DYNAMICS OF COMPETITIVENESS AND DETERMINANTS OF INDONESIAN COCOA EXPORTS IN THE GLOBAL MARKET

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Abstract

Background: Cocoa is a strategic Indonesian plantation commodity that faces challenges in productivity, quality, and global competitiveness, despite being the world's third-largest producer.
Purpose: This study aims to analyze the dynamics of Indonesia's cocoa competitiveness and the determinants of cocoa exports in the global market.
Design/methodology/approach: This study used secondary data from the BPS, UN Comtrade, FAO, World Bank, and Bank Indonesia. The analysis includes the Trade Specialization Index (ISP), Export Product Dynamics (EPD) to measure the market position, and the Error Correction Model (ECM) to analyze the determinants of exports in the short and long term.
Findings/Results: ISP shows Indonesia as a net exporter with an average value of 0.614 and relatively good strength. The EPD classifies the top destination countries of Malaysia, China, the Philippines and India as Rising Stars, indicating strong growth potential. The ECM results show that production, productivity, price, exchange rate, destination countries' GDP, RCA, and ECI have a significant effect on exports in the long run, emphasizing the role of structural factors. Meanwhile, in the short term, the effect is inconsistent because of market volatility and structural limitations.
Conclusion: The findings imply that improving productivity, enhancing quality standards, and strengthening the downstream cocoa industry are crucial for increasing Indonesia's export competitiveness. These efforts can enhance the country's comparative advantage and economic complexity, thereby supporting sustainable export growth in the global market.
Originality/value (state of the art): The integration of ISP and EPD analyses with export determinants using ECM provides a comprehensive overview and practical policy recommendations for the sustainability of cocoa exports.

Keywords: Cocoa, global market, Trade Specialization Index, global competitiveness, cocoa exports

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INTRODUCTION

Indonesian cocoa faces complex challenges in maintaining its competitive position in the global market. As the world's third-largest producer of cocoa after Côte d'Ivoire and Ghana, this commodity plays a strategic role as a source of foreign exchange and sustains the livelihoods of millions of farmers. (Napitupulu et al. 2024). However, the competitiveness of Indonesia's cocoa exports is constrained by various structural and external factors. Domestic production factors, such as productivity and quality, which are not optimal, limit the ability to compete in the international market (Novianti et al. 2024). Meanwhile, global market dynamics marked by price fluctuations and fierce competition, further complicate efforts to improve export performance (Putro et al. 2023).

Indonesia's cocoa productivity faces several structural obstacles. The age of older plants, the limitation of superior seeds, and inefficient cultivation practices are the main factors that suppress the production performance. Another problem arises from the aspect of cocoa bean quality, which often does not meet international standards due to weak post-harvest handling. This has weakened Indonesia's cocoa competitiveness in the global market, especially as international consumers increasingly demand quality consistency and compliance with certification standards (Agbolosoo et al. 2024).

Global market dynamics further aggravate the challenges of Indonesia's cocoa exports. International price fluctuations, exchange rate volatility, and increased competition from other major producing countries tend to depress Indonesia's export position (S. D. K. Sari & Imaningsih, 2024). The export structure, which is still dominated by raw cocoa beans with low added value, also causes the foreign exchange contribution from this sector to be suboptimal. Global trends that show an increase in demand for high-value processed products further widen the gap between production potential and the realization of export added value obtained by Indonesia (Prastowo & Wulandira, 2023).

The downstream policy launched by the government is expected to increase added value and strengthen the competitiveness of Indonesian cocoa through the development of the processing industry (Saragih et al. 2021). Processed products such as cocoa fat, powder, and chocolate have broad international market prospects. However, the implementation of downstream policies still faces challenges in the form of technological limitations, low integration between farmers and the processing industry, and weak institutional support. This condition confirms the gap between the great potential of Indonesian cocoa and the achievement of real export competitiveness. In addition, fluctuations in global cocoa prices, dependence on imported processing equipment, and inconsistent quality standards across regions hinder Indonesia's competitiveness in the international markets. The dominance of raw bean exports over processed cocoa products indicates that the country has not yet fully captured the potential value-added chain. These phenomena illustrate that enhancing export competitiveness requires not only policy direction but also systemic improvements in production efficiency, technological capacity, and market adaptation mechanisms.

Several previous studies have highlighted the issues of Indonesian cocoa competitiveness and exports. Vanzza Aji et al. (2019) shows that Indonesia's cocoa export competitiveness is still lagging behind Côte d'Ivoire and Ghana based on the results of RCA and CMS analysis. Muyas and Nieamah (2025) found that the dominance of raw cocoa bean exports caused Indonesia's value to be low. Augustin et al. (2021) emphasized that Indonesia's cocoa exports to the five main destination countries show a positive trend, but their competitiveness fluctuates due to global market pressures. Dianawati et al. (2023) emphasized the importance of examining competitiveness from the perspective of global value chains, while Dago and Pei (2025) emphasized that production, world prices, exchange rates, and export prices are important determinants of exports.

Some studies focus solely on analyzing competitiveness, export trends, or the influence of production and exchange rates on export performance without simultaneously examining the long-term relationships between these variables. Empirical results indicate that although Indonesian cocoa exports have experienced positive growth, their competitiveness tends to fluctuate and remains below that of major competitors such as Côte d'Ivoire and Ghana. Furthermore, evaluations of downstream policies have not fully explained the link between processing industry transformation and export growth. Therefore, a research gap exists that

needs to be bridged through an approach that integrates the dynamics of competitiveness and the determinants of Indonesian cocoa exports into a comprehensive empirical model.

