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The Effects of Inflation, Exchange Rates, And Gross Domestic Product on Indonesia's Crude Oil Exports

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Abstract

This study examines the relationship between inflation, exchange rates, and Gross Domestic Product (GDP) in destination countries and Indonesia's crude oil exports to Thailand, Malaysia, Singapore, Australia, and South Korea during 2014–2024. Using annual panel data consisting of 55 observations, panel regression analysis was conducted, with the Fixed Effect Model selected based on Chow and Hausman tests. The results indicate that inflation in destination countries is negatively and significantly associated with Indonesia's crude oil exports. In contrast, exchange rates exhibit a negative but insignificant relationship, while GDP shows a positive but insignificant relationship with export volumes. Collectively, the three variables significantly explain 52.93% of the variation in exports. These findings suggest that macroeconomic conditions in importing countries, particularly inflation, are associated with fluctuations in Indonesia's crude oil exports, whereas the roles of exchange rates and GDP appear limited within the observed sample. The study contributes to the trade and energy literature by providing evidence from major Asian-Pacific export destinations. However, the findings should be interpreted cautiously due to the limited number of observations and the exclusion of structural factors such as global oil prices and energy policy dynamics.

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INTRODUCTION

Crude oil trade represents a strategic sector in the global economy, serving both as a primary energy source and an industrial raw material. Several Asia-Pacific countries South Korea, Singapore, Malaysia, Thailand, and Australia have consistently imported crude oil from Indonesia during 2014–2024 due to their limited domestic oil reserves. At the same time, Indonesia itself has transitioned from a net oil exporter to a net oil importer since 2004, requiring imports to meet domestic refinery needs.

Recent empirical studies show contradictory results. Pemayun & Widanta (2024) found that exchange rates, foreign investment, production, and global oil prices simultaneously affect Indonesia's oil exports. In contrast, Auliani & Purnomo (2025) reported that South Korea's inflation and GDP per capita have a *positive* effect on Indonesia's crude oil exports, while exchange rates and global oil prices have a *negative* effect. These inconsistencies suggest that the relationship between macroeconomic variables and crude oil exports is neither stable nor uniform across time periods, country samples, or model specifications (Mistak & Ozkan, 2024).

The theoretical mechanisms underlying these mixed findings remain fragmented. Standard international trade theory (Krugman et al., 2023) emphasizes price competitiveness: high inflation in *destination countries* raises production costs and reduces import demand. Exchange rate theory predicts that depreciation of the importer's currency increases the local cost of USD-denominated oil, potentially lowering import volumes. GDP (Mankiw, 2021) reflects economic capacity, but for strategic energy commodities with inelastic demand, income effects may be weak. The present study integrates these three channels into a single analytical framework applied to crude oil exports a commodity with distinct trade elasticity characteristics (Rosidah, 2025).

Global crude oil prices fluctuated sharply during the 2019–2025 period. Based on data from the Federal Reserve Economic Data (FRED), Brent crude oil prices fell from approximately 64 US dollars per barrel in 2019 to 43 dollars in 2020 due to the pandemic, then rose to 70 dollars in 2021, surged to 99 dollars in 2022, and declined to around 68 dollars in 2025. Moshiri & Kheirandish (2024) confirm that oil price shocks positively affect the economic growth of exporting countries but negatively affect importing countries with a one-year lag, with a greater magnitude in oil-importing developing countries such as Indonesia.

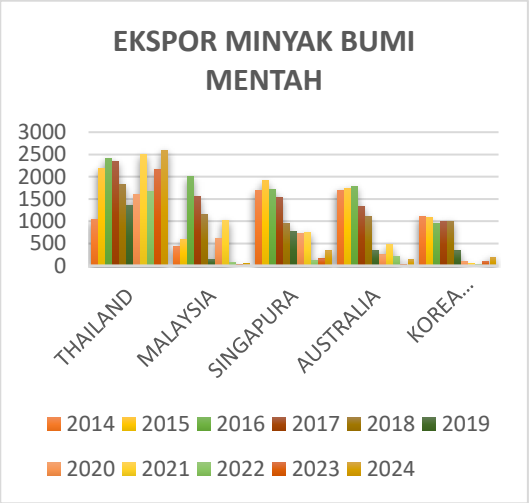

Figure 1. Graph of Indonesia's Crude Oil Exports to the 5 Main Destination Countries, 2014–2024

