GLOBAL DOMINANCE IN CRUDE PALM OIL (CPO): STRATEGIC FACTORS SHAPING INDONESIA'S COMPETITIVE EDGE-A PANEL DATA APPROACH

Dominasi Global dalam Minyak Sawit Mentah (CPO): Faktor-faktor Strategis yang Membentuk Keunggulan Kompetitif Indonesia-Pendekatan Data Panel

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Abstrak

Indonesia, sebagai negara yang mendominasi industri minyak sawit mentah (Crude Palm Oil/CPO) di pasar global, membutuhkan strategi untuk mempertahankan daya saing yang berkelanjutan. Penelitian ini bertujuan menganalisis faktor-faktor strategis yang memengaruhi daya saing CPO Indonesia di pasar internasional dengan menggunakan metode Revealed Comparative Advantage (RCA) serta analisis regresi data panel melalui pendekatan Generalized Method of Moments (GMM). Hasil penelitian menunjukkan bahwa keunggulan komparatif CPO Indonesia sangat dipengaruhi oleh dinamika ekonomi global, kebijakan negara-negara pengimpor, regulasi lingkungan yang semakin ketat, serta meningkatnya persaingan global. Selain itu, hasil regresi mengungkapkan bahwa pertumbuhan ekonomi, nilai tukar, populasi negara pengimpor, dan harga CPO global memberikan pengaruh positif terhadap daya saing CPO Indonesia di pasar internasional, sedangkan inflasi di negara pengimpor berdampak negatif. Oleh karena itu, pemerintah perlu merumuskan kebijakan adaptif untuk menghadapi tantangan global dan memanfaatkan peluang internasional melalui diplomasi ekonomi, menjaga stabilitas makroekonomi, meningkatkan kualitas produksi CPO, serta memperkuat daya saing melalui inovasi teknologi dan efisiensi rantai pasok. Langkah-langkah ini penting untuk mempertahankan dominasi Indonesia dalam industri CPO di pasar global sekaligus mendorong pertumbuhan ekonomi yang berkelanjutan.

Kata kunci: *Crude Palm Oil (CPO), Daya Saing Global, Indikator Makroekonomi, Data Panel, Revealed Comparative Advantage (RCA)*

Abstract

As a dominant player in the global Crude Palm Oil (CPO) industry, Indonesia requires strategies to sustain its competitive advantage. This research aims to analyze the strategic factors influencing the competitiveness of Indonesia's CPO in the international market, using the Revealed Comparative Advantage (RCA) method and panel data regression analysis through the Generalized Method of Moments (GMM) approach. The findings indicate that Indonesia's comparative advantage in CPO is significantly influenced by global economic dynamics, importers' policies, increasingly stringent environmental regulations, and intensifying global competition. Additionally, the regression results reveal that economic growth, exchange rates, the population of importing countries, and global CPO prices positively impact the competitiveness of Indonesia's CPO in the international markets. In contrast, inflation in importing countries has a negative effect. Therefore, the government must formulate adaptive policies to address global challenges, capitalize on international opportunities through economic diplomacy, maintain macroeconomic stability, improve CPO production quality, and strengthen competitiveness through technological innovation and supply chain efficiency. These steps are crucial to maintaining Indonesia's dominance in the global CPO industry while promoting sustainable economic growth.

INTRODUCTION

International trade facilitates the exchange of goods and services across countries and promotes capital flows, technology transfer, and sustainable economic growth (Ferreira et al., 2020; Saidi et al., 2020). Export activities play an important role in economic development, especially for developing countries seeking to improve their position in the global value chain (Erdoğan et al., 2020). Indonesia, with its abundance of natural resources, has utilized international trade to develop its leading sectors (Rochwulaningsih et al., 2019). One of the main pillars of the Indonesian economy is the crude palm oil (CPO) industry. CPO contributes significantly to the country's income, plays a vital role in global food security (Goh & Lee, 2010), and contributes substantially to the country's foreign exchange (Nurfatriani et al., 2022).