This study was designed using a quantitative approach that integrated three analysis methods. The Trade Specialization Index (ISP) and Export Product Dynamics (EPD) were applied to evaluate the competitiveness and transformation of Indonesia's cocoa export market in its main destination countries. The Error Correction Model (ECM) was used to examine the short- and long-term balance relationships of various export determinants. The variables analyzed included domestic factors such as production, productivity, and prices, as well as external factors such as exchange rates, trading partners' gross domestic product (GDP), revealed comparative advantage (RCA), and Economic Complexity Index (ECI). The synergy of these three methods is expected to provide a holistic and in-depth perspective on the competitive structure and factors determining the sustainability of long- and short-term export growth for Indonesian cocoa in the future.

This study aims to analyze competitiveness using ISP and EPD approaches and export determinants simultaneously, resulting in a more comprehensive understanding. The novelty of this research lies in the integration of the two approaches, while its impact is expected to make a theoretical contribution to the development of international trade studies in the agribusiness sector, as well as practical recommendations for the formulation of policy strategies to strengthen Indonesia's cocoa exports sustainably.

METHODS

This study uses quantitative secondary data obtained from various official national and international sources, such as the Central Statistics Agency, Directorate General of Plantations, Bank Indonesia, International Monetary Fund, World Bank, UN Comtrade, FAO and Agriculture Organization, and International Trade Centre. The data collected covered the period 2000–2022, focusing on cocoa commodities based on the Harmonized System (HS) codes 1801–1806.

The data collection technique in this study was conducted through documentation, which involved searching, recording, and compiling secondary data from various official publications and international databases. This method was chosen because it provides objective, measurable, and comparable data across different time periods.

Analysis of Trading Specialization Indices (ISP)

$$ISP = (Xia-Mia)/(Xia+Mia)$$

Information: Xia (Export value of Indonesian cocoa commodities (US$)); Mia (Import value of Indonesian cocoa commodities (US$)).

Export Product Dynamic Analysis (EPD)

Mathematically, the business power/market share (X-axis) of a product is formulated:

$$\frac{\sum_{t=1}^{t}\left(\frac{xij}{wij}\right)t\ x\ 100\% - \sum_{t=1}^{t}\left(\frac{xij}{wij}\right)t-1\ x\ 100\%}{T}$$

Growth of market attractiveness, also called product market share (Y-axis):

$$\frac{\sum_{t=1}^{t}\left(\frac{xj}{wj}\right)t\ x\ 100\% - \sum_{t=1}^{t}\left(\frac{xj}{wj}\right)t-1\ x\ 100\%}{T}$$

Information: Xij (The export value of Indonesia's processed cocoa commodity to the destination country of Indonesian cocoa importer (US$)); Wij (The export value of the world's processed cocoa commodity to the destination country of Indonesian cocoa importer (US$)); Xj (The total value of Indonesia's exports to the destination country of Indonesian processed cocoa importers (US$)); Wj (The total value of world exports to the destination country of Indonesian processed cocoa importers (US$)); T(Number of years of analysis); t (Year to-t).

Error Correction Model Analysis

The Error Correction Model (ECM) was used to observe the long- and short-term effects of each free variable on the bound variable (H. P. Sari et al. 2025). The data analysis process in this study began with an examination of the stationary nature of the data through the Unit Root Test. All variables, both bound and explanatory, were tested for stationarity. In this context, the Augmented Dickey-Fuller (ADF) test was used.

This study forms a long-term equation model. The model is built by regressing data that are not stationary at the specific level. The Long-Term ECM model formed in this study is as follows:

The Long-Term ECM model formed in this study is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \varepsilon$$

After the long-term model is formed and the residuals are obtained, the next step is to construct a short-term model by incorporating the ECT from the cointegration test results. The addition of this variable represents the magnitude of the adjustment required to correct the short-term imbalance towards long-term equilibrium. The short-term equation model used in this study is as follows:

$$DY = \beta_0 + \beta_1 DX_1 + \beta_2 DX_2 + \beta_3 DX_3 + \beta_4 DX_4 + \beta_5 DX_5 + \beta_6 DX_6 + \beta_7 DX_7 + \beta_8 DX_8 + \beta_9 DX_9 + ECT$$

Information: Y (Export Volume (Ton)); X1 (Indonesian Cocoa Production (Ton)); X2 (Cocoa Consumption (Ton)); X3 (Land Productivity (Ton/Ha)); X4 (Cocoa Selling Price (USD/Ton)); X5 (Rupiah Exchange Rate (IDR)); X6 (GDP Rill Indonesia); X7 (GDP Rill Malaysia); X8 (GDP Rill India); X9 (GDP Rill China); ECT (Error Correction Model).

The final stage in this analysis procedure is to test the classical Gaussian-Markov assumptions, which include tests for normality, freedom from autocorrelation, homoscedasticity, and freedom from multicollinearity. Because the Error Correction Model (ECM) is constructed using Ordinary Least Squares (OLS) estimation, meeting these assumptions is necessary to ensure that the resulting estimator is a Best Linear Unbiased Estimator (BLUE).

