

Macroeconomic Determinants of Indonesia's Refined Palm Oil Export Performance: Evidence from China, India and Pakistan (2010-2024)

Jeisica^{1*}, Niniek Imaningsih¹

Afiliation ¹Universitas Pembangunan Nasional Veteran Jawa Timur

Email 22011010116@student.upnjatim.ac.id*

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ABSTRACT

Indonesia is the world's largest producer and exporter of palm oil, with refined palm oil (RPO) playing an increasingly strategic role in export diversification and downstream industrialization. However, the export performance of Indonesia's refined palm oil remains volatile, indicating that competitiveness is influenced not only by production capacity but also by macroeconomic conditions, external demand, and international competition. This study examines the determinants of Indonesia's refined palm oil exports to China, India, and Pakistan during 2010–2024 using a panel data econometric approach. The analysis incorporates the Real Effective Exchange Rate (REER), trading partner GDP, competitor prices, and downstream industrial policy within a unified framework. Model selection tests identify the Common Effect Model (CEM) as the most appropriate specification. The results show that REER has a negative and statistically significant effect on exports, indicating that exchange rate appreciation weakens Indonesia's export competitiveness. In contrast, trading partner GDP and competitor prices positively and significantly affect refined palm oil exports, reflecting the importance of external demand and substitution effects in global markets. Meanwhile, the downstream industrial policy variable has a positive but statistically insignificant effect. Overall, the findings suggest that Indonesia's refined palm oil exports are primarily driven by international competitiveness and global market dynamics rather than domestic policy intervention alone.

Keywords: Competitor Prices, Export Determinants, GDP, REER, RPO Trade

JEL Classification: F14, C23, O24

INTRODUCTION

Indonesia has long been recognized as the world's largest producer and exporter of palm oil, positioning the commodity as a strategic pillar of national trade performance, industrial development, and foreign exchange earnings. The palm oil sector plays a central role in Indonesia's economic structure through employment generation, rural economic development, and export revenue creation. In recent years, refined palm oil (RPO) products have become increasingly important as Indonesia intensifies downstream industrialization policies aimed at shifting exports from primary commodities toward higher value-added manufactured products (Purnomo et al., 2020; OECD, 2020). The increasing global demand for palm oil derivatives in food processing, oleochemical, cosmetic, and biofuel industries has further strengthened the strategic position of refined palm oil within global production and trade networks (Shigetomi et al., 2020; UNCTAD, 2023).

Despite Indonesia's dominant production capacity, the export performance of refined palm oil to major importing countries such as China, India, and Pakistan has shown fluctuating and heterogeneous trends over time. These dynamics indicate that export competitiveness cannot be explained solely by production scale or natural resource endowment. Instead, refined palm oil exports are influenced by interactions among macroeconomic stability, international demand conditions, price competitiveness, exchange rate movements, and industrial policy implementation (Kartowisastro et al., 2024; Lugo-Arias et al., 2024; Tandra & Suroso, 2023). The persistence of export volatility suggests that Indonesia's refined palm oil competitiveness remains highly sensitive to both domestic economic conditions and global market uncertainty.

One of the most important determinants of export competitiveness is exchange rate performance, particularly the Real Effective Exchange Rate (REER), which reflects a country's relative international price competitiveness. An appreciation of the REER increases the relative price of exports and potentially weakens international demand, whereas depreciation tends to improve export competitiveness (Habib et al., 2017; Bahmani-Oskooee & Aftab, 2017). At the same time, demand conditions in importing countries are strongly associated with income growth, purchasing power, and macroeconomic stability, making export demand inherently cyclical and externally driven (Santos-Paulino & Thirlwall, 2015). Competition with Malaysia as another major refined palm oil exporter further intensifies market dynamics because importing countries continuously adjust sourcing decisions based on relative prices, trade costs, and supply reliability (Rahman et al., 2021).

Although the Indonesian government has implemented downstream palm oil policies aimed at strengthening domestic refining capacity and increasing export value added,

empirical evidence regarding the effectiveness of these policies remains mixed. Downstream industrialization is expected to encourage industrial upgrading, technological capability enhancement, and export diversification; however, sustainability regulations, trade barriers, and environmental standards continue to shape international market access and competitiveness (Kurniawan et al., 2023; Purnomo et al., 2020; Meijaard et al., 2020). This condition implies that refined palm oil exports are influenced not only by domestic policy intervention but also by broader macroeconomic conditions, international competition, and structural transformation within global value chains.

From a theoretical perspective, contemporary international trade is increasingly explained not only by comparative advantage but also by demand structures and global production networks. Export demand theory argues that exports are determined by relative prices, income levels in destination countries, and prices of substitute goods (Santos-Paulino & Thirlwall, 2015). Within this framework, the Real Effective Exchange Rate (REER) represents international price competitiveness, trading partner GDP proxies market size and purchasing power, while competitor prices capture substitution effects in international commodity markets (Feenstra & Taylor, 2021). These mechanisms are highly relevant for refined palm oil markets where buyers continuously compare suppliers based on price efficiency, product quality, and supply stability.

