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COMMODITIES IN UNEQUAL EXCHANGE: GLOBAL PRICE FORMATION AND INDONESIA'S RBD COCONUT OIL EXPORTS

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ABSTRACT

This study investigates the determinants of Indonesia's Refined, Bleached, and Deodorized Coconut Oil (RBD CNO) export volume through the lens of unequal exchange and global price formation. Using panel data from seven major destination countries—China, the United States, Sri Lanka, South Korea, Russia, Singapore, and Malaysia—over the period 2014–2023, the analysis estimates Common Effect, Fixed Effect, and Random Effect models, with model selection based on the Chow, Hausman, and Lagrange Multiplier tests. The results indicate that international RBD CNO prices exert a negative and statistically significant effect on export volume, while the GDP of importing countries has a positive and significant influence. In contrast, population size and Indonesia's domestic production capacity show no significant effects. These findings suggest that export performance is shaped more by external market structures and purchasing power asymmetries than by domestic supply conditions. The study's novelty lies in integrating panel econometric analysis with a political economy perspective, demonstrating how Indonesia's position as a primary commodity exporter entails structural vulnerability to global price volatility. The findings contribute to sociological debates on trade dependency and unequal exchange, highlighting how asymmetric market relations constrain export growth in the Global South.

Keywords: *Commodity Exports, Global Price Formation, Political Economy, Trade Dependency, Unequal Exchange*

INTRODUCTION

The agricultural sector remains a fundamental pillar of the Indonesian economy, not only as a provider of food security and employment but also as a source of foreign exchange through plantation commodity exports (Arifah & Kim, 2022; Hasudungan et al., 2024). Among these commodities, coconut occupies a particularly strategic position. Indonesia possesses approximately 3.31 million hectares of coconut plantations, the majority of which are managed by smallholder farmers, making coconut production deeply embedded in rural livelihoods and local economies (Alouw et al., 2025). Coconut is often described as a "tree of life" because nearly all of its components can be utilized, ranging from fresh consumption to downstream industrial products. In recent decades, global demand has increasingly shifted toward processed coconut derivatives with higher value added, one of the most prominent being Refined, Bleached, and

Deodorized Coconut Oil (RBD CNO). This product has become an essential input in the food, cosmetics, and pharmaceutical industries due to its stability, versatility, and compatibility with health-oriented consumption trends (Hao et al., 2026).

As the second-largest coconut exporter in the world, Indonesia holds substantial potential to strengthen its position in the global RBD CNO market. However, empirical evidence indicates that export performance remains volatile and uneven across destination countries. Data from UNCOMTRADE show that while Indonesia's total RBD CNO exports experienced growth—particularly after 2021—several major importing countries such as China and South Korea recorded declining import volumes in certain periods (Hasudungan et al., 2024; Pratama et al., 2023). This fluctuation suggests that rising export values do not necessarily reflect stable or sustainable demand. Instead, they point to a complex interaction between global price formation, market competition, and structural dependencies in international trade (Arifah & Kim, 2022; Aulia et al., 2020). These dynamics highlight an important empirical puzzle: why does a country with abundant natural resources and growing production capacity still face unstable export outcomes?

From an economic perspective, export performance is closely linked to price competitiveness, macroeconomic conditions in importing countries, and structural features of global commodity markets. Export prices play a central role in shaping demand, particularly for primary and semi-processed commodities that face intense competition from substitutes such as palm oil and soybean oil (Alouw et al., 2025; Anggrasari et al., 2023; Anggrasari & Saputro, 2022). The global vegetable oil market is characterized by high price volatility, driven by climate shocks, geopolitical tensions, biofuel policies, and speculative activities. Consequently, even modest price increases can trigger demand substitution in importing countries, placing exporting nations like Indonesia in a vulnerable position. In addition, the Gross Domestic Product (GDP) of destination countries reflects purchasing power and industrial demand, which directly affects the absorption capacity of imported commodities (Fudjaja et al., 2020). Population size is often assumed to represent market potential; however, demographic scale does not always translate into higher imports, especially when domestic substitutes are available or when industrial structures prioritize alternative inputs (Cherif & Hasanov, 2024; Kozicka et al., 2023; McCullough, 2025).

Domestically, Indonesia faces structural challenges that further complicate its export trajectory. Coconut production has shown signs of stagnation and decline in recent years, driven by aging plantations, reduced cultivated areas, low farm-gate prices, and limited investment in replanting and technological upgrading (Zainol et al., 2023; Zakia & Marifatullah, 2023). These conditions constrain the availability of raw materials such as copra for the RBD CNO processing industry, thereby affecting supply consistency. Moreover, increasing domestic demand from food, cosmetics, and pharmaceutical industries has intensified competition between export and domestic markets, raising questions about how production growth translates into export expansion. These structural constraints suggest that export performance cannot be understood

solely through production volume, but must be analyzed within a broader political economy framework.

A growing body of literature has examined the determinants of coconut oil and vegetable oil exports, offering valuable but often fragmented insights. Several studies emphasize the dominant role of international prices and exchange rates in shaping export volumes. Maulana et al. (2023) and Tandra et al. (2022) demonstrate that price competitiveness is a critical determinant of Indonesia's vegetable oil exports, as higher prices tend to reduce demand due to the availability of close substitutes. Similarly, Nugraha et al. (2023) find that export prices and destination-country GDP significantly influence export performance, reinforcing classical demand theory. Other studies highlight the importance of macroeconomic conditions in importing countries. Bustaman et al. (2022), and Hidayati & Ekaria, (2023) show that economic growth in destination countries increases demand for processed coconut products, particularly in industrial and consumer-oriented sectors.

At the same time, empirical findings regarding the role of population and domestic production remain inconsistent. Honlah et al. (2024) argues that coconut oil exports are more sensitive to global market dynamics than to domestic production capacity, especially when domestic absorption is high. Isip et al. (2023) report that population growth in importing countries does not significantly affect Indonesia's export volumes, as consumption patterns depend more on industrial structure than demographic size. In contrast, some studies suggest that production growth can enhance export capacity if supported by efficient logistics and favorable trade policies (Awaluddin et al., 2025; Jayasekhar & Thomas, 2024; Nabillah et al., 2025). These divergent conclusions indicate that the relationship between production, population, and export performance is neither linear nor uniform across contexts.