Source: Central Statistics Agency

Figure 1 shows significant volatility. Thailand exhibits a relatively stable increase (from 1,045.2 tons in 2014 to 2,595.8 tons in 2024). Malaysia, Singapore, Australia, and South Korea experienced drastic declines, especially after 2020, with South Korea falling from 1,105.9 tons (2014) to 33.3 tons (2022). This heterogeneity across destination

countries despite similar macroeconomic trends suggests that country-specific factors (energy policies, refinery capacity) may interact with inflation, exchange rates, and GDP (Arintoko & Kadarwati, 2024).

Degirmen et al. (2025) show that oil price shocks cause currency depreciation in oil-importing developing countries due to current account concerns. Bianchi & Coulibaly (2023) note that central banks in such economies tend to raise interest rates to curb depreciation, reinforcing Indonesia's structural vulnerability as a net oil importer.

Several macroeconomic factors are hypothesized to influence crude oil exports: (1) Inflation in destination countries high inflation reduces industrial purchasing power and import demand for energy (Krugman et al., 2023). (2) Exchange rate a weaker currency in importing countries raises the local price of USD-denominated oil, potentially reducing import volume (Salvatore, 2019). (3) GDP of destination countries gher GDP typically increases energy consumption, but the effect may be weak for crude oil due to energy diversification (Todaro & Smith, 2020).

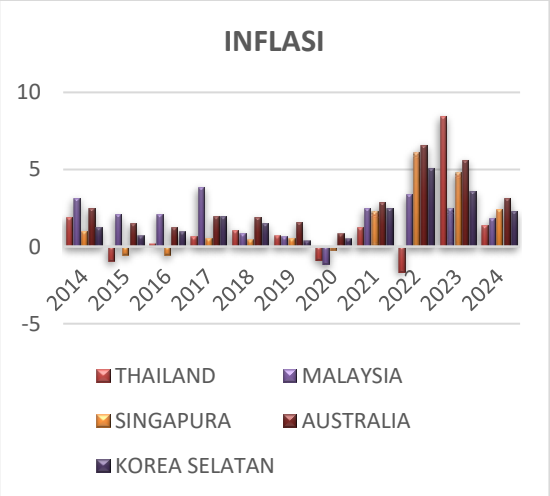

Figure 2. Inflation Chart for Indonesia's Top 5 Crude Oil Export Destinations, 2014–2025
Source: World Bank

Figure 2 shows inflation spikes in 2022 across all five countries (Thailand 8.47%, Malaysia 3.37%, Singapore 6.13%, South Korea 5.08%, Australia 6.59%). Algül (2024) finds a two-way causality between energy import dependence and inflation, implying that inflation is not only a consequence but also a driver of energy import patterns.

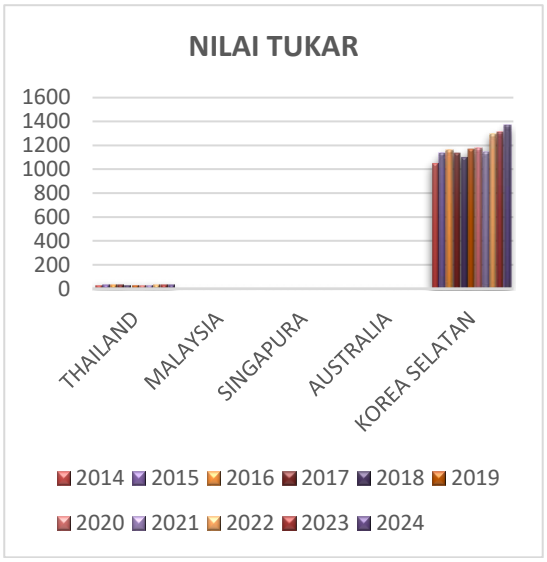

Figure 3. Exchange Rate Chart for the 5 Main Destination Countries of Indonesia's Crude Oil Exports, 2014–2024
Source: World Bank

Most destination currencies depreciated against the USD (e.g., Thai Baht from 32.47 to 35.29, Malaysian Ringgit from 3.27 to 4.57, South Korean Won from 1,052.84 to 1,363.37). This depreciation increases the local cost of oil imports, potentially reducing demand for Indonesian crude (Citrawan et al., 2025).