This research framework (Figure 1) describes the relationship between the competitiveness of Indonesia's cocoa exports and the factors that affect them in the global market. Low productivity, inconsistent seed quality, and the dominance of crude grain exports are major issues exacerbated by international trade dynamics and downstream policies. To answer this question, this study uses ISP and EPD analyses to assess the position and dynamics of export competitiveness, as well as the ECM to analyze the determinants of exports in the short and long terms. The results of the integration of these three analyses are expected to be the basis for formulating policy strategies to increase productivity, strengthen downstreaming, stabilize prices, and expand the Indonesian cocoa export market sustainably.

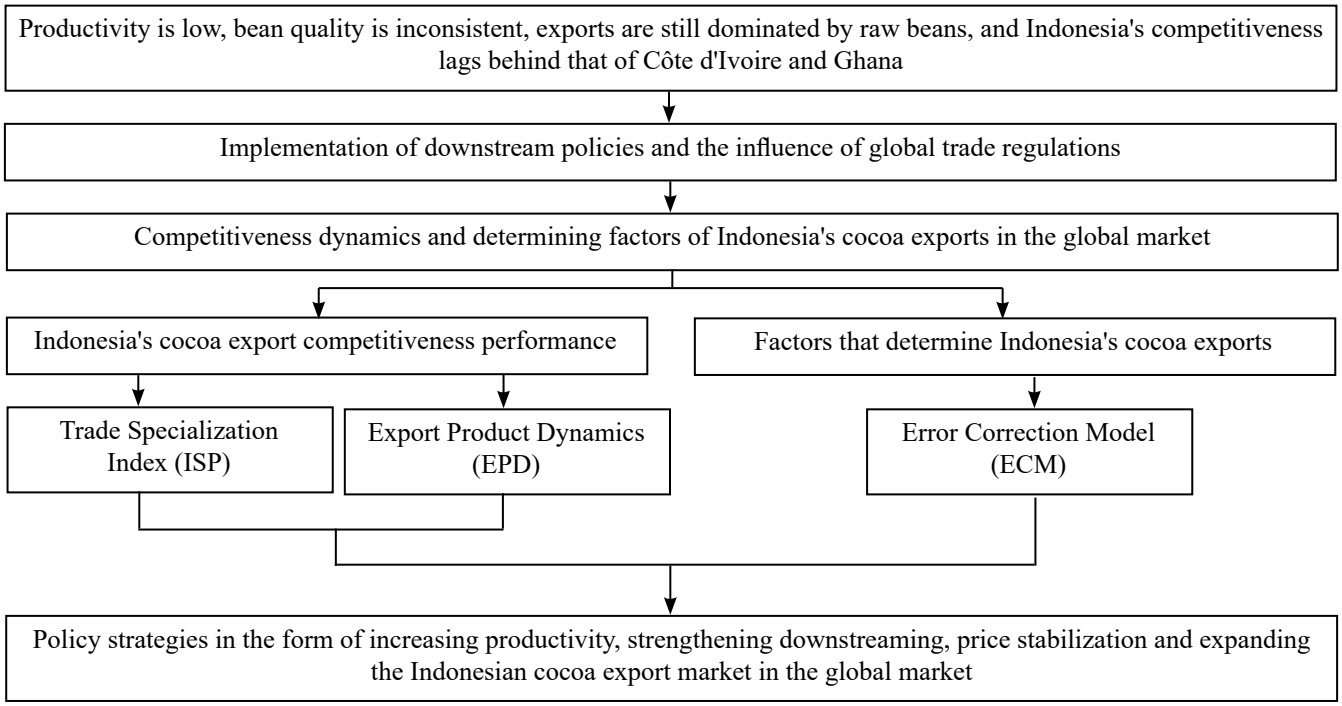

Figure 1. Research framework

Based on theoretical studies and previous research, each variable is estimated to affect Indonesia's cocoa exports in the short and long terms. Therefore, this study formulated several hypotheses to be tested using the Error Correction Model.

According to the theory of supply and export capacity (Salvatore, 2013), a country's production capability determines its ability to meet domestic and international market demands. In agricultural trade, higher production capacity tends to expand export potential because it ensures a consistent supply and price stability (Krugman and Obstfeld, 2007). Increased production signals surplus availability beyond domestic consumption, encouraging export expansion, and cocoa production shows the national capacity to meet export needs. Increased production indicates greater supply capability, potentially increasing export volumes (Fauzi & Islami, 2023).
H1: Cocoa production has a positive and significant effect on Indonesia's cocoa exports in the short and long terms.

Based on the theory of production efficiency and comparative advantage (Keynes et al. 1891,Porter (1992), productivity represents how efficiently inputs are converted into outputs. High productivity lowers per-unit costs and increases competitiveness in the international markets. Within the agricultural sector, productivity improvement reflects technological progress and resource optimization, which directly enhances export performance. Productivity reflects the efficiency of the use of production factors. The higher the productivity, the greater the ability to increase export competitiveness (Mignenan and Nandingar, 2024).
H2: Productivity reflects the efficiency of the use of production factors. The higher the productivity, the greater the ability to increase export competitiveness

According to the international price competitiveness theory (Krugman, 1986), export prices determine a country's ability to compete in the global market. When export prices are competitive relative to substitutes, the demand from importing countries tends to increase. Conversely, price increases reduce competitiveness and export volumes, especially in markets with elastic demand. Export prices are an important factor that determines the competitiveness of products in international markets. Competitive prices increase demand in export destination countries (Prastowo and Wulandira, 2023).
H3: Export prices have a positive and significant effect on Indonesia's cocoa exports in the short and long terms.