More recent research has begun to situate commodity exports within a broader political economy perspective. Scholars drawing on unequal exchange theory argue that developing countries exporting primary or semi-processed commodities often face asymmetric power relations in global markets, where prices are largely determined by demand structures and institutional arrangements in advanced economies (AlMalki & Durugbo, 2023; Sager & Gofen, 2022). Sedeh et al. (2022) highlights that commodity-dependent countries are particularly vulnerable to price volatility, which constrains their capacity to achieve stable export growth and industrial upgrading. Within this framework, Indonesia's RBD CNO exports can be seen not merely as an economic transaction, but as part of a structural relationship where value capture is unevenly distributed along global value chains (Gabor & Sylla, 2023; Robinson et al., 2023).

Despite the richness of existing studies, much of the literature either focuses on aggregate vegetable oil exports or relies on limited time frames that do not fully capture recent structural shifts, including post-pandemic recovery and changing global consumption patterns. Moreover, many empirical analyses treat export determinants as purely technical variables, without adequately situating them within the broader context of global price formation and unequal exchange. As a result, the mechanisms through which international prices and destination-

country economic conditions interact to shape Indonesia's RBD CNO exports remain underexplored, particularly using recent panel data that span multiple major trading partners over a critical decade.

Against this backdrop, this study seeks to deepen the understanding of Indonesia's RBD CNO export dynamics by examining how international prices, destination-country GDP, population, and domestic production jointly influence export volumes during the 2014–2023 period. By employing a panel data regression framework across seven major importing countries, the analysis captures both cross-country variation and temporal dynamics, allowing for a more nuanced interpretation of export behavior. More subtly, the study situates these empirical relationships within the logic of global price asymmetry, revealing how Indonesia's export performance is shaped by external economic forces that lie beyond domestic control.

The purpose of this study, therefore, is not merely to identify statistically significant variables, but to illuminate the structural conditions under which Indonesia participates in the global RBD CNO market. By linking econometric findings with insights from international political economy, this research contributes to a more comprehensive understanding of commodity exports as both economic and social processes. In doing so, it provides a basis for rethinking export strategies, industrial policy, and the role of the state in mitigating vulnerability within unequal global trade relations, while also enriching social and political science debates on development, dependency, and global value chains.

RESEARCH METHOD

This study adopts a quantitative explanatory research design to examine the economic factors influencing Indonesia's Refined, Bleached, and Deodorized Coconut Oil (RBD CNO) export volume within the context of global market dynamics. The quantitative approach is chosen because the research seeks to identify causal relationships between measurable economic variables and export performance, allowing for objective, replicable, and statistically verifiable findings (Ahmad et al., 2019; Nassaji, 2021). By employing an econometric framework, this study aims to move beyond descriptive trends and provide empirical evidence regarding how international prices, macroeconomic conditions of importing countries, and domestic production interact to shape export outcomes.

The research location is determined purposively, not in a geographical sense, but in terms of export destination countries that represent Indonesia's major RBD CNO markets. This selection is grounded in the research objective to capture variations in export dynamics across countries with different economic structures, levels of development, and consumption patterns. Seven major importing countries—China, the United States, Sri Lanka, South Korea, Russia, Singapore, and Malaysia—are selected because they consistently appear as Indonesia's principal RBD CNO trading partners during the 2014–2023 period. These countries reflect diverse market characteristics, ranging from large industrial economies and trading hubs to emerging markets,

making them analytically relevant for understanding differential demand responses and price sensitivity in the global coconut oil market.

The population of this study consists of all available time-series data related to Indonesia's RBD CNO exports during the 2014–2023 period. This includes export volume, international export prices, domestic RBD CNO production, Gross Domestic Product (GDP) of destination countries, and population size of importing countries. Given the manageable size of the dataset and the strategic importance of the selected countries, the study employs a saturated sampling technique, where all observations within the defined population are used as the sample. This approach ensures comprehensive coverage and reduces sampling bias, allowing the analysis to reflect the full structure of Indonesia's RBD CNO export performance (Sugiyono, 2019).

Data collection relies entirely on secondary data obtained from authoritative and internationally recognized sources, including the United Nations Commodity Trade Statistics Database (UNCOMTRADE), Statistics Indonesia (BPS), the World Bank, and official publications from relevant government agencies. The use of secondary data is justified by the study's focus on macroeconomic and trade variables that are systematically recorded, standardized, and publicly available. Moreover, these sources provide longitudinal data with consistent measurement units, which is essential for panel data analysis and cross-country comparison (Mrabti & Alaoui, 2024).

To analyze the data, this study employs a panel data regression model, which combines cross-sectional and time-series dimensions to capture both inter-country differences and temporal dynamics. Panel data analysis is particularly suitable for this research because it increases the number of observations, enhances estimation efficiency, and reduces the risk of omitted variable bias by accounting for unobserved heterogeneity (Sardana et al., 2023). The regression model specifies export volume as the dependent variable, while export price, GDP, population, and domestic production serve as independent variables. Model estimation is conducted using the Common Effect Model, Fixed Effect Model, and Random Effect Model, with the most appropriate specification selected through the Chow test, Hausman test, and Lagrange Multiplier test.

Data validation is carried out through a series of classical assumption tests, including multicollinearity and heteroscedasticity tests, to ensure the reliability and robustness of the regression estimates. Variables are also cross-checked across data sources to confirm consistency and accuracy. By integrating rigorous statistical testing with carefully curated secondary data, this methodological approach is designed to produce valid, transparent, and empirically grounded findings that meaningfully explain the determinants of Indonesia's RBD CNO export performance within the global trade system.