Complementing this perspective, New Trade Theory emphasizes economies of scale, product differentiation, and government intervention as major determinants of trade specialization and industrial competitiveness (Krugman et al., 2018). Indonesia's downstream palm oil policy represents a form of strategic industrial intervention intended to transform export structures toward higher value-added manufacturing activities rather than reliance on primary commodity exports. Nevertheless, empirical findings indicate that industrial policies do not automatically improve export performance, particularly under conditions of increasing global competition, sustainability-related trade restrictions, and uncertainty in global value chains (Rodrik, 2016; Baldwin, 2022).

Recent empirical studies provide growing evidence regarding the determinants of palm oil trade performance. Lugo-Arias et al. (2024) demonstrate that exchange rates and price competitiveness significantly affect palm oil export performance in the long run. Tandra and Suroso (2023) identify structural factors such as population size and vegetable oil imports as important determinants of comparative advantage, while sustainability concerns may negatively affect exports to developed markets. Abdullah et al. (2024) show that Indonesia's palm oil exports to India are influenced by prices, tariffs, exchange rates, and income levels, with refined palm oil products exhibiting higher sensitivity to substitute prices. Supporting these findings, Nkhoma et al. (2021) find that trading partner GDP and export prices significantly influence export demand,

while [Ismail et al. \(2022\)](#) highlight the importance of income levels and sustainability restrictions in determining Malaysian palm oil export performance.

Despite these contributions, several important research gaps remain. First, most previous studies focus on crude palm oil (CPO) or aggregated palm oil commodities, while empirical analysis specifically examining refined palm oil exports (HS 151190) remains relatively limited. Second, earlier research tends to examine macroeconomic variables, competitiveness factors, or policy interventions separately, resulting in fragmented explanations of export performance. Third, the effectiveness of downstream industrial policies in strengthening export competitiveness remains empirically debated, especially amid increasing sustainability pressures and global trade restructuring ([Baldwin, 2022](#); [Rodrik, 2016](#)). Therefore, a more integrated empirical framework that simultaneously incorporates macroeconomic competitiveness, external demand conditions, market competition, and industrial policy is necessary to better understand Indonesia's refined palm oil export performance.

Responding to these gaps, this study examines the determinants of Indonesia's refined palm oil exports by integrating the Real Effective Exchange Rate (REER), trading partner GDP, competitor prices, and downstream policy within a unified analytical framework. By combining macroeconomic variables with industrial policy dimensions, this study contributes to the literature by bridging export demand theory with contemporary perspectives on industrial upgrading and global value chain participation. Empirically, the study provides updated evidence using panel data analysis covering major importing countries during the 2010–2024 period. From a policy perspective, the findings are expected to provide insights into how Indonesia can strengthen export competitiveness, enhance downstream industrial transformation, and sustain refined palm oil performance in increasingly competitive global markets ([OECD, 2020](#); [UNCTAD, 2023](#)).

METHOD

This study employs a quantitative approach using panel data econometric analysis to investigate the determinants of Indonesia's refined palm oil (RPO) exports to major importing countries, namely China, India, and Pakistan, during the period 2010–2024. The panel data approach is selected because it combines cross-sectional dimensions across countries with time-series observations over multiple periods, thereby enabling the estimation to capture both inter-country heterogeneity and temporal macroeconomic dynamics simultaneously. Compared with pure cross-sectional or time-series methods, panel data estimation offers several econometric advantages, including higher degrees of freedom, greater variability of observations, lower multicollinearity, and improved estimation efficiency ([Baltagi, 2021](#); [Wooldridge, 2019](#)). Furthermore, panel data models are highly relevant in international trade studies

because export performance is inherently influenced by structural country characteristics and dynamic global economic conditions over time.

The analytical framework of this study is derived from export demand theory and New Trade Theory. Export demand theory emphasizes that export performance is primarily determined by relative prices, income levels in destination countries, and substitute commodity prices, while New Trade Theory highlights the role of industrial policy, economies of scale, and competitiveness in shaping international trade specialization (Feenstra & Taylor, 2021; Krugman et al., 2018). Based on these theoretical foundations, Indonesia's refined palm oil exports are assumed to be influenced by macroeconomic competitiveness represented by the Real Effective Exchange Rate (REER), external demand conditions represented by trading partner GDP, international market competition reflected in competitor prices, and industrial policy intervention through downstream palm oil policy implementation.