The exchange rate pass-through theory (Dornbusch, 1976) explains how currency fluctuations affect export performance through relative price changes. A depreciation of the domestic currency makes exports cheaper in foreign markets, stimulating demand. Conversely, appreciation tends to reduce competitiveness and export volumes. However, in the long term, exporters may adjust their production and pricing strategies, leading to a positive adjustment effect. Exchange rates affect export competitiveness through changes in the relative prices between countries. The depreciation of the rupiah tends to increase exports, while appreciation can decrease it (Prastowo & Wulandira, 2023).
H4: The exchange rate has a negative and significant effect on Indonesia's cocoa exports in the short term, but has a positive and significant effect in the long term.

According to the gravity model of international trade (Anderson, 2011), the economic size of trading partners, reflected by their GDP, determines the volume of bilateral trade flows. Higher GDP in importing countries indicates stronger purchasing power and greater demand for imported commodities, including cocoa. The GDP of destination countries such as Malaysia, India, and China reflects people's purchasing power, which affects the demand for Indonesian cocoa products (Sofyan & Apriliana, 2025).
H5: The GDP of export destination countries has a positive and significant effect on Indonesia's cocoa exports in both the short and long terms.

The theory of comparative advantage (Keynes et al. 1891) states that countries specialize in producing and exporting goods for which they have a relative efficiency advantage. RCA quantitatively measures this advantage by comparing a country's export share of a particular commodity to global trade patterns (Balassa, 1965). A high RCA value reflects strong export specialization and competitive strength in international markets. The RCA illustrates Indonesia's level of comparative superiority in the cocoa trade. A high RCA value indicates a strong competitive position in the global market (Vanzza Aji et al. 2019).
H6: RCA has a positive and significant effect on Indonesia's cocoa exports in both the short and long terms.

According to the economic complexity theory (Hausmann & Hidalgo, 2011), countries with diversified and sophisticated production structures tend to exhibit stronger and more sustainable export growth. A higher ECI value indicates the ability to produce complex products, reflecting advanced knowledge, innovation, and institutional quality that supports export expansion. The ECI reflects the diversity and sophistication of a country's economic structure. High economic complexity strengthens export capabilities and global competitiveness (Fadillah et al. 2024)
H7: ECI has a positive and significant effect on Indonesia's cocoa exports in both the short and long terms.

RESULTS

Indonesia's Cocoa Trade Position in the International Market

Indonesia is a major cocoa producer, competing with Côte d'Ivoire and Ghana. Differences in export orientation and policy implementation influence the trade specialization. The Trade Specialization Index (ISP) compares Indonesia's position with that of other main exporters, as shown in Table 1.

Indonesia's cocoa trade position, as measured by the Trade Specialization Index (ISP), is in stark contrast to Côte d'Ivoire and Ghana, which maintain stable net exporter status with average ISPs close to 1 (Vanzza Aji et al. 2019). Although Indonesia is also a net exporter on average with an average ISP of 0.614, its ISP value has shown a drastic decline and sharp fluctuations since 2010. This decline reached a low of 0.210 in 2022, directly related to the implementation of the Export Duty on Cocoa Beans (Wijaya & Simamora, 2024). This policy aims to strategically restrain the export rate of raw seeds and divert supply to the domestic processing industry, thereby encouraging downstream and increasing the added value of processed products (Hanafi & Tinaprilla, 2017). Thus, the decrease in ISP in raw beans can be interpreted as an indication of a successful structural transition towards specialization in processed products (Rahmadona et al. 2023). This transition shows that trade restructuring has succeeded in directing the volume of raw materials to be absorbed by the national downstream industry. Nevertheless, the success of this downstream industry must be balanced with the ability of processed products to compete in the global market.

Position of Indonesia's Cocoa Export Market to Main Destination Countries

The dynamics of Indonesia's cocoa export market reflect the country's ability to maintain its competitiveness and adapt to changes in global demand (Andriani et al. 2025). To assess this position, the Export Product Dynamics (EPD) approach is applied, which evaluates both export growth and market share growth in major importing countries (Meliany et al. 2025). The results of this analysis are shown in Table 2.

The results of the Export Product Dynamic (EPD) analysis show that Indonesia's cocoa exports to Malaysia, China, India, and the Philippines are all in the Rising Star position, indicating a strong growth prospect owing to an increase in the export and market share of products (Alaini et al. 2025). This position is very important in Malaysia as the center of the global cocoa processing industry, which presents a stable market opportunity for Indonesia, with an average export share growth of 0.005. Rising Star's achievements in all destination countries, including China, India, and the Philippines, confirm that Indonesia's cocoa opportunities in the global market are still very open and can adapt to demand dynamics in Asia in line with the growth of the middle class, which increases the consumption of processed chocolate products (Augustin et al. 2021). Optimizing these opportunities requires improving product quality, supply consistency, and meeting international standards to increase added value, in line with findings that emphasize that competitiveness is not measured by volume, but rather determined by product quality and global value chain connectivity (Fadillah et al. 2024).