RESULTS AND DISCUSSION

Description of Research Variables

The description of the research variables includes factors that influence the export volume of Indonesian RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) as the dependent variable (Y). The independent variables consist of four main components. First, the export price of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) (X1), which reflects the level of product competitiveness in the global market and is a major determinant in export decisions. Second, RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) production (X2), which describes domestic supply capacity as a determining factor in Indonesia's ability to meet export demand. Third, the gross domestic product (GDP) of the export destination country (X3), which serves as an indicator of the importing country's level of demand and purchasing power for processed coconut oil products. Fourth, the population of the importing country (X4), which represents market potential based on the number of people in the export destination country. The analysis of the relationship between these variables aims to understand how domestic production conditions and external global economic factors affect the dynamics of Indonesia's RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) export volume (Hamidi & Miksalmina, 2025).

RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) Export Volume from Indonesia

The volume of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) exports from Indonesia plays a crucial role in the national economy, given that the country is one of the world's largest coconut producers. RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) has become a leading product that is in high demand in the international market, useful in industries ranging from food to cosmetics. Global demand for high-quality coconut oil continues to increase, encouraging local producers to increase production capacity and meet the required quality standards. In addition, support from the government through pro-export policies and investment in research and development of processing technology has contributed to the growth of this industry (Siregar et al., 2025; Soselisa et al., 2024).

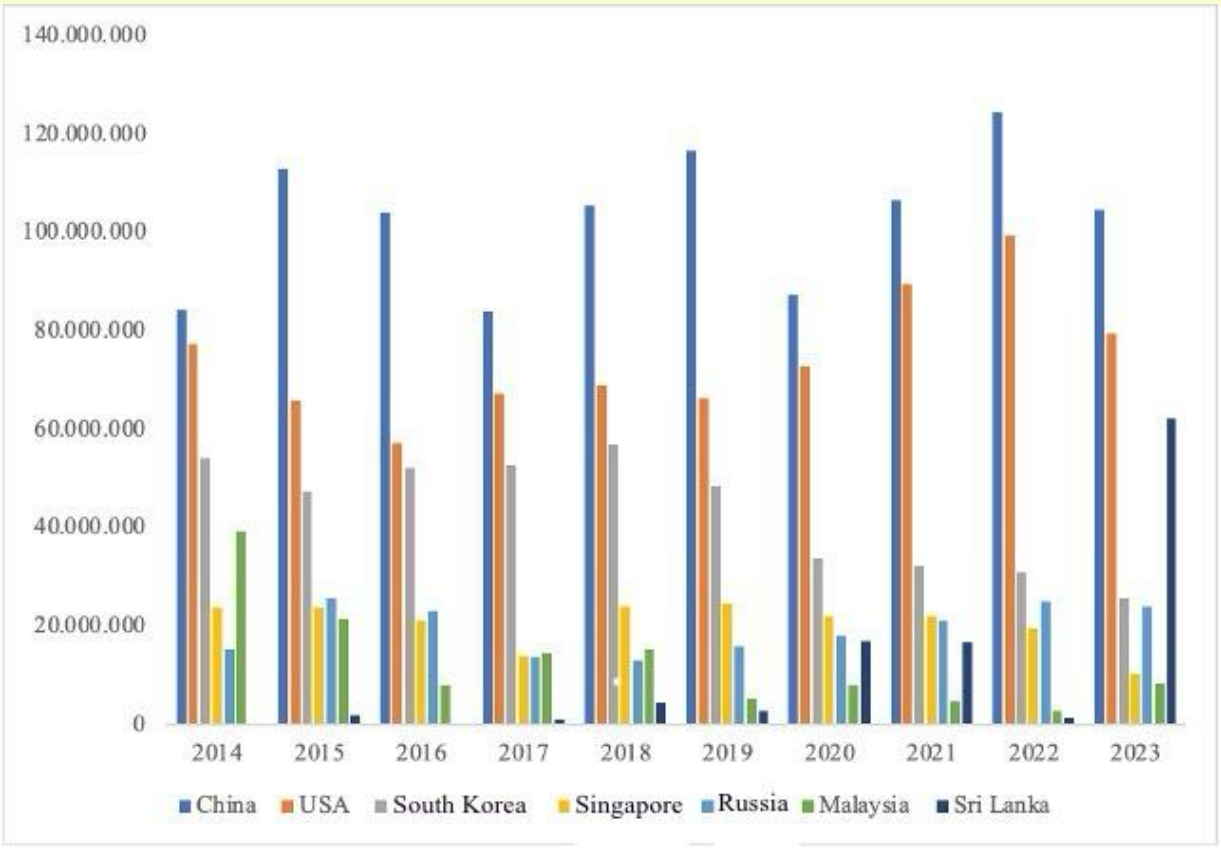

Figure 1 Chart of the RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) Volume Export (Kg)

Source: Data Processed, 2025

Based on the data in Figure 1, exports of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) from Indonesia to various countries show a fluctuating pattern throughout 2014 to 2023, with different dynamics in each destination country. Over the past ten years, China has consistently been the main destination country with the highest export volume each year, indicating a significant dependence on this market and high demand from the vegetable oil-based downstream industry in that country. The United States (USA) ranks second as the largest export market, and since 2019 there has been a more stable upward trend, indicating an expansion in demand, particularly in the processed food and cosmetics sectors. Meanwhile, South Korea and Singapore show relatively stable export patterns with smaller fluctuations compared to China and the US, reflecting a more constant demand but in lower volumes. These four countries show different growth patterns that illustrate market diversity.

Several other countries, such as Russia, Malaysia, and Sri Lanka, recorded much smaller export volumes. However, in 2023, there was a significant increase in exports to Sri Lanka. This increase made Sri Lanka one of the countries with the highest export volumes that year, even surpassing several typically larger markets such as South Korea, Singapore, and Malaysia. The increase was due to the high demand for coconut oil as a raw material for the food and pharmaceutical sectors.

The challenges faced by the RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) export sector include global price fluctuations, competition from other coconut oil producing countries, and the need to maintain sustainable production. An environment that is increasingly aware of sustainability issues is forcing producers to implement environmentally friendly and responsible agricultural practices. The importance of international certifications such as Rainforest Alliance or Fair Trade is becoming increasingly relevant to enhance the competitiveness of Indonesian products in the global market. Therefore, increasing export volume should not only be viewed in terms of numbers, but also in terms of quality, social impact, and the sustainability of the coconut industry, which must be considered to ensure long-term growth that benefits all stakeholders.

RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) Internasional Price

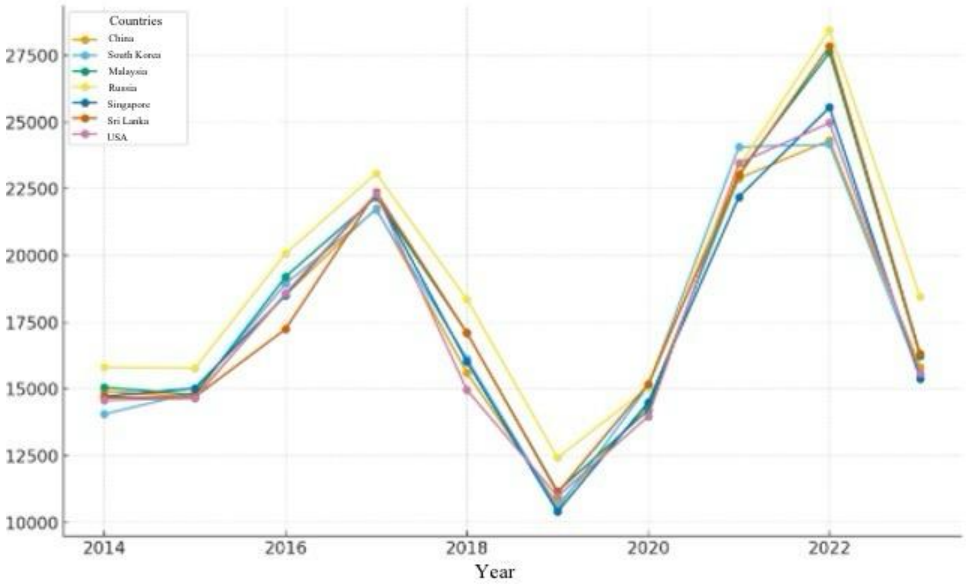

Figure 2 RBD CNO Export Price Chart (USD)
Source: Data Processed, 2025

Figure 2 shows the development of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) export prices from 2014 to 2023 in several major export destination countries such as China, South Korea, Malaysia, Russia, Singapore, Sri Lanka, and the United States. In general, the price of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) fluctuated quite sharply during this period. Significant price increases occurred around 2017 and 2021–2022, reflecting increased global demand for processed coconut oil and the influence of global vegetable oil market conditions. Conversely, a sharp decline in prices was seen in 2019, which was likely influenced by oversupply or weakening global vegetable oil commodity prices.

Although each country shows relatively similar price patterns, there are differences in price levels between countries that reflect variations in import costs, trade policies, and differences in purchasing power in their respective markets. Countries such as the United States

and Russia tend to have slightly higher prices than other Asian countries, which may be due to greater transportation distances and logistics costs. Overall, this graph indicates that the price of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) in the international market is heavily influenced by global supply and demand dynamics, world economic conditions, and fluctuations in the prices of other vegetable oils such as palm oil and soybean oil.

GDP RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) Importing Countries

Figure 3 shows the growth of Gross Domestic Product (GDP) of the main importing countries of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil), such as China, South Korea, Malaysia, Russia, Singapore, Sri Lanka, and the United States during the period 2014–2023. It can be seen that the United States and China have the highest GDP values compared to other countries, indicating large economic capacity and high purchasing power potential for imported products, including RBD CNO (Refined, Bleached, and Deodorized Coconut Oil). In general, the GDP trend of all countries tends to increase from year to year, reflecting stable global economic growth despite a slowdown in 2020 due to the COVID-19 pandemic.

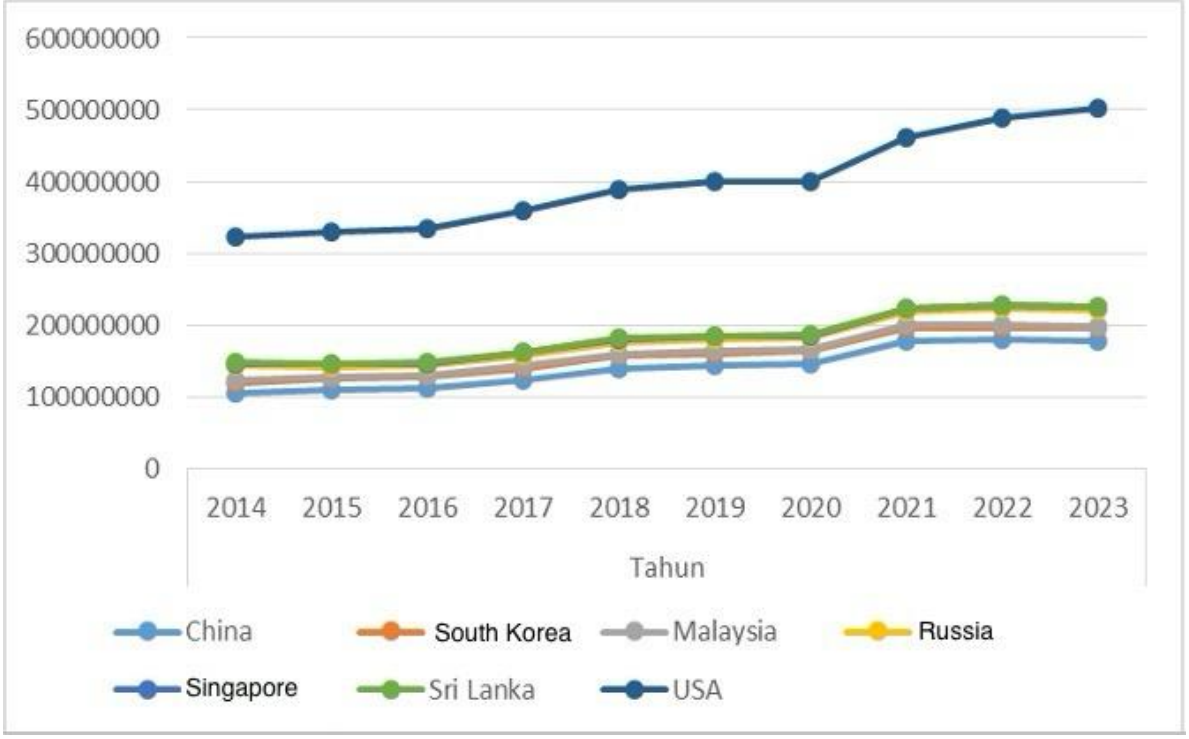

Figure 3. GDP of RBD CNO Importing Countries
Source: Data Processed, 2025

The increase in the GDP of these importing countries has a positive implication for the demand for Indonesian RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) in the international market. The increase in GDP indicates increased economic activity and public consumption, which in turn can drive the need for coconut derivative products for the food,