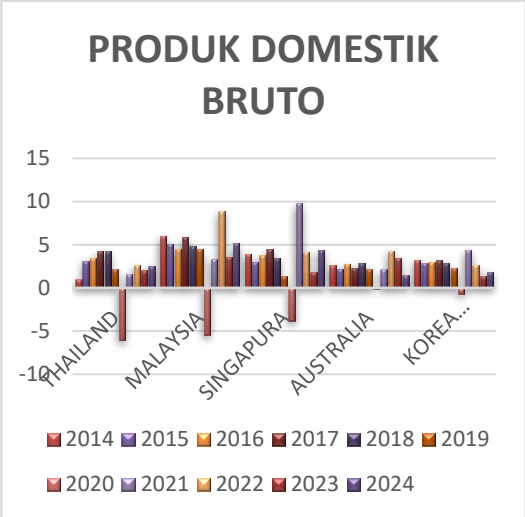

Figure 4. Graph of Gross Domestic Product of Indonesia's Top 5 Crude Oil Export Destinations, 2014–2024
Source: World Bank

All countries experienced sharp GDP contraction in 2020 (Thailand -6.05%, Malaysia -5.45%, Singapore -3.81%) followed by strong recovery in 2021–2022. However, as noted by Yazid et al., (2020) , GDP effects on crude oil exports are often insignificant, possibly due to low income elasticity of oil demand in industrialized economies.

Prior studies on the effects of inflation, exchange rates, and GDP on Indonesia's crude oil exports have yielded contradictory results. Yazid et al., (2020) found that destination country inflation has a negative and significant effect, while GDP is insignificant. In contrast, Auliani & Purnomo (2025) reported a positive effect of destination inflation on exports to South Korea. Rangkuty et al. (2024) concluded that GDP and the exchange rate have a significant positive effect on Indonesia's aggregate exports, but their study did not focus specifically on crude oil. Vannezia & Aminda (2023) found that exchange rates and inflation are insignificant, while Pemayun & Widanta (2024) reported a significant negative effect of exchange rates on crude oil exports.

These inconsistencies arise from three sources: differences in model specification (time-series vs. panel data, VECM vs. FEM), country heterogeneity (single destination vs. multiple countries), and structural breaks (pre- vs. post-pandemic, policy shifts). No prior study has simultaneously examined the 2014–2024 period covering the COVID-19 shock, the global inflationary surge of 2022, and the Indonesian government's 2025 downstream oil policy using a panel of the five most consistent destination countries (Thailand, Malaysia, Singapore, Australia, South Korea). Therefore, a clear research gap exists: the need for a unified empirical analysis that integrates inflation, exchange rates, and GDP within a single panel data framework, specifically for crude oil exports, while accounting for country-specific fixed effects and post-pandemic structural changes.

This study contributes: (1) the most recent annual panel data (2014–2024) capturing pandemic, oil price volatility, and post-Russian-Ukraine inflation; (2) focus on five primary destination countries (Thailand, Malaysia, Singapore, Australia, South Korea) that consistently import Indonesian crude; (3) panel data regression (FEM) that accounts for both cross-sectional and time-series heterogeneity; (4) baseline analysis prior to Indonesia's 2025 export-capping policy, providing a benchmark for future policy evaluation. The Indonesian government recently capped crude oil exports to prioritize domestic downstream processing. This policy shift makes understanding the pre-policy determinants (inflation, exchange rate, GDP) critically important (Iorngurum, 2023).

Based on the integrated theoretical framework, this study proposes four main hypotheses. First, inflation in destination countries is hypothesized to have a negative effect on Indonesia's crude oil exports through the price competitiveness

channel, as higher inflation reduces industrial purchasing power and import demand for energy. Second, the exchange rate of destination countries against the US dollar is expected to have a negative effect; specifically, an increase in the local currency per USD (depreciation of the destination currency) raises the local cost of USD-denominated oil, thereby reducing import demand for Indonesian crude. Third, the GDP of destination countries is hypothesized to have a positive but potentially insignificant effect due to the low income elasticity of crude oil demand, especially in industrialized economies with diversified energy sources. Fourth, simultaneously, inflation, exchange rates, and GDP are expected to have a significant collective effect on Indonesia's crude oil exports to the five main destination countries.