Table 1. Comparison of average values of processed cocoa ISP in Indonesia, Côte d'Ivoire, and Ghana in 2000–2022

Country	Average ISP Value
Indonesia	0.614
Côte d'Ivoire	0.998
Ghana	0.996

Factors affecting Indonesia's Cocoa Exports in the International Market

Stationary Test

Stationarity testing ensures data stability and model validity in the time series analysis. The Augmented Dickey-Fuller (ADF) test identifies whether the variables are stationary or contain a unit root. The test results for the variables are presented in Table 3.

The results of the Augmented Dickey-Fuller (ADF) test in this study show that all variables, including export volume, production, consumption, productivity, price, exchange rate, Indonesia's real GDP, destination country real GDP, RCA, and ECI, are stationary, characterized by a probability value that is below the significance level of 5 percent. These findings confirm that the time-lapse data used met the criteria of stationarity, which means that the data movement was relatively stable around its long-term average and did not show a random trend (Devianto et al. 2024). The stationary condition of all variables is an important foundation that guarantees the reliability of the estimation results, and provides a strong justification for continuing the cointegration analysis and the Error Correction Model (ECM), considering that the ECM requires that the research variables must have the same order of integration (Devianto et al. 2024).

Cointegration Test

Cointegration testing aims to determine the long-term equilibrium relationship between the variables in the model. The presence of cointegration indicates that changes among variables move together. The results of this test are presented in Table 4. The cointegration test showed a close long-term relationship between Indonesia's cocoa export volume and all its determining factors, both in the short and long term (Agbolosoo et al. 2024). This is confirmed by a significant residual lag coefficient (-1) with a value of -0.957 with a probability of 0.0004, indicating a strong Error Correction Model (ECM). This ECM ensures that any short-term deviations will be corrected towards a long-term equilibrium with an adjustment rate of approximately 95.7 percent per period, thus validating the use of the Error Correction Model (ECM) model for further analysis.

Table 2. Average value of Indonesian cocoa EPD to destination countries 2000–2022

Importer	Average Growth of Export Share (%) X-Axis	Average Product Market Share Growth (%) Y-axis	Competitive Position
Malaysia	0.005	0.002	Rising Star
China	0.008	0.001	Rising Star
India	0.002	0.001	Rising Star
Filipina	0.005	0.001	Rising Star

Table 3. ADF stationarity test results for variables determining Indonesian cocoa exports

Variable	Probabilitas	Lag	Max Lag	Results
Production (X1)	0.0000	0	4	Stasioner
Consumtion (X2)	0.0141	1	4	Stasioner
Productivity (X3)	0.0002	1	4	Stasioner
Price (X4)	0.0004	0	4	Stasioner
Exchange rate (X5)	0.0000	0	4	Stasioner
GDP Rill Indo (X6)	0.0091	3	4	Stasioner
GDP Rill Malay (X7)	0.0000	1	4	Stasioner
GDP Rill India (X8)	0.0011	2	4	Stasioner
GDP Rill China (X9)	0.0024	2	4	Stasioner
RCA (X10)	0.0057	4	4	Stasioner
ECI (X11)	0.0000	1	4	Stasioner

Table 4. Cointegration test results between indonesian cocoa export variables and determining factors

Variable	Coefficient	Std. Error	t-Statistic	Probabilitas
RES (-1)	-0.957146	0.227146	-4.213797	0.0004
C	-1245.706	9397.851	-0.132552	0.8959

Error Correction Model Test (ECM)

Long-Term Equations

The estimation of the long-term relationship among variables affecting Indonesia's cocoa exports was conducted using the Error Correction Model (ECM). This model identifies the long-run effects of key factors such as production, consumption, productivity, price, exchange rate, partner countries' GDP, and competitiveness indicators (RCA and ECI). The regression results of the long-term equation are presented in Table 5.

The results of the analysis of the Long-Term ECM Test produced a regression equation model, which is as follows:

$$Y = -190945 + 0.663461X_1 + 2.262160X_2 + 8627.917X_3 + 57.55487X_4 + 28.33903X_5 + 1.04X_6 + 3.66X_7 + 6.92X_8 + 7.70X_9 + 12814.84X_{10} + 146175.3_{X11} + \varepsilon$$

The results of the estimation of the long-term regression equation show that the model has a fairly high explanatory power. The R-squared value of 0.792 indicates that about 79.2 percent of the variation in cocoa exports can be explained by all independent variables in the model. Meanwhile, the F-Statistic Probability of 0.0179 is smaller than 0.05, confirming that all independent variables simultaneously have a significant effect on cocoa exports. This shows that the long-term regression model used is statistically feasible and can provide a comprehensive picture of the fundamental factors determining the performance of Indonesia›s cocoa exports (Ramdhani & Dewi, 2024). This model can explain the fundamental factors that determine the performance of Indonesian cocoa exports in the international market, and individually, most independent variables also show a significant influence on cocoa exports (Putro et al. 2023).