cosmetics, and pharmaceutical industries. This graph shows that the economic growth of trading partner countries has the potential to be a driving factor in increasing the volume of Indonesia's RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) exports in the future.

Population of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) Importing Countries

Figure 4 shows the growth in the population of countries importing RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) from 2014 to 2023, including China, South Korea, Malaysia, Russia, Singapore, Sri Lanka, and the United States. In general, all importing countries experienced relatively stable population growth during this period. China had the highest population among them, followed by the United States and Russia, while Singapore had the smallest population. This population growth reflects the growth of market potential and public consumption needs for various products, including processed coconut oil-based products such as RBD CNO (Refined, Bleached, and Deodorized Coconut Oil).

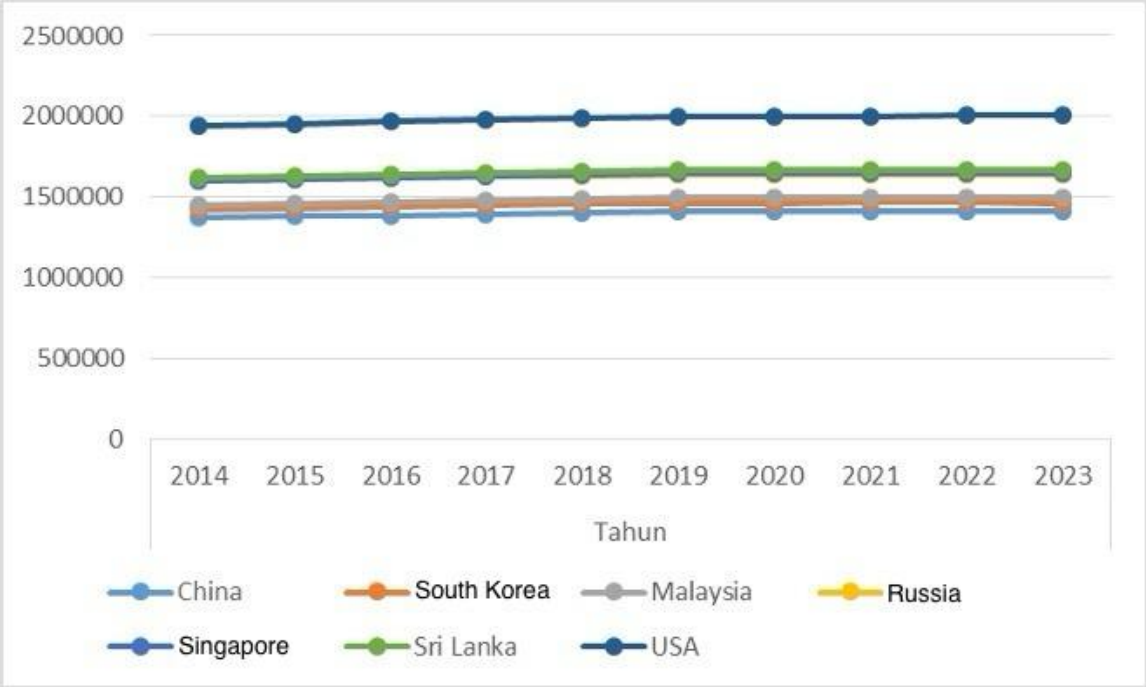

Figure 4. Population (Lives) of RBD CNO Importing Countries Chart
Source: Data Processed, 2025

The increase in the population of importing countries has the potential to increase demand for RBD CNO due to the growing needs of the food, cosmetics, and household industries that use coconut oil as a base ingredient. Countries with large populations such as China and the United States play an important role in maintaining the stability of Indonesia's export volume, as their large markets can absorb more products. This graph confirms that population growth is one of the external factors that can influence the increase in Indonesia's RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) export volume to the international market.

Indonesia's RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) Production

Figure 5 shows the development of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) production in Indonesia during the period 2014 to 2023. In general, RBD CNO production fluctuated from year to year based on UNCOMTRADE (2021). At the beginning of the period (2014–2017), production was relatively stable with a slight upward trend. However, there was a sharp decline in 2018, which was likely due to a reduction in coconut raw material supply caused by weather factors and a decline in plantation productivity, as explained by the UNSD (2024). After that, production increased again in 2020, which was related to improvements in the capacity of the coconut processing industry and increased demand and prices for vegetable oil worldwide, before fluctuating again in the following years (FAO, 2020).