The remainder of this paper is organized as follows. Section 2 describes the data, variable definitions, and panel regression methodology. Section 3 presents the empirical results and discussion. Section 4 concludes with policy implications and research limitations.

METHOD

This study employs a quantitative approach using secondary panel data that combines time-series observations from 2014 to 2024 and cross-sectional data from five main destination countries for Indonesia's crude oil exports: Thailand, Malaysia, Singapore, Australia, and South Korea. The selection of these five countries is based on three analytical criteria: (1) their consistent imports of Indonesian crude oil throughout the study period, (2) their significant contribution to Indonesia's total crude oil export volume, and (3) their strategic energy relationships with Indonesia within the Asia-Pacific region. The 2014–2024 period was deliberately chosen to encompass major global dynamics, including the COVID-19 pandemic, sharp oil price fluctuations, the post-pandemic inflationary surge of 2022, and geopolitical conflicts such as the Russia-Ukraine war.

Data were collected from official publications of the Central Statistics Agency (BPS) for Indonesia's crude oil export volume (measured in thousand tons). Inflation, exchange rates, and GDP data for each destination country were obtained from the World Bank and the Federal Reserve Economic Data (FRED). The dependent variable is the volume of Indonesia's crude oil exports to each destination country (in thousand tons). The independent variables are: (1) inflation, measured as the annual percentage change in the Consumer Price Index (CPI) of each destination country; (2) exchange rate, defined as the nominal exchange rate of the destination country's currency against the US dollar (local currency units per USD); and (3) GDP, measured in constant 2015 US dollars (billions) to eliminate price effects and ensure comparability across countries. All variables are operationally defined according to standard macroeconomic indicators used in international trade analysis.

The selection of inflation, exchange rate, and GDP is grounded in international trade theory. Inflation in destination countries affects import demand through the price competitiveness mechanism (Krugman et al., 2023). Exchange rates influence the local cost of USD-denominated oil, thereby affecting import volumes (Salvatore, 2019). GDP reflects the destination country's economic capacity and energy consumption potential (Mankiw, 2021; Todaro & Smith, 2020). The study acknowledges that other variables such as global oil prices, destination countries' energy policies, domestic refinery capacity, foreign direct investment, and trade agreements may

also influence crude oil exports. However, these variables are excluded due to data availability constraints and the study's focus on macroeconomic determinants. This omission is recognized as a limitation that may contribute to omitted-variable bias, and future research should incorporate these factors.

The panel dataset comprises 55 observations. This relatively small sample size limits statistical power and the ability to include multiple control variables or lag structures. Consequently, the model specification is intentionally parsimonious to preserve degrees of freedom. The findings should therefore be interpreted with caution, and robustness checks using larger samples or alternative estimation methods are recommended for future research.

The primary analytical tool is panel data regression with the following equation:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \varepsilon_{it}$$

where Y_{it} is the volume of Indonesia's crude oil exports to destination country i in year t (thousand tons), X_{1it} is inflation (annual CPI percentage), X_{2it} is the exchange rate (local currency per USD), X_{3it} GDP (constant 2015 USD billions), and εitεit is the error term. No logarithmic transformation was applied because the study aims to interpret coefficients directly in original units, and the diagnostic tests did not indicate severe heteroscedasticity that would require transformation. However, the absence of log transformation may limit the interpretation of elasticities, and this is acknowledged as a methodological limitation.

Three alternative panel data models are available: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). Model selection was conducted using the Chow test (CEM vs. FEM) and the Hausman test (FEM vs. REM). Theoretically, FEM is preferred when unobserved country-specific characteristics (such as energy policy regimes, institutional quality, or long-term import contracts) are correlated with the independent variables and are fixed over time. Given that the five destination countries have distinct and stable structural characteristics for example, Singapore's role as a trading hub versus Australia's resource-based economy FEM is conceptually appropriate for capturing this time-invariant heterogeneity. The Lagrange Multiplier test (CEM vs. REM) would be applied only if the Hausman test favored REM, but given the expected results, it was not required.