Short-Term Equations

The short-term dynamics of Indonesia's cocoa exports were analyzed using the Error Correction Model (ECM) to capture short-run adjustments toward long-run equilibrium. The regression results in Table 6. The results of the ECM Test in the Short Term produced the following regression equation model:

$$Y = 1096{,}719 + 0{,}167512X_1 - 2{,}176214X_2 + 93135{,}54X_3 - 138{,}9901X_4 - 31{,}04345X_5 + 1{,}18X_6 + 4{,}53X_7 + 1{,}26X_8 - 4{,}39X_9 + 38045{,}03X_{10} + 128574{,}5_{X11} - 0{,}291163ECT + \varepsilon$$

The results of the short-term equation estimation show that the R-squared value of 0.837 indicates that about 83.7 percent of the variation in Indonesia's cocoa export changes can be explained by independent variables in the model, so that the model has a strong ability to explain short-term dynamics. This value is relatively higher than the long-term model, so it can capture annual fluctuations that occur due to changes in production factors, prices, exchange rates, and economic conditions of the export destination country (Alaini et al. 2025). Meanwhile, the F-statistic probability of 0.0539, which is close to the 5 percent significance limit, shows that independent variables simultaneously have an almost significant influence on cocoa exports in the short term. These results indicate that although the short-term response tends to be more volatile, the dynamics of Indonesia's cocoa exports are still influenced by a combination of domestic and external fundamental factors, and tend to move towards a long-term equilibrium (Agbolosoo et al. 2024).

Classic Assumption Test

The results of the classical assumption test show that the regression model met the BLUE (Best Linear Unbiased Estimator) criteria. The Jarque-Bera normality test yielded a probability of 0.8895 > 0.05, so the data were distributed normally (Table 7). Multicollinearity was not detected because the entire VIF value was < 10. The heteroscedasticity test with Breusch-Pagan-Godfrey yielded a probability of 0.9827 > 0.05, which means a homogeneous error variance. In addition, the Breusch-Godfrey autocorrelation test yields a probability of 0.5352 > 0.05, so that the model is autocorrelated-free. If these assumptions are met, the model used is valid, efficient, and feasible in explaining the factors affecting cocoa exports in Indonesia (Fauzi and Islami, 2023).

Table 5. Long-term equation regression results of the ECM Model for Indonesian cocoa exports

Variabel	Coefficient	Std. Error	t-Statistic	Probabilitas
C	-190945.0	517417.3	-0.369035	0.0191
Production (X1)	0.663461	0.227258	2.919415	0.0140
Consumtion (X2)	2.262160	4.112272	2.550100	0.0032
Productivity (X3)	8627.917	1345468.0	0.006413	0.0050
Price (X4)	57.55487	44.94750	1.280491	0.0267
Exchange rate (X5)	28.33903	14.45008	1.961168	0.0057
GDP Rill Indo (X6)	1.04000	7.890000	1.311848	0.0163
GDP Rill Malay (X7)	3.66	3.370000	0.108516	0.0055
GDP Rill India (X8)	6.92	2.38	3.290554	0.0068
GDP Rill China (X9)	7.70	6.85	0.112467	0.0125
RCA (X10)	12814.84	50543.71	2.253540	0.0045
ECI (X11)	146175.3	245926.4	3.594386	0.0043
R-Squared		0.792157		
Prob (F-Statistic)		0.017994		

Table 6. Short-term equation regression results of the ECM Model for Indonesian Cocoa Exports

Variable	Coefficient	Std. Error	t-Statistic	Probabilitas
C	1096.719	108967.1	0.010065	0.9922
ΔProduction (X1)	0.167512	0.150092	1.116057	0.2968
ΔConsumtion (X2)	-2.176214	3.670765	-0.592850	0.5697
ΔProductivity (X3)	93135.54	614930.4	0.151457	0.8834
ΔPrice (X4)	-138.9901	111.9847	-1.241152	0.2497
ΔExchange rate (X5)	-31.04345	15.39037	-2.017069	0.0784
ΔGDP Rill Indo (X6)	1.18	4.30	2.744683	0.0253
ΔGDP Rill Malay (X7)	4.53	2.86	1.584527	0.1517
ΔGDP Rill India (X8)	1.26	2.54	0.497632	0.6321
ΔGDP Rill China (X9)	-4.39	1.19	-0.368340	0.7222
ΔRCA (X10)	38045.03	19295.64	1.971690	0.0841
ΔECI (X11)	128574.5	136476.6	0.942099	0.3737
ECT	-0.291163	0.407194	0.715048	0.0049
R-Squared		0.837422		
Prob (F-Statistic)		0.053891		

Table 7. Summary of classical assumption test results in the ECM regression model for Indonesian cocoa exports

Assumption	Test	Probability	Results
Normalitas	Jarque -Bera	0.8895	Fulfilled
Multikolinearitas	Variance Inflation Factor	VIF value < 10	Fulfilled
Heterokedastisitas	Breusch-Pagan-Godfrey	0.9827	Fulfilled
Autokorelasi	Breusch – Godfrey	0.5352	Fulfilled

The Influence of Production on Indonesian Cocoa Exports

Based on the results of the analysis in Tables 5 and 6, cocoa production shows a significant positive influence on exports in the long term, with a coefficient of 0.663. These findings confirm that increasing sustainable production capacity is a key factor in strengthening the competitiveness and continuity of Indonesia's cocoa exports in the global market (Putro et al. 2023). In contrast, in the short term, production has a positive coefficient of 0.167, but it is not significant. This indicates that the increase in annual production has not been able to directly boost exports, likely because most of the supply is absorbed by the domestic market or constrained by the quality of the beans that have not yet fully met international standards (Prastowo & Wulandira, 2023).