As the world's largest CPO producer, Indonesia plays a central role in supplying this commodity for various sectors, ranging from food, cosmetics, and pharmaceuticals to bioenergy (Cattau et al., 2016; Singagerda et al., 2018; Kamaruzaman et al., 2020; Prayitno et al., 2023). The versatility of CPO is reflected in its wide application, with human consumption reaching 80-90 percent (Shimizu & Desrochers, 2012). Indonesia's main export markets for CPO include countries with large populations, such as India, China, Pakistan, and Bangladesh, as well as markets in the United States and the European Union (Ali et al., 2020). Despite facing supply chain risk management challenges (Sutopo et al., 2015; Hadiguna & Tjahjono, 2017) as well as international campaigns regarding environmental impacts (Syahza & Asmit, 2020; Syahza & Irianti, 2021), Indonesia's CPO industry has managed to maintain strong competitiveness in the global market. In 2020, Indonesia accounted for 56 percent of global CPO exports, with export capacity reaching 73.5 percent of total production (Purba, 2020). The sector's performance remained positive during the COVID-19 pandemic, with exports increasing by 9.32 percent to

around USD 35 billion in 2021 (Jamilah et al., 2022).

Indonesia and Malaysia account for about 86 per cent of global CPO production. However, Indonesia still needs to catch up in processing value-added products, with only 59.66 percent of its CPO processed into derivative products. In contrast, Malaysia can process 82.5 per cent of its production (Jamilah et al., 2022). International campaigns highlighting environmental and health issues, such as those of the European Union, pose new challenges to Indonesia's palm oil exports (Tyson & Meganingtyas, 2022). Nonetheless, opportunities to increase consumption and expand CPO market share still exist, especially in key markets such as India, China, and Pakistan (Arifin & Putri, 2019).

Although previous literature has provided substantial insight into the various factors affecting CPO competitiveness (Bonny, 2017; Carlson et al., 2018; Kadarusman & Herabadi, 2018; Othman et al., 2022), most of these studies have focused on discrete aspects such as production efficiency, export policies, environmental sustainability, and market access. Despite the depth of these studies, a comprehensive understanding of the strategic factors that collectively shape

Indonesia's competitive advantage in the global CPO market still needs to be developed. In addition, the impact of global CPO price fluctuations, macroeconomic factors, and country population must be further explored to understand their implications on Indonesia's CPO competitiveness in the global market.

This study aims to fill this gap by comprehensively analyzing the strategic factors that shape Indonesia's competitive advantage in the global CPO market through a panel data approach. This research provides a comprehensive view of the CPO industry's competitive landscape by integrating dimensions such as global CPO price dynamics, macroeconomic conditions, and a country's population. Understanding these factors is crucial not only to document the strategic contribution of CPOs to the Indonesian economy but also to provide practical guidance for policymakers. The findings from this research will serve as an essential foundation in formulating policies that can strengthen Indonesia's position in a dynamic global economy, optimize the potential of the CPO industry, expand international trade cooperation, and encourage the development of downstream industries to improve the

economic and social welfare of local communities (Acosta & Curt, 2019). Through this comprehensive analysis, this research is expected to contribute to the broader discourse on sustainable and inclusive growth in Indonesia's plantation sector, ensuring that the country maximizes its natural resource wealth in a globally competitive environment.

METHOD
Research Design

This study adopts a quantitative research design aimed at analyzing the strategic factors influencing the competitiveness of Indonesia's crude palm oil (CPO) in the global market. To achieve this objective, the study utilizes the Revealed Comparative Advantage (RCA) method, a well-established analytical tool in international economics, which has been widely validated in the literature (Koopman et al., 2014; Radosevic & Yoruk, 2014; Laursen, 2015; French, 2017). RCA measures the relative trade performance of a commodity by comparing the commodity's share in national exports with its share in global trade. The RCA formula is as follows:

$$RCA_{ad} = \frac{X_{ad}/X_a}{X_{wd}/X_w} \qquad \text{............................(1)}$$

Where, $RCAad$ is the revealed comparative advantage for commodity d from country a, Xad is the export of commodity d from country a, Xa is the total export of country a, Xwd is the total global export of commodity d, Xw is the total global export. An RCA value greater than 1 indicates a comparative advantage, suggesting that Indonesia's CPO sector is more competitive than the global average. Conversely, an RCA value less than 1 indicates lower competitiveness.