To empirically estimate these relationships, the baseline panel regression model is formulated as follows:

$$EXPORT_{it} = \alpha + \beta_1 REER_{it} + \beta_2 GDP_{it} + \beta_3 PRICE_{it} + \beta_4 POLICY_{it} + \mu_i + \lambda_t + \varepsilon_{it} \dots\dots(1)$$

The empirical model consists of several variables representing export performance, macroeconomic competitiveness, market demand, international competition, and industrial policy intervention. In this study, $EXPORT_{it}$ refers to Indonesia's refined palm oil export value to importing country i during period t , which serves as the primary indicator of export performance. The variable $REER_{it}$ represents Indonesia's Real Effective Exchange Rate, functioning as a proxy for international price competitiveness because changes in the exchange rate affect the relative prices of Indonesian exports in global markets. Meanwhile, GDP_{it} denotes the gross domestic product of trading partner countries, reflecting external demand conditions, market size, and purchasing power in destination markets. The variable $PRICE_{it}$ represents Malaysia's refined palm oil export price, which is used as a proxy for competitor prices to capture substitution effects and competitive dynamics in international palm oil trade. Furthermore, $POLICY_{it}$ is incorporated as a dummy variable representing the implementation phase of Indonesia's downstream palm oil industrialization policy, intended to capture the impact of industrial upgrading and value-added export strategies on refined palm oil export performance.

In the regression equation, α denotes the intercept parameter, while β_1 to β_4 represent the slope coefficients that measure the magnitude and direction of the influence of each explanatory variable on refined palm oil exports. The term μ_i captures unobserved country-specific effects that may arise from structural differences among importing countries, such as institutional quality, trade preferences, regulatory systems, and consumption patterns, which are difficult to measure directly but may systematically affect export demand. In addition, λ_t represents time-specific effects that account for global macroeconomic shocks, commodity price fluctuations, international crises, and

other common disturbances affecting all countries simultaneously over the observation period. Finally, ε_{it} denotes the stochastic error term capturing unexplained variations in Indonesia's refined palm oil exports beyond the variables included in the model.

To improve elasticity interpretation, reduce heteroskedasticity, and stabilize data variance, this study further develops a log-linear transformation model for variables expressed in continuous numerical form. The logarithmic transformation is commonly used in international trade analysis because estimated coefficients can be directly interpreted as elasticities, indicating the percentage response of exports to changes in explanatory variables (Wooldridge, 2019). Accordingly, the extended log-linear specification is formulated as follows:

$$\ln EXPORT_{it} = \alpha + \beta_1 \ln REER_{it} + \beta_2 \ln GDP_{it} + \beta_3 \ln PRICE_{it} + \beta_4 POLICY_{it} + \mu_i + \lambda_t + \varepsilon_{it} \dots\dots\dots(2)$$

In the transformed log-linear model, the dependent variable and all continuous independent variables are expressed in natural logarithmic form, whereas the policy variable remains in dummy form because it represents a categorical condition rather than a continuous numerical measure. Under this specification, the estimated coefficients can be directly interpreted as elasticities. Specifically, the coefficient β_1 measures the elasticity of Indonesia's refined palm oil exports with respect to changes in the Real Effective Exchange Rate (REER), indicating the percentage change in exports resulting from a one percent change in international price competitiveness. The coefficient β_2 represents the elasticity of exports toward trading partner income, reflecting how changes in the GDP of importing countries affect Indonesia's refined palm oil export demand. Meanwhile, the coefficient β_3 captures the elasticity effect of competitor prices, particularly Malaysia's refined palm oil export prices, on Indonesia's export performance in international markets.

The application of the log-linear model is expected to produce more robust and reliable estimates because international trade and macroeconomic variables generally exhibit exponential growth patterns, non-linear relationships, and substantial value dispersion over time. Moreover, logarithmic transformation helps reduce heteroskedasticity problems, stabilize variance, and improve the normality of data distribution, thereby enhancing the overall econometric properties of the panel regression model. The operational definitions of variables used in this study are presented in Table 1.

Table 1. Operational Definition and Measurement of Variables

Variable	Conceptual Definition	Economic Interpretation	Measurement Unit	Expected Sign	Data Source
Export (EXPORT)	Indonesia's refined palm oil exports (HS 151190) to	Indicator of export performance and	USD (Export Value)	Dependent	UN Comtrade

Variable	Conceptual Definition	Economic Interpretation	Measurement Unit	Expected Sign	Data Source
	destination countries	market penetration			
Real Effective Exchange Rate (REER)	Inflation-adjusted exchange rate relative to trading partners	Measures international price competitiveness	Index (2010=100)	Negative	Bank for International Settlements (BIS)
Trading Partner GDP (GDP)	Economic size and purchasing power of importing countries	Proxy for external demand and market capacity	Constant USD	Positive	World Bank
Competitor Price (PRICE)	Malaysia's refined palm oil export price	Represents substitution and market competition effects	USD/kg	Positive	UN Comtrade
Downstream Policy (POLICY)	Implementation phase of Indonesia's downstream palm oil industrialization policy	Captures industrial upgrading and value-added strategy	Dummy Variable (1 = post-policy period; 0 = pre-policy period)	Positive	Government Regulation No. 14/2015