The Influence of Consumption on Indonesian Cocoa Exports

The results of the analysis in Tables 5 and 6 show that domestic cocoa consumption has a significant positive effect on exports in the long term, with a coefficient of 2.262. These findings indicate that the growth in domestic demand is directly related to the strengthening of exports, which can be explained by the improvement in the quality and continuity of supply driven by the growth of the domestic processing industry. This condition is consistent with research that confirms that domestic and global demand can go hand in hand, especially if supported by strengthening the processing industry (Agbolosoo et al. 2024). Meanwhile, in the short term, consumption shows a negative coefficient of -2.176, which is insignificant. These results indicate that an increase in domestic consumption does not directly depress export volumes annually, as the domestic market plays a larger role in absorbing annual production fluctuations without significantly affecting export volumes (Sofyan & Apriliana, 2025).

The Influence of Productivity on Indonesia Cocoa Exports

The results of the analysis in Tables 5 and 6 show that cocoa productivity has a significant positive influence on exports in the long term, with a coefficient of 8627.917. These findings confirm that improving land efficiency through improved cultivation and plantation management is the main determinant in strengthening Indonesia's export capacity and competitiveness (Mignenan & Nandingar, 2024). Meanwhile, in the short term, productivity, although it has a positive coefficient of 93135.54, does not have a significant effect. This indicates that the increase in annual efficiency has not directly affected export volumes due to the limitations of the processing industry and supply chain (Agbolosoo et al. 2024), Thus, productivity remains a strategic factor in strengthening Indonesia's cocoa exports, although the impact is more pronounced in the long term than in the short term.

The Influence of Prices on Indonesian Cocoa Exports

The results of long-term estimates show that cocoa prices have a significant positive effect on exports with a coefficient of 57.55, which means that the price increase encourages an increase in exports because it provides incentives for farmers and business actors to increase production and supply to the global market, while increasing the country's foreign exchange, in line with the view that it provides incentives for farmers and business actors to increase production and supply to the global market, as well as increasing the country's foreign exchange, in line with the view that the Prastowo & Wulandira (2023) regarding the importance of prices in strengthening the competitiveness of international trade. However, in the short term, cocoa prices have a negative coefficient of -138.99 and are insignificant, indicating that annual price fluctuations have not been able to increase export volumes and even have the potential to decrease them due to international market sensitivity, weak quality competitiveness, and non-price factors such as quality standards and supply consistency. This is consistent with the findings of Prastowo and Wulandira (2023) who confirmed that in the short term, Indonesia's cocoa exports are more influenced by structural and quality aspects than by price movements alone.

The Influence of Exchange Rate on Indonesian Cocoa Exports

The long-term estimates show that the IDR/USD exchange rate has a significant positive effect on cocoa exports, with a coefficient of 28.33. This means that the depreciation of the IDR relatively increases the competitiveness of Indonesian cocoa product prices in the global market because they are cheaper for foreign buyers, thus encouraging an increase in the export

volume. These findings are consistent with the theory of trade elasticity, which states that exchange rates are an important factor in determining a country's export performance (Prastowo and Wulandira, 2023). However, in the short term, the exchange rate has a negative coefficient of -31.04 even which is almost significant, indicating that annual exchange rate fluctuations can suppress exports, because rupiah volatility causes price uncertainty for exporters and importers and affects transaction costs and trade contracts (Satriana et al. 2019). These results are consistent with Sugiartiningsih (2022) who confirmed that the influence of exchange rates on plantation commodity exports is stronger in the long term, while in the short term the influence tends to fluctuate and is influenced by market stability and monetary policy.

The Influence of Indonesia's Real GDP on Indonesia's Cocoa Exports

The results of the estimation show that Indonesia's real GDP has a positive and consistently significant effect on cocoa exports, both in the long term, with a coefficient value of 1.04, and in the short term, with a coefficient value of 1.18. These findings confirm that sustainable domestic economic growth encourages increased production capacity and efficiency, which ultimately strengthens Indonesia's cocoa export capability (Prasetyo et al. 2021). This significant short-term influence is consistent with research showing that an increase in annual economic activity strengthens export capacity through improved productivity and downstream industry support (Lintang and Kurniawan, 2023). Thus, Indonesia's real GDP is an important determinant that plays a dual role in stably supporting cocoa exports over both time horizons.

The Influence of Malaysia's Rill GDP on Indonesia Cocoa Exports

The estimated results show that Malaysia's real GDP has a significant positive influence on Indonesia's cocoa exports in the long term, with a coefficient of 3.66. This confirms that Malaysia's economic growth as the center of the world's cocoa processing industry increases the need for raw materials, thereby increasing the opportunities for cocoa exports to Indonesia (Putro et al. 2023). In contrast, Malaysia's real GDP has a positive coefficient of 4.53 in the short term, but it is not significant. This indicates that Malaysia's annual economic fluctuations are not strong enough to directly affect exports, as trade in industrial raw materials tends to be more influenced by contracts and long-term factors. Thus, Malaysia's real GDP is an important factor supporting exports, with a more dominant impact observed in the long term.