Population and Sample/Materials

The population for this study includes all countries engaged in international CPO trade. However, the sample is limited to the ten largest importers of Indonesian CPO, namely India, China, Pakistan, the Netherlands, the United States, Spain, Egypt, Bangladesh, Italy, and Singapore. These countries were selected due to their significant contributions to Indonesia's CPO export market, ensuring that the analysis reflects the primary markets influencing Indonesia's CPO competitiveness globally. The study employs a panel data set covering a 12-year period (2012-2023), providing both cross-sectional and time-series dimensions. This results in 120 observations (10 countries × 12 years),

allowing for robust analysis of trends and patterns over time.

Instrument

The primary instrument used to measure the dependent variable, which is the competitiveness of Indonesia's CPO in the global market, is the Revealed Comparative Advantage (RCA) index. The independent variables analyzed include macroeconomic factors such as GDP per capita growth of importing countries, inflation rates in importing countries, exchange rates of the importing countries against the US dollar, global CPO prices, and the population of importing countries. These variables have been both theoretically and empirically validated as strategic factors influencing CPO competitiveness (Rosyadi et al., 2021; Chandrarin et al., 2022; Firdaus et al., 2022; Tandra et al., 2022; Hidayat et al., 2023, 2024). Details of these variables are presented in Table 1.

Table 1. Operational Definition of Variables

Variables	Measurement	Source
GDP per capita growth of importing countries	Annual %	World Bank Indicators
Inflation rate of importing countries	Annual %	World Bank Indicators
Exchange rate of importing countries	LCU per US$	World Bank Indicators
Population of importing countries	Total	World Bank Indicators
Global CPO price	US$ per metric ton	IndexMundi
Revealed Comparative Advantage (RCA)	$RCA_{ad} = \dfrac{X_{ad}/X_a}{X_{wd}/X_w}$	BPS, OEC, Grand View Research

Analysis Procedure

To estimate the impact of strategic factors on Indonesia's CPO competitiveness, this study applies panel data regression analysis using the Generalized Method of Moments (GMM). GMM was chosen due to its ability to address unobserved heterogeneity and to manage potential endogeneity in the model, which often arises in panel data (Ullah et al., 2018; Hashmi & Alam, 2019). The econometric model used in this study is as follows:

$$RCA_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 INF_{it} + \beta_3 KURS_{it} + \beta_4 RES_{it} + \beta_5 CPO_{it} + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots(2)$$

Where, *RCA* is Revealed Comparative Advantage; *GDP* is GDP per

capitagrowth of importing countries (annual percent); *INF* is Inflation rate of importing countries (annual percent); *RES* is population of importing countries (total); *CPO* is global CPO price (USD per metric ton); β_0 is constant; β_1-β_5 is coefficient; ε is error term; *i* is 1-5 (cross section data of 10 Indonesian CPO importing countries); and *t* is 1-12 (time series data from 2012-2023).

RESULTS AND DISCUSSION
Competitiveness of Indonesian CPO in the Global Market

Indonesia's Crude Palm Oil (CPO) competitiveness in the global market shows significant variations depending on the importing country. The results of the Revealed Comparative Advantage (RCA) analysis are summarized in Figure 1. Based on the RCA analysis, Indonesia recorded the highest RCA value in India, reaching 13.23 in 2022, reflecting a strong comparative advantage. This increase is driven by several factors, including high domestic demand, competitive CPO prices compared to other countries, and supportive bilateral trade policies (Ali et al., 2020; Prayitno & Widyawati, 2021). Research shows that India, as one of the major markets, has increased its

dependence on Indonesian CPO, which also contributes to its national energy security (Purba, 2020).

In China, a positive trend is also evident with the RCA value peaking in 2021 at 12.42. Rapid economic growth in China, along with improvements in the quality of Indonesian CPO products and strengthening trade relations, has strengthened Indonesia's position as a major supplier in the Chinese market (Prayitno & Widyawati, 2021; Hidayat et al., 2023). This suggests that good bilateral relations can increase the competitiveness of Indonesian products in the international market.