Source: Processed data, 2026

This study relies exclusively on secondary data obtained from internationally recognized institutions to ensure reliability, consistency, and comparability across countries and periods. Export data for Indonesia's refined palm oil (HS 151190) are obtained from the UN Comtrade database, which provides internationally harmonized trade statistics. Real Effective Exchange Rate (REER) data are sourced from the Bank for International Settlements (BIS), while GDP data for importing countries are collected from the World Bank's World Development Indicators (WDI) database. Competitor price data representing Malaysia's refined palm oil export prices are also retrieved from UN Comtrade. The use of internationally standardized databases minimizes measurement bias and improves the reliability of empirical estimation in cross-country trade analysis.

The estimation procedure follows standard panel data econometric techniques. The analysis begins with the Common Effect Model (CEM) or pooled ordinary least squares estimation, which assumes homogeneity across cross-sectional units. However, because trade relationships among importing countries are unlikely to be identical, model specification tests are conducted to determine the most appropriate panel estimation model.

First, the Chow test is employed to compare the Common Effect Model (CEM) and the Fixed Effect Model (FEM). A significant Chow test indicates that country-specific effects exist and that the FEM is preferred over pooled estimation. Second, the Lagrange Multiplier (LM) test developed by Breusch and Pagan is used to compare the Common

Effect Model and the Random Effect Model (REM). Finally, the Hausman specification test is conducted to determine whether the Fixed Effect Model or Random Effect Model is more appropriate by examining the correlation between individual effects and explanatory variables. If the individual effects are correlated with the regressors, FEM is preferred; otherwise, REM provides more efficient estimates.

To ensure estimator reliability and avoid biased statistical inference, several classical assumption and diagnostic tests are conducted after selecting the optimal model specification. Multicollinearity testing is performed using correlation matrices and Variance Inflation Factors (VIF) to verify that explanatory variables do not exhibit excessive linear dependence. Heteroskedasticity testing is conducted to examine whether error variances remain constant across observations. In the presence of heteroskedasticity, robust standard errors are employed to obtain consistent parameter estimates. Additionally, autocorrelation testing is carried out because panel data structures frequently exhibit serial correlation across time periods, particularly in macroeconomic and trade variables.

Considering the possibility of cross-sectional dependence arising from global commodity market integration and international economic shocks, this study also performs cross-sectional dependence testing using the Pesaran CD test. If cross-sectional dependence is detected, robust covariance estimators are applied to improve estimation consistency and statistical reliability.

Hypothesis testing is conducted using partial significance tests (t-statistics) to evaluate the individual influence of each explanatory variable on refined palm oil exports. Simultaneously, F-statistics are employed to examine the joint significance of all explanatory variables in explaining export performance. The coefficient of determination (R^2) is used to measure the explanatory power of the model, indicating the proportion of variation in refined palm oil exports explained by macroeconomic competitiveness, external demand conditions, market competition, and downstream industrial policy variables.

To strengthen empirical robustness, this study compares estimation results between the level-form specification and the log-linear specification. Consistent coefficient signs and significance levels across models are interpreted as evidence of estimation robustness and structural consistency in the determinants of Indonesia's refined palm oil exports.

RESULT

This section presents the empirical findings regarding the determinants of Indonesia's refined palm oil (RPO) exports to major importing countries during the 2010–2024 period. The analysis begins with panel data model selection procedures to identify the most appropriate estimation model before interpreting the regression results. Selecting the correct panel data specification is essential because different models produce different assumptions regarding the existence of individual heterogeneity and

the correlation structure among observations. An inappropriate model specification may lead to biased and inefficient estimators, thereby affecting the validity of statistical inference.

In panel data econometrics, three alternative estimation approaches are commonly employed, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The Common Effect Model assumes that all cross-sectional units share identical intercepts and slope coefficients, implying homogeneity across countries. In contrast, the Fixed Effect Model allows individual-specific heterogeneity through varying intercepts, while the Random Effect Model treats individual effects as part of the stochastic disturbance term. To determine the most suitable specification, this study conducts the Chow test and the Lagrange Multiplier (LM) test.

The Chow test is first applied to compare the Common Effect Model (CEM) and the Fixed Effect Model (FEM). The test result shows a probability value of 0.1830, which is greater than the 5 percent significance level. This finding indicates that the Fixed Effect Model is not statistically required because there is insufficient evidence of significant individual heterogeneity across importing countries. Therefore, the Common Effect Model is preferred over the Fixed Effect Model.

Subsequently, the Lagrange Multiplier (Breusch–Pagan) test is conducted to compare the Common Effect Model (CEM) and the Random Effect Model (REM). The LM test produces a probability value of 0.6002, which is also higher than the 5 percent significance level. This result suggests that random effects are not statistically significant, indicating that the Random Effect Model does not provide a better estimation than the pooled regression approach. Consequently, the Common Effect Model remains the preferred specification. The complete results of the panel data model selection tests are presented in Table 2.