Classical assumption tests were conducted with caution appropriate to panel data contexts. Multicollinearity was assessed using correlation coefficients among independent variables, with a threshold of 0.90. Heteroscedasticity was examined using the Glejser test, which regresses absolute residuals against the independent variables. The study does not report normality tests (e.g., Jarque-Bera) or the Durbin-Watson test because these are more appropriate for simple OLS time-series models rather than panel data with fixed effects. Furthermore, the study acknowledges that more advanced panel diagnostics such as cross-sectional dependence (e.g., Pesaran CD test), panel unit root tests (e.g., Im-Pesaran-Shin), and serial correlation within panels (e.g., Wooldridge test) were not performed due to the small sample size and the study's primary focus on coefficient estimation rather than causal inference. This limitation is explicitly recognized, and future research should address these issues using larger panels and more robust estimators.

The final model was estimated using

the Fixed Effect Model (FEM) with cross-section fixed effects. Hypothesis testing for partial effects used the t-test (with robust standard errors where appropriate), while simultaneous effects were tested using the F-test. The coefficient of determination (R^2) measures the proportion of variance in the dependent variable explained by the independent variables. All estimations were performed using EViews 9. The interpretation of results remains cautious: the model does not establish causality but rather identifies associations between macroeconomic variables and export volumes, given the observational nature of the data and the absence of instrumental variables or natural experiments.

The methods section acknowledges the following limitations: (1) small sample size (55 observations) limiting statistical power and the inclusion of additional variables; (2) potential omitted-variable bias due to exclusion of global oil prices, energy policies, and trade agreements; (3) lack of logarithmic transformation restricting elasticity interpretation; (4) absence of advanced panel diagnostics for stationarity, cross-sectional dependence, and serial correlation; (5) inability to establish causality due to the absence of instrumental variables or natural experiments. These limitations are addressed in the conclusion as directions for future research.

RESULTS AND DISCUSSION

Results

Before estimating the parameters, an appropriate panel data regression model was selected from three alternatives: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). The Chow test was used to compare CEM and FEM, while the Hausman test compared FEM and REM. The results are reported in Table 1.

Table 1. Results of Panel Data Regression Model Selection

Specification Tests	Test Statistic	Prob. Value	Conclusion
Chow Test (CEM vs. FEM)	Cross-section F = 8.0015	0.0001	FEM selected
Hausman Test (FEM vs. REM)	Chi-square = 18.0164	0.0004	FEM selected

Source: Processed data (2026)

The Chow test yielded a probability value of 0.0001, which is below the 0.05 significance level, rejecting the null hypothesis that CEM is appropriate. Therefore, FEM is preferred over CEM. The Hausman test produced a probability value of 0.0004 (< 0.05), rejecting the null hypothesis that REM is appropriate. Consequently, FEM was selected as the best model. This decision indicates that unobserved country-specific characteristics such as energy policy regimes, institutional quality, or long-term import contracts are correlated with the independent variables and remain fixed over time. The Lagrange Multiplier test (CEM vs. REM) was not required because the Hausman test already favored FEM.

Classical assumption tests were conducted to ensure the reliability of the regression estimates, with appropriate caution for panel data contexts.

The correlation matrix among independent variables is presented in Table 2.

Table 2. Results of the Multicollinearity Test

Variable	Inflation	Exchange Rate	GDP
Inflation	1.000	0.022	0.309
Exchange Rate	0.022	1.000	-0.088
GDP	0.309	-0.088	1,000

Source: Processed data (2026)

All correlation coefficients are well

below the conventional threshold of 0.90, indicating no severe multicollinearity. Thus, the independent variables do not exhibit strong linear relationships that would distort coefficient estimates.

The Glejser test was employed by regressing the absolute residuals against all independent variables. Table 3 reports the results.

Table 3. Heteroscedasticity Test Results (Glejser Test)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	572.0975	222.0591	2.5763	0.0132
Inflation	20.2346	20.2104	1.0012	0.3219
Exchange Rate	-0.8654	0.8847	-0.9782	0.3330
GDP	19.2303	15.0899	1.2744	0.2088

Source: Processed data (2026)

All independent variables have probability values greater than 0.05 (inflation 0.3219, exchange rate 0.3330, GDP 0.2088), indicating no evidence of heteroscedasticity. The model therefore satisfies the homoscedasticity assumption.