Pakistan shows a steady upward trend in competitiveness, with the highest RCA value of 7.80 in 2021. Increased domestic consumption, political and economic stability, and strategic partnership with Indonesia are the main driving factors (Firdaus et al., 2022). Meanwhile, in the European market, particularly the Netherlands, Indonesia's CPO competitiveness experienced a significant decline, with the RCA value only reaching 0.90 in 2023. This decline is due to stricter environmental policies and increased competition from other countries (Pramana, 2021; Gaol, 2018).
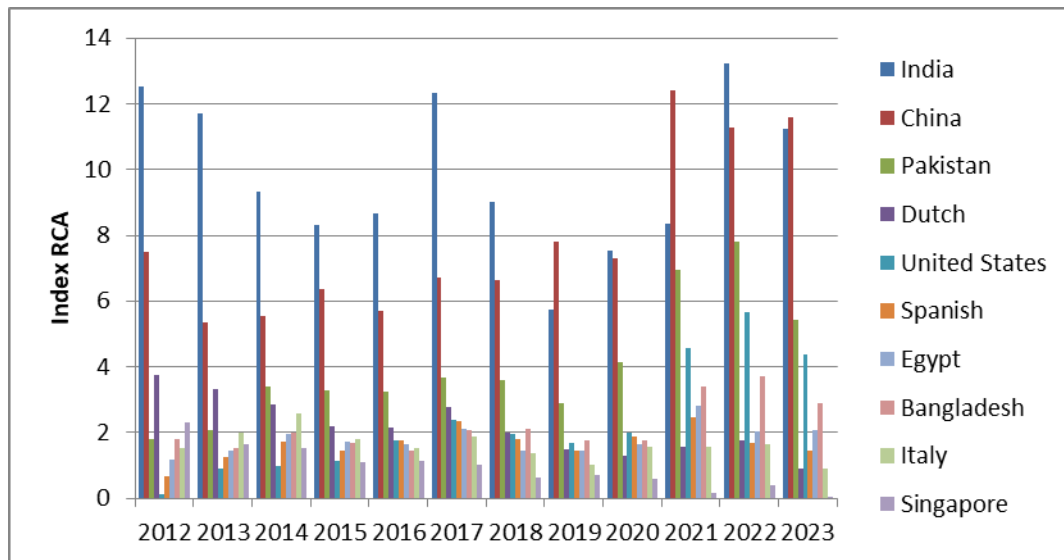
Figure 1. Development of RCA of Indonesia's CPO Export Destination Countries, 2012-2023

Source: Secondary data, processed by the author (2024).

In the United States, Indonesia's CPO competitiveness has increased since 2018, with the highest RCA value of 4.57 in 2021. This improvement was driven by effective marketing strategies and growing market demand (Prayitno & Widyawati, 2021). Spain showed stability in the RCA value of Indonesian CPO in the range of 1.5 to 2.3, reflecting consistent trade relations despite increased global competition (Prayitno & Widyawati, 2021).

On the other hand, Italy and Singapore show a significant decline in competitiveness. Italy experienced fluctuations in its RCA value, with a sharp decline in 2023 to 0.92, which is likely due to intense competition and unfavorable regulatory changes (Pramana, 2021; Dewani, 2023).

Singapore recorded a consistent decline, reaching a low of 0.05 in 2023, which can be attributed to changing consumer preferences towards more sustainable products (Pramana, 2021).

Overall, Indonesia's CPO competitiveness varies significantly across importing countries. These findings provide strategic insights for stakeholders to formulate more effective policies and strategies to maintain and improve the competitiveness of Indonesian CPO in the global market. Recommendations include adaptive trade policy adjustments, continuous improvement of product quality, market diversification, and intensification of promotional efforts in markets with high

growth potential (Prayitno & Widyawati, 2021).

Empirical Analysis

The results of data processing using the Generalized Method of Moments (GMM) method are summarized in Table 2. Overall, this model is considered capable of adequately explaining the relationship between the independent variables and the dependent variable. This is indicated by the Prob. F-statistics of 0.0000, which is smaller than the α significance level of 0.05. This indicates that overall, the independent variables can significantly explain variations in Indonesia's CPO competitiveness in the global market. The Adjusted R^2 (Adj R²) value of 0.9545 indicates that 95.45 percent of the variation in Indonesia's CPO competitiveness can be explained by the independent variables used in the model. This result indicates that the model has a high level of accuracy in estimating the competitiveness of Indonesian CPO in the international market.