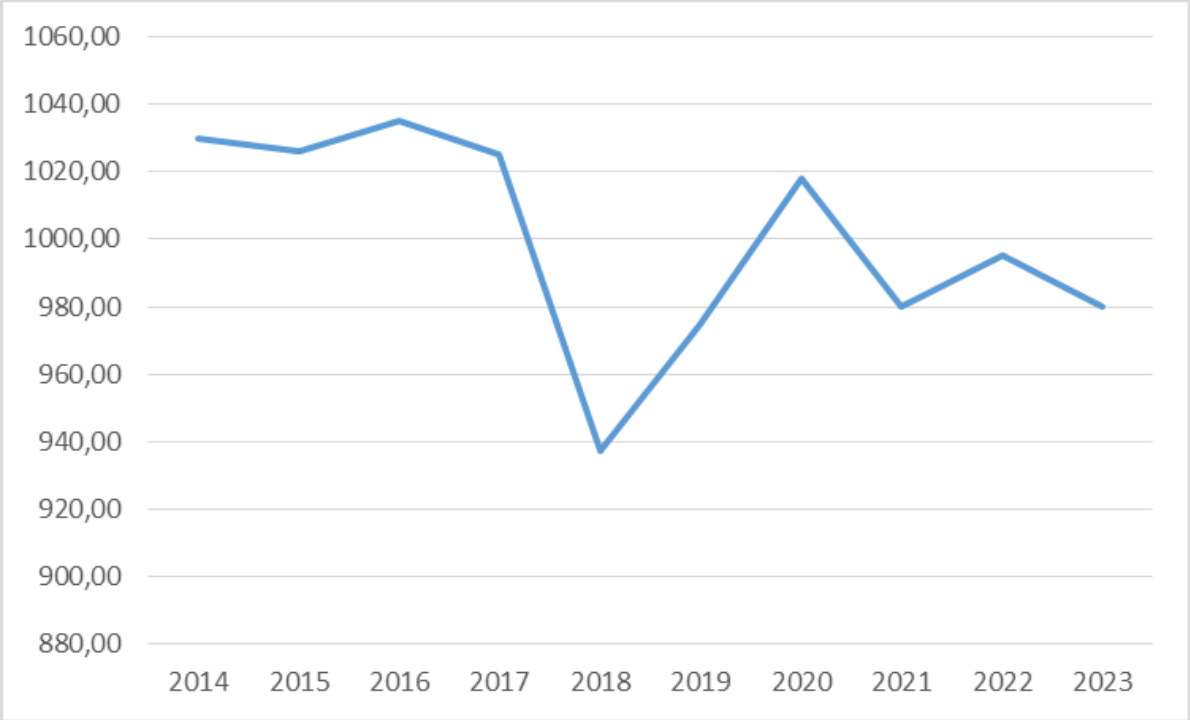

Figure 5. RBD CNO Producton (Tonne)
Source: Data Processed, 2025

These fluctuations in production illustrate that Indonesia's RBD CNO industry is still influenced by external factors such as raw material prices, global market demand, and export policies. Production stability is essential to maintain the availability of export supplies and Indonesia's position as one of the world's leading coconut oil producers. Therefore, increasing production efficiency and strengthening the raw material supply chain are key to maintaining the competitiveness of Indonesia's RBD CNO in the international market.

Data Panel Regression Model Selection

The Chow test results show a probability value of cross-section F and Chi-square of 0.00 < 0.05, so H1 is accepted and the Fixed Effect (FEM) model is considered better than the Common Effect Model (CEM). The analysis then continued with regression using the Random Effect Model (REM) and the Hausman test was performed. The Hausman test produced a probability value of 1.000 > 0.05, so H0 was accepted and the Random Effect Model (REM) was considered more appropriate to use than FEM because the differences between individuals were random and not correlated with the independent variables. To reinforce the model selection results and ensure that the use of a random model was appropriate, a Lagrange Multiplier (LM) test was conducted, which produced a probability value of 0.2832, >0.05. This result indicates that there is no significant random effect, so that REM is not better than the basic model (CEM). Therefore, the most appropriate model to use is the Common Effect Model (CEM).

Table 1 Model Selection Test Result

Test	**Prob.**
Chow Test	
Cross-section F	0.0639
Cross-section Chi-square	0.0333
Hausman Test	
Cross-section random	1.0000
LM (Lagrange Multiplier) Test	
Breusch-Pagan	1.151817
	(0.2832)

Source: Data Processed, 2025

This result is in line with the research by Tandra et al. (2022), who also found that the Common Effect Model (CEM) is the best model for analyzing Indonesian agricultural commodity exports when the variation between export destination countries is insignificant. They stated that when the characteristics of the destination countries are relatively homogeneous and the changes over time are small, CEM remains efficient and sufficiently informative. The similarity of these findings reinforces that the use of CEM in this study is appropriate to describe the relatively stable relationship between variables during the observation period.

Model Assumption Test

Multicollinearity Test

Table 2 shows that all VIF values are < 10, so H0 is accepted and there is no multicollinearity. The results of the pairwise correlation and VIF tests confirm that each independent variable is able to explain the dependent variable independently without excessive linear relationships. Thus, the resulting regression coefficients are stable, reliable, and can be interpreted well. The absence of multicollinearity also strengthens the validity of the estimation

of the influence of variables on the export volume of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil).

Table 2 Results of Pairwise Correlation Multicollinearity Test

Variable	VIF
X1	1.112550
X2	3.819745
X3	3.666635
X4	1.031775

Source: Data Processed, 2025

Table 3 shows that all correlation coefficients between independent variables are below 0.85, so the model is free from multicollinearity. This means that each independent variable has its own explanatory power and the model is suitable for proceeding to the next stage of analysis. This finding is in line with Siregar et al. (2025), who states that a correlation of < 0.85 indicates the absence of multicollinearity.

Table 3 Results of Pairwise Correlation Multicollinearity Test

	X1	X2	X3	X4
X1	1.000000	-0.229691	-0.113994	0.173929
X2	-0.229691	1.000000	0.848648	-0.037188
X3	-0.113994	0.848648	1.000000	-0.005319
X4	0.173929	-0.037188	-0.005319	1.000000

Source: Data Processed, 2025

Heteroscedasticity Test

Table 4 shows that the value of probability Chi-Square Obs* R-Squared < significance value α (0.05), so H1 is accepted. This means that it can be concluded that the regression model does not contain heteroscedasticity. Heteroscedasticity can occur if the data has residual values that are not variable or constant. This means that an observation has different levels of reliability with a background that is not found in a model (Anggrasari & Saputro, 2022; Aulia et al., 2020).

Table 4 Heteroscedasticity Test Result

Test	Prob.
F-statistic	0.0072
Obs*R-squared	0.0094

Source: Data Processed, 2025

Based on Table 5, the regression model estimation results show that the RBD CNO export price variable has a negative effect on export volume. A 1% increase in export prices will reduce Indonesia's RBD CNO export volume by 1.355%. This is in line with international demand theory,

whereby an increase in price will reduce demand from importing countries. Conversely, the GDP variable of the destination country has a positive effect, whereby a 1% increase in GDP will increase export volume by 0.636%. This finding illustrates that the higher the economic growth rate of importing countries, the greater their ability to absorb RBD CNO products from Indonesia.