The selected Fixed Effects Model (FEM) was estimated to examine the effects of inflation, exchange rate, and GDP on Indonesia's crude oil exports. The estimation results are presented in Table 4.

Table 4. Fixed Effects Model Estimation Results

Variabel	**Koefisien**	**Std. Error**	**t-Statistik**	**Prob.**
C	1604.135	91.38913	13.26449	0.0020
Inflasi	-107.4886	44.72321	-2.403420	0.0202
Nilai Tukar	-2.236141	1.957762	-1.142192	0.2592
PDB	50.41935	33.39207	1.509920	0.1378
Statistik Model				**Nilai**
R-squared				0.529275
Adjusted R-squared				0.459168
F-statistic				7.549439
Prob(F-statistic)				0.000004
Durbin-Watson stat				0.990881

Source: Processed data (2026)

The FEM specification includes cross-section intercepts that capture unobserved heterogeneity across the five destination countries. However, the estimated fixed effects for each individual country are not reported in Table 4 due to space constraints and because the primary focus is on the slope coefficients. Without the country-specific intercepts, the interpretation of how each destination country's unique characteristics affect export volumes remains incomplete. Future reporting should include these values or at least summarize their range and significance.

The constant term (1604.135) would represent the estimated export volume when all independent variables are zero. However, this scenario is economically meaningless in a macroeconomic context, as inflation, exchange rates, and GDP are never simultaneously zero. Therefore, the constant should not be overinterpreted; it merely serves as a baseline adjustment in the regression.

The inflation coefficient is -107.489, with a probability of 0.0202 (< 0.05). This indicates that, holding other variables constant, a one-percentage-point increase in destination country inflation is associated with a decrease in Indonesia's crude oil exports of approximately 107.5 thousand tons. The effect is statistically significant at the 5% level, supporting H1.

The exchange rate coefficient is -2.236, with a probability of 0.2592 (> 0.05). The negative sign suggests that an increase in the destination country's exchange rate (local currency per USD, i.e., depreciation of the local currency) is associated with lower export volumes, but the effect is not statistically significant. Thus, H2 is not supported.

The GDP coefficient is 50.419, with a probability of 0.1378 (> 0.05). Although positive as hypothesized, the effect is not statistically significant. Therefore, H3 is not supported.

The F-statistic is 7.549 with a

probability of 0.000004 (< 0.05), indicating that the three independent variables jointly have a significant effect on Indonesia's crude oil exports. Thus, H4 is accepted. However, the R-squared value of 0.5293 means that only 52.93% of the variation in exports is explained by inflation, exchange rates, and GDP. The remaining 47.07% is attributable to other factors not included in the model such as global oil prices, energy policies of destination countries, domestic refinery capacity, geopolitical events, and long-term supply contracts. This moderate explanatory power suggests that the model, while statistically significant, leaves substantial variation unexplained, reinforcing the need for additional variables in future research.

Discussion

This study examined the effects of destination countries' inflation, exchange rates, and GDP on Indonesia's crude oil exports to five main destinations (Thailand, Malaysia, Singapore, Australia, and South Korea) over the 2014–2024 period. The empirical results reveal three main patterns. First, destination country inflation has a negative and statistically significant effect on export volume, supporting the price competitiveness channel. Second, both exchange rates and GDP exhibit the expected signs (negative for exchange rates, positive for GDP) but are statistically insignificant. Third, the three variables jointly explain approximately 53% of export variation, with the remaining 47% attributable to omitted factors such as global oil prices, energy policies, and long-term supply contracts. The following discussion interprets these findings within the context of international trade theory and prior empirical studies, while critically addressing the study's limitations.

The significant negative effect of inflation aligns with standard international trade theory, which emphasizes price stability as a determinant of export competitiveness (Krugman et al., 2023; Salvatore, 2019). When inflation rises in an importing country, production costs increase, industrial purchasing power declines, and demand for energy inputs including crude oil tends to fall. This cost-push inflation mechanism (Samuelson & Nordhaus, 2010) is particularly relevant for crude oil, a strategic commodity with relatively inelastic demand in the short run. Although demand is inelastic, a sustained increase in domestic prices in importing countries may still reduce import volumes by squeezing industrial profit margins and forcing energy saving adjustments.