Table 2. Results of Empirical Analysis of the Generalized Method of Moments (GMM) Method

Variables	Coefficient	Std. Error	t-statistic	Prob.	Weighted Statictics
C	-1.2278	0.9449	-1.2993	0.1967	
GDP	0.0122	0.0044	2.7412	0.0072*	
INF	-0.0311	0.0026	-11.876	0.0000*	
KURS	0.0161	0.0031	5.2056	0.0000*	
RES	5.3509	2.5709	2.0794	0.0400**	
CPO	0.0027	9.6705	27.883	0.0000*	
R^2					0.9599
Adj R^2					0.9545
F-statistics					1979.4
Prob. F-statistic					0.0000

Source: Secondary data (2024), processed.
Notes: *significant at α (< 0.01), **significant at α (< 0.05).

Partially, based on the Prob. t-statistic value, several independent variables proved to have a significant effect on the competitiveness of Indonesian CPO in the global market at 1 percent and 5 percent significance levels. The importer country population variable has the strongest and most significant influence on Indonesia's CPO competitiveness at the 1 percent significance level, while other variables such as GDP per capita, inflation, exchange rate, and global CPO price

also show significant influence at the 5 percent significance level.

Discussion

The coefficient of GDP per capita of the importing country of 0.0122 with a t-statistic probability of 0.0072 indicates that GDP per capita of the importing country has a positive and significant influence on the competitiveness of Indonesian Crude Palm Oil (CPO) in the global market. An increase in GDP reflects strong economic growth, which implies an increase in purchasing power and demand for CPO-based products (Prabowo et al., 2020; Rosyadi et al., 2021). This provides impetus for Indonesian CPO producers to expand markets and increase export volumes, ultimately strengthening Indonesia's competitive position (Rosyadi et al., 2021).

Furthermore, GDP growth also facilitates increased investment in infrastructure and processing industries in export destination countries, potentially increasing the absorption capacity of CPO as raw material. Strategic cooperation with local processing companies can strengthen long-term trade relationship, provide stable access to global market, and increase the competitiveness of Indonesian CPO products (Husin et al.,

2023). In addition, strong economic growth encourages product diversification and innovation in the industrial sector, resulting in more diverse and high-quality products, which are more in line with consumer preferences (Ali & Cantner, 2020; Surya et al., 2021; Zhou et al., 2021). Thus, Indonesia has a great opportunity to develop value-added CPO products, such as sustainable palm oil, which not only strengthens competitiveness but also builds Indonesia's image as an innovative and high-quality supplier (Syahza & Asmit, 2020).

The coefficient of importers' inflation, at -0.0311 with a t-statistic probability of 0.0000, indicates that inflation in importing countries has a negative and significant impact on Indonesia's CPO competitiveness. Rising inflation reduces consumers' purchasing power (Purnomo, 2017; Soebagiyo, 2017), suppressing the demand for CPO-based products. This is often accompanied by tighter monetary policies, which slow down economic growth and investment in CPO-related sectors such as the food and biofuel industries (Van Doorslaer & Vermeiren, 2021). These conditions negatively affect the demand for CPO, directly weakening Indonesia's

competitive position in the global market.

When Indonesia's RCA declines due to inflation in importing countries, this indicates not only an absolute decrease in Indonesia's competitiveness but also a relative decline compared to other exporters. Since RCA is a relative measure, a drop in Indonesia's RCA suggests that other exporting countries, such as Malaysia—its main competitor—may experience an increase in their RCA (Ramadhani & Santoso, 2019; Firdaus et al., 2022; Othman et al., 2022). A decrease in Indonesia's CPO competitiveness means that competing countries can capture a larger market share, displacing Indonesia as the leading CPO supplier in the global market.

Furthermore, high inflation can trigger economic and political instability in importing countries, often followed by protectionist policies such as increased import tariffs or restrictions on import volumes. These protectionist measures can further exacerbate the competitiveness of Indonesia's CPO, as market access becomes limited and export costs rise (Ramadhani & Santoso, 2019; Rifin et al., 2020). Therefore, it is crucial for Indonesia to monitor inflationary conditions in key

importing countries and develop effective mitigation strategies, such as market diversification and product quality enhancement, to maintain the competitiveness of its CPO in an increasingly competitive and dynamic international market.