Table 2. Panel Data Model Selection Results

Test	Model Compared	Statistic / Probability	Decision Rule	Result	Selected Model
Chow Test	CEM vs FEM	Prob. Chi-square = 0.1830	Prob. > 0.05 → CEM preferred	FEM not required	CEM
Lagrange Multiplier (Breusch–Pagan)	CEM vs REM	Prob. = 0.6002	Prob. > 0.05 → CEM preferred	Random effect not detected	CEM

Source: Processed data (2026).

Based on the overall model selection procedures, the Common Effect Model (CEM) is identified as the most appropriate estimation model for this study. The results imply that the export behavior of Indonesia's refined palm oil to China, India, and Pakistan does not exhibit sufficiently strong country-specific effects to justify the use of Fixed Effect or Random Effect estimation. In other words, the variations in refined palm oil

exports are more strongly explained by the observed explanatory variables, namely exchange rate competitiveness, trading partner income, competitor prices, and downstream policy, rather than by unobserved cross-country heterogeneity. Therefore, subsequent regression analysis and hypothesis testing are conducted using the Common Effect Model specification.

Following the selection of the Common Effect Model (CEM) as the most appropriate panel estimation approach, the regression analysis was conducted using the log-linear specification to examine the determinants of Indonesia's refined palm oil exports during the 2010–2024 period. Prior to interpreting the estimation results, several diagnostic and classical assumption tests were performed to ensure the reliability and robustness of the regression model. The results indicate that the estimated model has passed the classical assumption tests, including multicollinearity, heteroskedasticity, and autocorrelation diagnostics. In addition, robust standard errors were applied to strengthen estimator consistency and minimize potential bias arising from panel data disturbances. Therefore, the estimated coefficients can be considered statistically reliable and econometrically robust for interpretation and policy inference. The regression estimation results are presented in Table 3.

Table 3. Panel Data Regression Results (Log Specification)

Variable	Coefficient	Std. Error	t-Statistic
Constant	2.913***	1.001	2.914
Ln(REER)	-0.295***	0.1	-2.95
Ln(GDP Partner)	0.267**	0.1	2.675
Ln(Competitor Price)	0.392***	0.1	3.915
Policy Dummy	0.055	0.099	0.554
F-statistic	14.24791*		
Prob(F-statistic)	0.0000		
R-squared	0.5876		
Adjusted R-squared	0.5464		
Observations	45		

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Source: Processed data (2026).

The regression results demonstrate that the overall model is statistically significant, as indicated by the probability value of the F-statistic, which is substantially below the 5 percent significance level. This finding confirms that the explanatory variables jointly influence Indonesia's refined palm oil exports during the observation period. Furthermore, the adjusted R^2 value of 0.546353 indicates that approximately 54.64 percent of the variation in Indonesia's refined palm oil exports can be explained by the variables incorporated in the model, namely exchange rate competitiveness, trading partner income, competitor prices, and downstream policy intervention. The remaining variation is associated with other external and structural factors not explicitly included in the regression model, such as transportation costs, trade facilitation, global commodity cycles, geopolitical tensions, logistics efficiency, and sustainability-related trade restrictions.

Among the explanatory variables, the Real Effective Exchange Rate (REER) exhibits a negative and statistically significant relationship with refined palm oil exports. The elasticity coefficient of -0.295 indicates that a one percent appreciation in Indonesia's REER reduces refined palm oil exports by approximately 0.295 percent, *ceteris paribus*. This finding confirms that export competitiveness in the refined palm oil sector remains highly sensitive to international relative price movements. An appreciation of the REER increases the relative price of Indonesian exports in foreign markets, thereby weakening Indonesia's price competitiveness compared with competing exporting countries.

The significance of the REER variable reflects the importance of macroeconomic stability in sustaining export performance within commodity-based industries. Since refined palm oil products are traded in highly competitive international markets characterized by relatively homogeneous product structures, importers tend to respond strongly to changes in relative prices. Consequently, appreciation in the exchange rate may induce importing countries to shift their sourcing decisions toward alternative suppliers offering more competitive export prices. This result reinforces export demand theory, which argues that international trade performance is strongly influenced by relative price competitiveness and exchange rate dynamics. The finding is also consistent with previous empirical studies emphasizing the importance of exchange rate stability in determining agricultural and commodity export performance in emerging economies (Habib et al., 2017; Lugo-Arias et al., 2024).