This finding reinforces the results of Yazid et al. (2020), who also found a negative and significant effect of destination country inflation on Indonesia's crude oil exports using a panel of seven destination countries (2009–2018). However, it contrasts with Auliani & Purnomo (2025) , who reported a positive effect of inflation on Indonesia's oil exports to South Korea. This divergence may be explained by country-specific characteristics: South Korea, as a high-income OECD economy with a highly industrialized and energy-intensive structure, may exhibit different import responses compared to the ASEAN countries (Thailand, Malaysia, Singapore) and Australia included in this study. Specifically, South Korea's strategic energy reserves and long-term supply contracts might buffer the immediate impact of inflationary shocks. The present study's sample includes a mix of developed (Singapore, Australia, South Korea) and emerging (Thailand, Malaysia) economies, and the negative inflation effect appears robust across this heterogeneity.

The insignificant effect of exchange rates on crude oil exports, despite the negative sign consistent with theoretical

expectations, requires careful interpretation. Standard trade elasticity theory suggests that a depreciation of the importing country's currency increases the local cost of dollar-denominated oil, thereby reducing import demand (Salvatore, 2019). However, for strategic energy commodities like crude oil, several structural factors may weaken this relationship. First, crude oil trade is often governed by long-term contracts (typically one to five years) with prices linked to global benchmarks (e.g., Brent, Dubai). These contractual arrangements reduce the sensitivity of import volumes to short-run exchange rate fluctuations. Second, energy security concerns especially in oil-importing countries like South Korea and Singapore may lead to stable import volumes regardless of exchange rate movements, as governments prioritize supply reliability over price optimization. Third, as noted by Kurniawan et al. (2024), global oil prices have a more dominant influence on exchange rates than the reverse effect; the direction of causality may thus run from oil prices to exchange rates rather than from exchange rates to oil imports. The insignificance of exchange rates in this study is consistent with Vannezia & Aminda (2023) and Kardiana (2024), who also found no significant effect of exchange rates on Indonesia's export performance using VECM and time-series methods. However, it contrasts with Pemayun & Widanta (2024), who reported a significant negative effect. This discrepancy likely reflects differences in sample periods (their study covered 2003–2022, while this study includes post-pandemic years 2023–2024) and destination country coverage (nine countries versus five). The post-2022 period, characterized by global inflation and monetary tightening, may have altered exchange rate pass-through patterns.

Similarly, the insignificant positive effect of GDP, while theoretically expected (Mankiw, 2021; Todaro & Smith, 2020), suggests that crude oil export volumes are not strongly responsive to the economic growth of destination countries. Several explanations are plausible. First, all five destination countries have actively pursued energy diversification policies, reducing their dependence on crude oil as a share of total primary energy consumption. Singapore, for example, has invested heavily in liquefied natural gas (LNG) and renewable energy; South Korea and Australia have expanded nuclear and renewable capacity (Arintoko & Kadarwati, 2024). Second, Indonesia's own declining crude oil production and its transition to a net importer since 2004 mean that exportable volumes are increasingly constrained by supply-side factors rather than by foreign demand. Third, the income elasticity of crude oil demand in advanced economies is low, as energy consumption has decoupled from GDP growth due to efficiency improvements and structural shifts toward services (Hamilton, 2009). This finding aligns with Yazid et al. (2020), who also found GDP insignificant for Indonesia's crude oil exports, but contrasts with Rangkuty et al. (2024), who reported a significant positive effect for Indonesia's aggregate exports. The difference underscores the importance of commodity-specific analysis: aggregate exports include coal, palm oil, and nickel, which have higher income elasticities than crude oil.