The coefficient of the importing country's exchange rate of 0.0121 with a t-statistic probability of 0.0161 indicates that the strengthening of the importing country's exchange rate has a positive and significant effect on the competitiveness of Indonesian CPO. When an importing country's currency strengthens, imported products such as CPO become more affordable for consumers and industries in that country, which encourages increased demand for Indonesian CPO, strengthens export volumes, and improves Indonesia's competitive position as one of the world's major CPO exporters (Prasetyo & Marwanti, 2017).

Strengthening exchange rate also benefits local industries in importing countries that use CPO as raw material, allowing increased production at lower costs without sacrificing profit margins (Prasetyo & Marwanti, 2017). This supports the growth of industrial sectors such as processed food, cosmetics, and biofuels, which directly

supports the stability and increased demand for CPO from Indonesia. In addition, this opens opportunities for Indonesia to develop higher value-added export products, such as biofuel products or vegetable oil-based chemicals (Sugiharti et al., 2020; Chandrarin et al., 2022).

The importing country population coefficient of 5.3509 with a t-statistic probability of 0.0400 indicates that a larger population in the importing country contributes positively to the competitiveness of Indonesian CPO in the global market. A large population creates a broad and diverse market, which drives increased demand for CPO-based products along with population growth and urbanization (Prabowo et al., 2020; Tandra et al., 2022).

The large population also facilitates strategic partnerships with local processing industries, strengthening Indonesia's position in the global supply chain and improving distribution efficiency (Neilson et al., 2020; Trisia et al., 2021). By capitalizing on these demographic dynamics, Indonesia can strengthen CPO competitiveness in the global market, increase export volume and value, and maintain its dominance as one of the world's major CPO exporters.

The coefficient of global CPO price of 0.0027 with a t-statistic probability of 0.0000 indicates that an increase in global CPO price has a positive and significant influence on the competitiveness of Indonesian CPO in the global market. High global CPO prices increase the income of Indonesian exporters (Prabowo et al., 2020), encouraging them to invest in plantation replanting, adoption of the latest agricultural technology, and increased processing capacity (Syahza & Asmit, 2020). These investments increase efficiency and productivity, ultimately strengthening the competitiveness of Indonesian CPO products in the global market (Azzahra et al., 2022; Hidayat et al., 2024).

Higher revenues also strengthen the financial position of Indonesian CPO producers, allowing them to withstand market fluctuations and other external risks, such as climate change or supply disruptions (Cai & Luo, 2020; Eggers, 2020; Liu et al., 2020; Zhu et al., 2020; Didier et al., 2021). In addition, high global CPO prices increase Indonesia's bargaining power in international trade negotiations, expand its distribution network, and strengthen its position as one of the

world's major CPO exporters (Prabowo et al., 2020; Rosyadi et al., 2021; Hidayat et al., 2023; Hidayat et al., 2024).

CONCLUSION AND POLICY RECOMMENDATION

Indonesia dominates the global Crude Palm Oil (CPO) market; however, strategies are required to sustain its competitive advantage. The RCA analysis results indicate that specific market conditions, bilateral relations, and economic indicators in crucial importing countries such as India, China, and Pakistan influence Indonesia's CPO competitiveness. In contrast, markets such as the European Union, particularly the Netherlands, face significant challenges due to stricter environmental policies and increased competition.

Additionally, the regression analysis reveals that the GDP per capita growth of importing countries, exchange rates, population size, and global CPO prices positively and significantly impact Indonesia's CPO competitiveness. At the same time, inflation negatively and significantly affects it.

Based on these findings, the government should formulate more adaptive and comprehensive policies to address global challenges and seize opportunities in international markets. This includes strengthening economic and trade diplomacy, particularly in addressing environmental policies in EU countries. Furthermore, the government must ensure domestic macroeconomic stability, optimize the quality and sustainability of CPO production, and enhance competitiveness through technological innovation and supply chain efficiency. These strategies will help maintain Indonesia's leadership in the global CPO industry and foster sustainable economic growth.

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