The estimation results further reveal that trading partner GDP positively and significantly affects Indonesia's refined palm oil exports. The coefficient value of 0.267 indicates that a one percent increase in the GDP of importing countries contributes to an approximately 0.267 percent increase in Indonesia's refined palm oil exports. This finding suggests that external demand conditions remain a crucial driver of export growth. Economic expansion in importing countries generally increases industrial activity, household consumption, and purchasing power, thereby stimulating demand for refined palm oil products utilized in food processing, cosmetics, oleochemicals, and biofuel industries.

The positive elasticity of trading partner GDP also indicates that Indonesia's refined palm oil exports are highly integrated into global production and consumption networks. Stronger economic growth in destination countries increases market absorption capacity and strengthens import demand for intermediate and industrial commodities. Conversely, economic slowdowns or recessions in major importing countries may directly weaken export demand and reduce export performance. This finding confirms the central role of external macroeconomic conditions in shaping export-oriented commodity sectors and supports international trade literature emphasizing the significance of income elasticity in export demand functions (Feenstra & Taylor, 2021).

The competitor price variable exhibits the strongest positive coefficient in the model, indicating that changes in Malaysia's refined palm oil export prices significantly affect

Indonesia's export performance. The elasticity coefficient of 0.392 implies that a one percent increase in competitor prices leads to an approximately 0.392 percent increase in Indonesia's refined palm oil exports. This result demonstrates the existence of strong substitution effects within the international palm oil market, where importing countries continuously compare relative prices among major exporting countries before determining sourcing decisions.

The relatively large coefficient magnitude associated with competitor prices suggests that market competition plays a dominant role in determining refined palm oil export dynamics. This finding reflects the highly interconnected and oligopolistic structure of the global palm oil market, where pricing behavior and supply conditions among major exporters substantially influence international trade flows. When Malaysia's export prices increase, Indonesian refined palm oil products become relatively more attractive and competitive in international markets, thereby encouraging import substitution toward Indonesian exports. Previous studies similarly highlight that Indonesia and Malaysia compete intensely in terms of export pricing and international market share within the global palm oil industry (Rahman et al., 2021; Tandra & Suroso, 2023).

Meanwhile, the downstream policy dummy variable shows a positive but statistically insignificant coefficient. Although the positive sign suggests that downstream industrialization policies may contribute to export expansion, the absence of statistical significance indicates that the direct impact of policy intervention on refined palm oil export performance remains relatively limited during the observation period. This result may imply that the benefits of downstream industrial transformation require a longer adjustment period before generating measurable improvements in export competitiveness.

The insignificant policy effect may also reflect the complexity of structural transformation in the palm oil sector. Industrial upgrading not only depends on refining capacity expansion but also requires improvements in technological capability, logistics infrastructure, institutional coordination, and international market integration. Furthermore, increasing sustainability standards, environmental regulations, and certification requirements imposed by global markets may constrain the effectiveness of domestic industrial policies in enhancing export performance. As a result, policy intervention alone may not be sufficient to strengthen international competitiveness without broader improvements in productivity, efficiency, and market adaptability.

Overall, the empirical findings suggest that Indonesia's refined palm oil exports remain predominantly driven by external market conditions and international competitiveness factors rather than by domestic industrial policy alone. Exchange rate stability, external economic growth, and relative competitor pricing emerge as the primary determinants shaping export performance in global refined palm oil markets. These findings imply that sustaining Indonesia's competitiveness requires not only downstream industrial policies but also stronger macroeconomic management, greater production efficiency,

and enhanced adaptability to evolving global market structures and sustainability requirements.

DISCUSSION

The empirical findings indicate that Indonesia's refined palm oil (RPO) exports are primarily driven by international competitiveness and external demand conditions rather than by domestic industrial policy intervention alone. The regression results reveal that exchange rate competitiveness, trading partner income, and competitor prices significantly influence Indonesia's refined palm oil exports, whereas the downstream industrialization policy does not yet exert a statistically significant direct effect during the observation period. These findings reflect the structural characteristics of the global palm oil market, where export performance is highly sensitive to relative prices, external macroeconomic conditions, and competition among major exporting countries.

The negative and statistically significant effect of the Real Effective Exchange Rate (REER) confirms the importance of macroeconomic competitiveness in sustaining Indonesia's refined palm oil exports. The estimated elasticity implies that appreciation in Indonesia's REER weakens export performance by increasing the relative price of Indonesian refined palm oil products in international markets. This condition reduces Indonesia's price competitiveness compared with competing exporters and subsequently lowers import demand from destination countries. In commodity-based markets characterized by relatively homogeneous products, importers are generally highly responsive to price differentials among suppliers, making exchange rate movements a critical determinant of export competitiveness.

From a theoretical perspective, this finding strongly supports export demand theory, which emphasizes that international trade flows are influenced by relative prices and exchange rate dynamics. Appreciation of the real exchange rate increases export prices in foreign currency terms, thereby reducing the attractiveness of domestic products in international markets. Consequently, importing countries may reduce imports or shift sourcing decisions toward alternative exporters offering lower relative prices. The result also reflects the broader dynamics of global commodity trade, where efficiency and price competitiveness remain dominant factors shaping market access and export performance (Feenstra & Taylor, 2021).