Table 5 Common Effect Model (CEM) Estimates Result

Indepentent Variable	**Export volume dependent variable**			
	Coefficient	**Std. Error**	**t-statistic**	**prob**
Constant	8.193488	20.94848	0.391126	0.6970
RBD Price	-1.355481	0.110158	-12.30487	0.0000
GDP	0.636601	0.096155	6.620599	0.0000
Population	-0.153430	0.103190	-1.486866	0.1419
RBD Production	1.017049	3.043474	0.334174	0.7393
F Statistic			87.11169	0.000000
R-Squared			0.842785	
Adj R-Squared			0.833110	

Source: Data Processed, 2025

The population of the destination country has a negative effect on export volume, where a 1% increase in population reduces RBD CNO exports by 0.153% because the country prioritizes domestic needs. Indonesia's RBD CNO production has a positive and significant effect; a 1% increase in production increases exports by 1.017%, indicating that production capacity is the main driver of exports. In general, price, purchasing power, and production are important determinants of RBD CNO exports, while the population growth of the destination country actually suppresses export levels.

Goodness of Fit Test

Coefficient of Determination (R^2)

The R-squared value is 0.842785 and the Adjusted R-squared value is 0.833110. This indicates that approximately 84.28% of the variation in RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) export volume can be explained by independent variables, namely the international price of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil), GDP, population, and Indonesian RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) production. The remaining 15.72% is explained by other factors outside the scope of this study. The regression model used has a high level of goodness of fit, as most of the variation in the dependent variable can be explained by the independent variables in the model.

These results are in line with the research by Zakia & Marifatullah (2023), which found an R-squared value of 0.81, indicating that coconut oil exports are greatly influenced by export prices, domestic production, and the GDP of the destination country. The similarity of these high

determination values reinforces that macroeconomic and production factors play a significant role in explaining the performance of vegetable oil exports, including RBD CNO, so that the research model is considered capable of describing a strong empirical relationship between variables.

F (Simultaneous) Test

Based on the results in Table 5, an F-statistic value of 87.11169 was obtained with a Prob (F-statistic) value of 0.000000<0.05. This indicates that all independent variables, namely the international price of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) International, GDP, Population, and Production of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) in Indonesia, simultaneously have a significant effect on the export volume of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil). The regression model used is suitable for further analysis because it meets the criteria for simultaneous significance.

These results are consistent with the research by Maulana et al. (2023), which shows that export prices, domestic production, and the GDP of destination countries have a significant effect on Indonesian vegetable oil exports. These findings confirm that macroeconomic factors and production capacity are decisive for export volume. This similarity reinforces the empirical validity of the study that these main variables also have a significant effect on Indonesia's RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) exports.

T (Partial) Test

The t-test results in the CEM model show that there are two variables that significantly affect the export volume of Indonesian RBD CNO (Refined, Bleached, and Deodorized Coconut Oil), namely the price of RBD and the GDP of the destination country. The RBD Price variable has a probability value of 0.0000 < 0.05 with a negative coefficient (-1.355481), so it can be concluded that an increase in the price of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) significantly reduces export volume. Meanwhile, the GDP variable also has a probability value of 0.0000 < 0.05 with a positive coefficient (0.636601), which means that the higher the GDP of the destination country, the more significantly the export volume of Indonesian RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) will increase. These two variables have been proven to play an important role in influencing export fluctuations.

The Population and RBD Production variables do not have a significant effect on the export volume of Indonesian RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) because they have probability values of 0.1419 and 0.7393, respectively, which are greater than the significance threshold of 0.05. The population coefficient (-0.153430) shows a negative direction, but its influence is not statistically strong enough to affect export volume. Similarly, RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) production (coefficient 1.017049), although positive, is not significant, so that an increase in domestic production has not been proven to directly boost exports.

The t-test in this study shows that the price of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) has a significant negative effect and the GDP of the destination country has a significant positive effect on export volume, consistent with previous studies stating that global prices and the purchasing power of the destination country are the main factors determining coconut oil exports (Hidayati & Ekaria, 2023; Nugraha et al., 2023). Meanwhile, the insignificance of the population and production variables is in line with Honlah et al. (2024), which confirms that coconut oil exports are more influenced by international market conditions than domestic factors. Partially, only price and GDP have a real effect on the export volume of Indonesian RBD CNO (Refined, Bleached, and Deodorized Coconut Oil).

Analysis of Factors Affecting the Export Volume of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) to Major Importing Countries

This study analyzes the extent to which several key factors—namely the international price of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil), the Gross Domestic Product (GDP) of importing countries, population size, and Indonesia's domestic RBD CNO production—affect the export volume of Indonesian RBD CNO. The empirical results indicate that these variables influence export performance in markedly different ways, reflecting the complex interaction between global market dynamics, demand-side conditions, and domestic structural constraints.

The international price of RBD CNO is found to have a negative and statistically significant effect on Indonesia's export volume. The estimated coefficient of –1.355481 with a probability value of 0.0000 (< 0.05) suggests that increases in global prices lead to a significant decline in export volume. This result reflects the high price sensitivity of the vegetable oil market, which is characterized by the availability of close substitutes such as palm oil and soybean oil. As export prices rise, importing countries tend to shift their demand toward cheaper alternative oils, reducing demand for Indonesian RBD CNO. This finding is consistent with international demand theory, which posits that higher export prices reduce demand in importing countries due to substitution effects (Robinson et al., 2023). It also aligns with the law of demand, which emphasizes the inverse relationship between price and quantity demanded. Empirical support for this result is provided by Hasudungan et al. (2024), who show that rising palm oil export prices significantly reduce Indonesia's export volume due to declining international competitiveness. Similarly, Pratama et al. (2023) find that export prices are a key determinant of demand for Indonesian CNO in destination markets. According to Anggrasari et al. (2023), primary commodity markets typically exhibit high demand elasticity because of the abundance of substitutes, causing price increases to quickly suppress demand. Anggrasari & Saputro (2022) further emphasizes that price variables play a central role in international trade models as indicators of global competitiveness, reinforcing the significance of RBD CNO prices in shaping Indonesia's export performance.

