gas imports.
4. Exchange rate stability must remain a priority for the government and monetary authorities, as the exchange rate has a significant impact on oil and gas imports. Managing exchange rate stability is essential to controlling risks associated with rising import costs, foreign currency requirements, and pressure on state finances.
5. Financial and foreign exchange risk management needs to be strengthened by parties involved in oil and gas procurement. Planning for US dollar requirements, managing foreign currency cash flows, and utilizing hedging instruments when necessary can help mitigate risks arising from exchange rate fluctuations.
6. Controlling inflation cannot serve as the sole instrument for reducing oil and gas imports, as research indicates that inflation does not significantly affect import volumes. Import reduction policies should instead focus on fundamental factors: energy production capacity, consumption efficiency, energy diversification, and supply resilience.
7. The government needs to strengthen fiscal planning for the energy sector, as rising oil and gas import needs can increase foreign currency requirements and potentially heighten pressure on energy subsidies and compensation schemes when international energy prices and exchange rates fluctuate.

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