The result is consistent with previous empirical studies highlighting the role of exchange rate competitiveness in commodity exports. Lugo-Arias et al. (2024) found that exchange rate appreciation weakens palm oil export performance because it increases relative export prices in international trade. Similarly, Habib et al. (2017) argued that real exchange rate appreciation reduces export-oriented competitiveness by eroding comparative pricing advantages in global markets. In the context of Indonesia's refined palm oil sector, the findings imply that exchange rate stability remains essential for maintaining export competitiveness and sustaining Indonesia's

market position in the global vegetable oil industry (Habib et al., 2017; Lugo-Arias et al., 2024).

The positive and statistically significant effect of trading partner GDP further demonstrates that external demand conditions constitute an important determinant of Indonesia's refined palm oil exports. Economic growth in importing countries increases industrial production, household purchasing power, and consumption demand, thereby stimulating imports of refined palm oil products used in food processing, cosmetics, oleochemicals, and biofuel industries. This finding confirms that Indonesia's refined palm oil exports are strongly integrated into global production and consumption networks, where export demand is closely associated with macroeconomic conditions in destination markets.

The positive income elasticity observed in this study indicates that refined palm oil functions not only as a consumption commodity but also as an important intermediate industrial input. As importing countries experience economic expansion, industrial activities requiring palm oil derivatives also increase, thereby strengthening demand for Indonesia's refined palm oil exports. This finding aligns with international trade theory, which argues that foreign income growth represents one of the principal determinants of export demand because rising purchasing power generally increases import absorption capacity (Feenstra & Taylor, 2021).

The findings are also supported by previous empirical studies examining palm oil trade dynamics. Abdullah et al. (2024) demonstrated that income growth and domestic economic conditions significantly influence India's import demand for Indonesian palm oil products. Similarly, Priyati (2018) emphasized that GDP growth in importing countries positively affects global palm oil demand through increased industrial activity, purchasing power, and consumption demand. The consistency of these findings indicates that economic growth in major destination markets remains a critical driver of Indonesia's refined palm oil export expansion (Abdullah et al., 2024; Priyati, 2018).

Among all explanatory variables, competitor prices exhibit the strongest positive influence on Indonesia's refined palm oil exports. The positive elasticity indicates that increases in Malaysia's refined palm oil export prices improve Indonesia's relative competitiveness, thereby encouraging importing countries to shift part of their demand toward Indonesian exports. This finding confirms the existence of strong substitution effects within the international palm oil market, where importing countries continuously compare export prices among major suppliers before determining sourcing decisions.

The dominant influence of competitor prices reflects the oligopolistic structure of the global palm oil market, where Indonesia and Malaysia account for the majority of world palm oil exports and compete intensively in terms of pricing, market access, and supply reliability. Under such market conditions, relatively small changes in export prices among dominant suppliers may substantially affect international trade flows and market shares. Consequently, Indonesia's export performance is highly dependent not

only on domestic competitiveness but also on the pricing strategies and supply conditions of competing exporters.

This finding supports export demand theory, which argues that relative prices among substitute exporters strongly influence import demand allocation in international markets. The result is also consistent with [Rahman et al. \(2021\)](#), who found that Indonesia's and Malaysia's palm oil exports are highly interdependent due to similarities in export structures and destination markets. Likewise, [Tandra and Suroso \(2023\)](#) emphasized that relative export prices remain one of the most important determinants of comparative advantage and export competitiveness in the global palm oil industry ([Rahman et al., 2021](#); [Tandra & Suroso, 2023](#)).

In contrast to the significant effects of macroeconomic competitiveness and external demand variables, the downstream industrial policy variable exhibits a positive but statistically insignificant effect. Although the positive sign suggests that downstream industrialization policies may contribute to export enhancement, the absence of statistical significance indicates that the direct effect of policy intervention on Indonesia's refined palm oil export performance remains relatively limited during the study period.

Several structural explanations may account for this finding. First, industrial transformation policies generally require long-term adjustment processes before generating measurable improvements in export competitiveness. The development of downstream industries involves substantial investments in refining capacity, technological upgrading, logistics infrastructure, and industrial integration, all of which require time before translating into stronger export performance. Consequently, the benefits of downstream industrialization may not yet be fully reflected within the observation period covered in this study.

Second, the effectiveness of downstream industrialization policies may be constrained by increasing sustainability pressures and environmental regulations within global palm oil markets. Importing countries increasingly impose stricter sustainability standards, traceability requirements, and certification mechanisms that directly influence market access and export competitiveness. Although Indonesia has implemented the Indonesian Sustainable Palm Oil (ISPO) certification system to strengthen the sustainability dimension of the domestic palm oil industry, international recognition and acceptance of domestic certification systems remain uneven across export markets. This condition potentially limits the extent to which downstream policies can directly improve export competitiveness in international markets.