The joint significance of the three variables (F-test $p < 0.001$) confirms that macroeconomic conditions in destination countries collectively matter for Indonesia's crude oil export performance. This is consistent with Todaro & Smith (2020) and Devi & Sutrisna (2021), who argued that export performance results from the interaction between domestic supply advantages and destination country economic dynamics. However, the

R-squared of 0.529 indicates that nearly half of the variation in exports remains unexplained. This is not surprising given the complexity of crude oil trade, which is shaped by global oil prices (Hamilton, 2009; Moshiri & Kheirandish, 2024), destination countries' energy policies (e.g., renewable energy targets, strategic petroleum reserves), geopolitical events (e.g., the Russia-Ukraine conflict), and Indonesia's own production capacity and export restrictions (Kementrian ESDM, 2021). The unexplained variance suggests that future research should incorporate these omitted variables, possibly using richer datasets or alternative methods such as ARDL or panel cointegration.

The discussion acknowledges several conceptual limitations. First, the theoretical framework assumes linear relationships, but the effects of inflation, exchange rates, and GDP may be asymmetric for example, inflationary spikes could have larger impacts than moderate inflation. Second, the study does not account for potential endogeneity, as crude oil exports may themselves influence destination countries' GDP or exchange rates through supply shocks. Third, the absence of lag structures ignores delayed effects: changes in GDP or exchange rates may take one or two years to fully affect trade flows. Fourth, the model does not include global oil prices, which are widely recognized as a primary driver of crude oil trade. These limitations imply that the findings should be interpreted as associations rather than causal effects. The study's contribution lies in providing a focused, recent panel analysis of Indonesia's crude oil exports to its five most consistent trading partners, while clearly identifying directions for future research.

The inconsistent results across studies on this topic can now be better understood. Some studies find significant GDP effects (Rangkuty et al., 2024), while others (including this study) do not. The difference likely stems from the level of commodity aggregation: studies using aggregate exports tend to find significant GDP effects because non-oil commodities dominate. Studies focusing specifically on crude oil (Pemayun & Widanta, 2024; Yazid et al., 2020) tend to find weak or insignificant GDP effects, reflecting the unique characteristics of oil trade. Similarly, exchange rate effects are significant in some panels but not others, depending on the inclusion of countries with flexible versus managed exchange rate regimes (e.g., Singapore's managed float vs. Malaysia's managed float vs. Australia's free float). This study's finding of insignificant exchange rate effects may be partly due to the mix of exchange rate regimes in the sample. The significant negative inflation effect, however, appears robust across most crude oil-focused studies, suggesting that price stability in destination countries is a consistently important determinant.

In summary, the discussion emphasizes that while standard macroeconomic variables matter, crude oil exports are only partially explained by inflation, exchange rates, and GDP. The significant role of destination inflation highlights the importance for Indonesian policymakers to monitor inflationary trends in key trading partners. However, the insignificance of exchange rates and GDP suggests that efforts to boost crude oil exports through exchange rate manipulation or reliance on partner country growth alone are unlikely to be effective. Instead, structural factors such as maintaining production capacity, negotiating long-term contracts, and diversifying export destinations may be more relevant. For future research, incorporating global oil prices, energy policy indicators, and lag structures, as well as testing for asymmetry and endogeneity, would provide a more

complete understanding of crude oil export dynamics.

CONCLUSION

This study examined the effects of inflation, exchange rates, and GDP of destination countries on Indonesia's crude oil exports to Thailand, Malaysia, Singapore, Australia, and South Korea (2014–2024) using panel data regression with the Fixed Effect Model. The results show that destination inflation has a negative and significant effect on export volume, while exchange rates and GDP are insignificant. The three variables jointly explain approximately 53 percent of export variation.

The main analytical contribution is that among standard macroeconomic determinants, only destination inflation consistently influences crude oil exports, reflecting the price competitiveness channel. The insignificance of exchange rates and GDP suggests that crude oil trade is less responsive to short-run currency fluctuations and partner country income growth, consistent with long-term contracts and inelastic energy demand.

Policy implications are that Indonesian authorities should monitor inflation trends in key destination countries. However, boosting exports through exchange rate manipulation or relying on partner GDP growth alone is unlikely to be effective. Maintaining production capacity, negotiating long-term contracts, and diversifying export destinations are more realistic strategies.

Limitations of this study include small sample size (55 observations), moderate explanatory power ($R^2 = 0.53$), omitted variables (e.g., global oil prices, energy policies), and absence of causality tests. Future research should incorporate additional variables, larger panels, and methods addressing endogeneity.

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