The Influence of India's Real GDP on Indonesia's Cocoa Exports

The results of the estimation show that India's real GDP has a significant positive effect on Indonesia's cocoa exports in the long term, with a coefficient of 6.92. This confirms that India's rapid economic growth increases the consumption of processed cocoa products in line with the growth of the middle class, thereby strengthening Indonesia's cocoa export demand (Reviane & Pananrangi, 2021). In contrast, in the short term, India's real GDP has a positive coefficient of 1.26, but it is not significant. This indicates that India's annual economic fluctuations have not directly affected export volumes, as cocoa trade is more closely linked to long-term contracts and supply chain stability (Neilson et al. 2020). As such, India's real GDP is an important factor supporting the export outlook, with a more dominant contribution to the long-term horizon.

The Influence of China's Real GDP on Indonesia Cocoa Exports

China's real GDP analysis results show a significant positive influence on Indonesia's cocoa exports in the long term, with a coefficient of 7.70. This confirms that China's economic growth is sustainably increasing purchasing power and demand for Indonesian cocoa products, driven by the growth of the middle class and shifts in consumption patterns (Alaini et al. 2025). In contrast, in the short term, China's real GDP has a negative coefficient of -4.39 and is insignificant. This indicates that fluctuations in annual economic growth in China do not necessarily affect export volumes, as cocoa trade tends to be more stable and relies on long-term contracts rather than short-term economic changes (Sofyan & Apriliana, 2025). Thus, although the influence is not dominant in the short horizon, China's real GDP is an important variable that supports the structural increase in cocoa exports in Indonesia.

The Influence of RCA's on Indonesia Cocoa Exports

The results of the RCA analysis show a significant positive influence on Indonesia's cocoa exports in the long term, with a coefficient of 12814.84. This confirms that the higher the comparative advantage, the stronger the competitiveness and opportunities of Indonesia's cocoa exports in the international market (Alaini et al. 2025). However, in the short term, RCA also had a positive effect, with a coefficient value of 38045.03, but it was not significant. This is due to the fact that changes in the value of the RCA are more reflective of long-term structural trends, while annual exports in the short term are more influenced by fluctuations in prices, exchange rates, and demand of destination countries Rustiadini & Novianti (2025). Thus, the RCA is a dominant strategic indicator for strengthening Indonesia's cocoa exports over the long term.

The Influence of ECI on Indonesia's Cocoa Exports

The results of the ECI analysis show a significant positive influence on Indonesia's cocoa exports in the long term, with a coefficient of 146175.3. These findings confirm that the more complex Indonesia's economy, the stronger the competitiveness of exports through improving the quality and diversification of products according to global standards (Fadillah et al. 2024). However, in the short term, the ECI has a positive coefficient of 128574.5, but it is not significant. This indicates that the increase in economic complexity has not had a direct impact on annual exports, as it has affected industrial development and long-term innovation. Thus, ECI is a strategic variable that supports the sustainability of Indonesia's cocoa exports, although its contribution is more significant in the long term.

Manajerial Implications

The results of this study emphasize the importance of an integrated strategy to strengthen the competitiveness of Indonesia's cocoa exports through synergy between the government, industry, and farmers. The government needs to prioritize the stability of macroeconomic variables, such as exchange rates and production costs, and increase productivity through plantation replanting programs and the provision of high-quality seeds. The cocoa processing industry is encouraged to invest in technology, innovation, and the implementation of international quality certification to ensure that Indonesian cocoa products meet global standards. On the other hand, farmer associations and agribusiness institutions need to strengthen their institutional capacity, implement sustainable cultivation practices, and build close partnerships with exporters to maintain a consistent supply of quality raw materials. In addition, exporters and investors need to diversify export markets and develop environmentally friendly technology-based processed products to meet the increasing demand in countries such as China, India, and Malaysia. Overall, the results of this study show that improving coordination, sustainability, and efficiency across the cocoa value chain is key to maintaining Indonesia's long-term competitiveness in the global market.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study shows that Indonesia's cocoa exports still have positive prospects in the global market, despite facing competitive challenges. ISP analysis shows a decline in Indonesia's position as a net exporter after the export duty policy, but this is in line with the downstream policy, which encourages the export of processed products. The EPD results place exports to key destination countries such as Malaysia, China, India, and the Philippines in the Rising Star category, which signals huge growth opportunities. The ECM analysis shows that in the long term, the variables of production, consumption, productivity, price, exchange rate, GDP of the destination country, RCA, and ECI have a significant effect on exports, while in the short term, the effect is more volatile. Overall, strengthening the competitiveness of Indonesia's cocoa exports requires an integrated strategy that increases productivity, price control, strengthens the processing industry, and supports sustainable policies. These results are consistent with Agbolosoo et al. (2024), who found that production capacity, exchange rate, and competitiveness indicators significantly influence Indonesia's cocoa exports, and Alaini et al. (2025), who confirmed that Indonesia's cocoa exports to major Asian markets are in a Rising Star position, indicating strong long-term growth potential.

Recommendations

Downstream policies must be strengthened with incentive support for the processing industry so that processed cocoa products become more competitive in the global market. Domestic price stability needs to be maintained through fiscal and monetary instruments so that it is not too affected by international market fluctuations. The government also needs to expand export markets through trade diplomacy, strengthen international trade agreements, and improve quality standards to meet global consumer demand. Policy integration that touches on aspects of production, downstreaming, price stabilization, and market access will be key to strengthening the competitiveness of Indonesia's cocoa exports sustainably.

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