In contrast, the GDP of importing countries has a positive and statistically significant effect on Indonesia's RBD CNO export volume. The estimated coefficient of 0.636601 with a probability value of 0.0000 (< 0.05) indicates that higher economic growth in destination countries increases their capacity to import refined coconut oil. This finding reflects rising consumption capacity and expanding industrial activity associated with economic growth. From a theoretical perspective, GDP is widely regarded as a proxy for economic strength and purchasing power, with higher GDP levels corresponding to greater consumption by households and industries (Bustaman et al., 2022). Countries with higher GDP typically exhibit higher vegetable oil consumption, particularly in the food, cosmetics, and manufacturing sectors. Empirical evidence supports this relationship, as Tandra et al. (2022) finds that GDP growth in importing countries significantly increases exports of Indonesian processed coconut products, while Hidayati & Ekaria (2023) identify GDP as a dominant determinant of demand for Indonesian coconut oil.

This relationship is particularly evident in major importing countries such as the United States, where extensive industrial demand in the processed food, cosmetics, and health sectors drives high vegetable oil consumption. RBD CNO is widely used as a raw material for trans-fat-free food products, organic personal care items, and health supplements, and GDP growth has consistently increased demand for such products. Similar patterns are observed in South Korea and the Netherlands, albeit with different market characteristics. South Korea's demand is driven by its food and cosmetics industries, particularly the K-beauty sector, which requires high-quality vegetable oil inputs. The Netherlands, meanwhile, functions as a major trading and redistribution hub for vegetable oils in Europe, importing RBD CNO not only for domestic use but also for re-export through the Port of Rotterdam. Singapore plays a comparable role in Asia as a trade and distribution center, while its high GDP per capita supports growing demand for premium food, pharmaceutical, and wellness products that utilize RBD CNO. Consequently, economic growth in these countries directly contributes to higher import demand for Indonesian refined coconut oil.

The population variable, by contrast, does not have a statistically significant effect on Indonesia's RBD CNO export volume. The estimated coefficient of –0.153430 with a probability value of 0.1419 (> 0.05) indicates that population size alone does not explain variations in export demand. This result suggests that increases in population do not automatically translate into higher imports of Indonesian coconut oil. According to economic theory, population growth tends to have a stronger effect on domestic consumption than on imports, as basic consumption needs are often met through local production before relying on foreign supplies (Honlah et al., 2024). Empirical studies support this interpretation. Hamidi & Miksalmina (2025) find that population growth in importing countries does not significantly affect vegetable oil imports from Indonesia, while Sager & Gofen (2022) show that population effects are context-specific and not universally significant.

Empirically, large-population countries such as China and India do not rely heavily on Indonesian RBD CNO imports because they possess substantial domestic supplies of substitute oils, including palm oil and soybean oil. In contrast, smaller countries such as Singapore import

large volumes of RBD CNO due to high industrial demand and limited domestic production capacity. This pattern indicates that import demand is driven more by industrial structure and the availability of substitutes than by population size. FAO (2020) similarly notes that countries with strong domestic vegetable oil industries tend to rely less on coconut oil imports, treating coconut oil as a secondary or substitute input rather than a primary commodity. Conversely, countries with limited domestic production capacity exhibit higher import dependence regardless of population size.

Finally, Indonesia's domestic production of RBD CNO shows a positive but statistically insignificant relationship with export volume, with a coefficient of 1.017049 and a probability value of 0.7393 (> 0.05). This finding indicates that increases in production do not automatically translate into higher exports. Although trade theory, particularly the Heckscher–Ohlin framework, suggests that countries tend to export goods that intensively use abundant production factors, export performance also depends on supporting conditions such as trade policy, logistics efficiency, and market access. When these conditions are not optimal, higher production does not necessarily lead to export expansion.

Empirical evidence suggests that much of Indonesia's increased RBD CNO production is absorbed by the domestic market rather than allocated for export. Fluctuations in coconut supply, limited processing capacity, and high logistics costs constrain export responsiveness. Moreover, producers often prioritize the relatively stable domestic market over exports, which are subject to volatile global prices and demand conditions. Aulia et al. (2020) finds that coconut oil exports tend to increase only when global demand is exceptionally strong. Zainol et al. (2023) further shows that growth in coconut oil production is largely absorbed by domestic industries, particularly food, cosmetics, and pharmaceuticals, leaving only a limited share for export markets. The relative stability of domestic demand compared to global demand explains why production increases do not significantly affect export volume, reinforcing the conclusion that export performance is shaped more by demand-side and price competitiveness factors than by production capacity alone.

CONCLUSION

Based on the results of the study, it can be concluded that the volume of Indonesian RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) exports based on the RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) export price variable has a negative and significant effect on export volume, which means that an increase in global prices tends to reduce demand from importing countries. Conversely, the Gross Domestic Product (GDP) of export destination countries has a positive and significant effect, indicating that economic growth in trading partner countries increases purchasing power and demand for Indonesian export products. The variables of population and domestic production of RBD CNO (Refined, Bleached, and Deodorized Coconut Oil) have a positive but insignificant effect, indicating that although increased production

contributes to exports.

ETHICAL STATEMENT AND DISCLOSURE

This study was conducted in accordance with established ethical principles, including informed consent, protection of informants' confidentiality, and respect for local cultural values. Special consideration was given to participants from vulnerable groups to ensure their safety, comfort, and equal rights to participate. No external funding was received, and the authors declare no conflict of interest. All data and information presented were collected through valid research methods and have been verified to ensure their accuracy and reliability. The use of artificial intelligence (AI) was limited to technical assistance for writing and language editing, without influencing the scientific substance of the work. The authors express their gratitude to the informants for their valuable insights, and to the anonymous reviewers for their constructive feedback on an earlier version of this manuscript. The authors take full responsibility for the content and conclusions of this article.

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