The findings are consistent with recent literature emphasizing the growing importance of sustainability governance in global commodity trade. [Meijaard et al. \(2020\)](#) argued that sustainability concerns increasingly shape market preferences and trade competitiveness within global vegetable oil markets. Similarly, [Hamdani \(2025\)](#) highlighted that certification systems such as ISPO, RSPO, and MSPO play strategic roles in determining market access and export competitiveness in sustainability-oriented markets ([Hamdani, 2025](#); [Meijaard et al., 2020](#)).

In addition, external economic shocks during the observation period may also have weakened the short-term effectiveness of downstream industrial policies. Global commodity market volatility, supply chain disruptions, and geopolitical tensions contributed to increasing uncertainty in international trade flows and import demand conditions. Such external disturbances may have overshadowed the direct impact of domestic industrial policies on export performance. This interpretation is consistent with [Nkhoma et al. \(2021\)](#), who found that policy-related variables frequently exhibit weaker short-term effects compared with external market factors such as international prices, tariffs, global demand conditions, and trade restrictions ([Nkhoma et al., 2021](#)). Overall, the discussion demonstrates that Indonesia's refined palm oil exports remain predominantly influenced by international market mechanisms rather than domestic industrial policy intervention alone. Exchange rate competitiveness, external economic growth, and competitor pricing behavior emerge as the principal determinants shaping export performance in global refined palm oil markets. These findings imply that strengthening Indonesia's competitiveness requires a comprehensive strategy integrating macroeconomic stability, industrial upgrading, productivity enhancement, sustainability compliance, and stronger participation in global value chains. Without improvements in these broader structural dimensions, downstream industrialization policies may face limitations in generating substantial and sustainable export competitiveness gains.

CONCLUSION

This study investigates the determinants of Indonesia's refined palm oil (RPO) exports to major importing countries, namely China, India, and Pakistan, during the 2010–2024 period using a panel data econometric approach. The empirical findings demonstrate that Indonesia's refined palm oil export performance is predominantly influenced by external competitiveness and international market conditions rather than by domestic industrial policy intervention alone. The model selection procedures identified the Common Effect Model (CEM) as the most appropriate estimation approach, indicating that variations in refined palm oil exports are more strongly explained by observable macroeconomic and market variables than by unobserved country-specific heterogeneity.

The regression results reveal that the Real Effective Exchange Rate (REER) exerts a negative and statistically significant effect on Indonesia's refined palm oil exports. This finding confirms that appreciation in Indonesia's exchange rate reduces international price competitiveness and weakens export performance in global markets. In contrast, trading partner GDP exhibits a positive and significant relationship with exports, indicating that economic growth and purchasing power in destination countries remain important drivers of refined palm oil demand. Furthermore, competitor prices represented by Malaysia's refined palm oil export prices show the strongest positive influence on Indonesia's exports, reflecting the existence of strong substitution effects

and intense competition within the global palm oil market. These results collectively confirm the relevance of export demand theory, which emphasizes the importance of relative prices, foreign income, and market competition in shaping international trade performance.

Meanwhile, the downstream industrial policy variable demonstrates a positive but statistically insignificant effect on refined palm oil exports. Although the policy direction toward downstream industrialization may contribute to long-term industrial upgrading and value-added creation, the findings suggest that its direct short-term impact on export performance remains limited during the observation period. This condition indicates that industrial policy alone is insufficient to strengthen export competitiveness without complementary improvements in productivity, technological capability, logistics efficiency, sustainability compliance, and integration into global value chains. Increasing sustainability requirements, certification standards, and external economic uncertainties may also constrain the effectiveness of domestic policy interventions in international markets.

From a policy perspective, the findings imply that strengthening Indonesia's refined palm oil export competitiveness requires a more comprehensive and integrated strategy. Maintaining exchange rate stability and macroeconomic resilience is essential to preserve international price competitiveness. At the same time, expanding export markets toward countries experiencing strong economic growth may help sustain external demand for refined palm oil products. Indonesia also needs to enhance production efficiency, strengthen downstream industrial integration, improve logistics and infrastructure, and accelerate the adoption of internationally recognized sustainability standards to improve long-term market access and competitiveness.

This study contributes to the literature by integrating macroeconomic competitiveness, external demand conditions, market competition, and industrial policy variables within a unified empirical framework specifically focused on refined palm oil exports (HS 151190). Nevertheless, several limitations should be acknowledged. The study focuses only on three major importing countries and employs limited policy indicators represented by a dummy variable. Future research is therefore encouraged to incorporate broader destination markets, additional competitiveness indicators, sustainability-related variables, non-tariff barriers, and dynamic panel estimation techniques to provide deeper insights into the structural determinants of Indonesia's refined palm oil exports in evolving global markets.

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