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The Effect of Cocoa Bean Export Duties on The Export of Processed Cocoa Products in Indonesia Evidence from Cocoa Powder

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ABSTRACT

Export duties on raw materials are widely used to promote downstream industrialization, yet their effectiveness in supporting processed exports remains debated. This study evaluates the effectiveness of cocoa bean export duties, international cocoa prices, and domestic production in influencing cocoa powder export performance using an Error Correction Model (ECM). The analysis employs 83 time-series observations from Statistics Indonesia and the Ministry of Trade. The results show that export duty rates have a negative and significant effect on cocoa powder exports, while prices have positive and significant effects. The error correction term (-0.6352) is significant at the 1% level, suggesting that 63.5% of short-run deviations are corrected each period. The findings indicate that export duties may constrain processed cocoa exports when industrial capacity remains limited. The study provides empirical evidence on export duties and offers policy insights for designing downstream industrialization policies.

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INTRODUCTION

Cocoa is a strategic agricultural commodity that plays an important role in the global economy as a primary input for the food and beverage industry. Beyond providing income for millions of smallholder farmers in tropical countries, cocoa supports the growing demand for processed products such as chocolate and cocoa-based beverages. As a globally traded commodity, cocoa contributes significantly to export earnings and employment in producing countries while also serving as an essential industrial input in the food, pharmaceutical, and cosmetic sectors [1], [2].

Indonesia is one of the major cocoa-producing countries, and cocoa exports are an important component of its agricultural trade. However, export performance has fluctuated considerably, with an average growth rate of 9.4% during 1991–2020 [3]. Previous studies identify domestic production, international prices, and exchange rates as important determinants of cocoa exports [4].

Nevertheless, empirical findings remain mixed: some studies report significant effects of domestic prices, while others find limited effects of macroeconomic variables [5]. In contrast, other studies report that production and exchange rates positively affect cocoa exports, whereas world prices have no significant impact [6]. These differences indicate the need for further empirical investigation.

Despite Indonesia's production potential, its cocoa processing industry remains relatively limited. Processed cocoa products account for a smaller share of exports than raw materials, indicating weak integration between upstream production and downstream processing. Strengthening domestic processing is therefore important for increasing value added.

Export duties on cocoa beans have been introduced partly to encourage downstream processing by restricting raw bean exports and increasing domestic availability for processors. Through this mechanism, export duties may reduce domestic cocoa bean prices and processing costs, thereby improving the international competitiveness of processed cocoa products [7], [8]. However, export duties can also reduce producer incentives, create market distortions, and weaken export competitiveness, making their effectiveness an empirical question.

International trade theory provides competing perspectives on export taxes. Optimal tariff theory suggests that a large exporting country may improve national welfare by imposing an export tax when terms-of-trade gains exceed distortionary losses. Evidence from Côte d'Ivoire indicates that export duties can increase government revenue when an exporting country possesses market power [9].

More broadly, international trade contributes to economic growth [10]. International trade is fundamentally explained by the theory of comparative advantage, which posits that countries tend to export goods that they can produce more efficiently, in relative terms, than other countries [11]. Indonesia's favorable agroclimatic conditions provide a comparative advantage in cocoa production [12].

Nevertheless, comparative advantage does not automatically translate into export competitiveness. Trade policy, including export duties, can alter domestic and international prices and the distribution of welfare [13], [14]. Indonesian evidence suggests that export duties may suppress cocoa export performance despite the country's production advantage [15].

In contrast, export tax incidence theory emphasizes that export taxes reduce prices received by domestic producers and may weaken production incentives and export volumes. Previous research finds that poorly designed export duties can reduce exports and national welfare [12]. Evidence from Côte d'Ivoire further suggests that although cocoa export taxes may increase government revenue in the short run, they can redistribute income from farmers to government without increasing national income in the long run [14].

Export tax incidence theory explains how the burden of export duties is distributed between domestic producers and foreign consumers. Where an exporting country has limited market power, domestic producers generally bear a greater share of the burden through lower farm-gate prices, while foreign consumers continue to pay prices close to world-market levels [15], [16].

In agricultural commodity markets, export duties may nevertheless support downstream industrialization by lowering raw-material export prices and domestic input costs. Consequently, farmers may bear much of the tax burden while processors benefit from cheaper inputs [17].

Export restrictions on raw materials are increasingly used as industrial policy instruments to promote domestic value addition and upgrading in global value chains. However, their effectiveness depends on domestic processing capacity and may generate trade distortions when that capacity is limited. In Indonesia, cocoa export duties have been associated with declining raw bean exports and expansion of processed products such as cocoa butter and powder, although productivity and competitiveness challenges remain [21], [22].

Several economic variables may also shape cocoa export performance. International cocoa prices are consistently identified as important drivers of trade dynamics, while the global cocoa market remains concentrated and vulnerable to external shocks such as COVID-19 [23]. The Living Income Differential implemented by Ghana and Côte d'Ivoire has also affected cocoa prices along global supply chains [19].

Export duties influence export performance through two primary channels: changes in relative prices (tax incidence) and the reallocation of raw materials toward domestic downstream industries. Optimal export taxes on cocoa beans affect export growth dynamics and long-run adjustment across major producing countries, including Indonesia, Ghana, and Côte d'Ivoire [19]. Similarly, evidence from Côte d'Ivoire suggests that export taxes can raise world prices when the exporting country possesses pricing power; however, in the absence of such power, the tax burden is largely borne by domestic suppliers [20]. Other studies find that export duties tend to shift supply from raw bean exports toward processed cocoa products—such as butter, paste, and powder—over the long run, although the magnitude of these effects varies across product types [21]. Evidence on price transmission in Indonesia also reveals asymmetric price transmission and the significant role of export duty policy in shaping producer prices, indicating that a substantial portion of the tax burden is borne upstream [22].

Domestic production plays a dual role in export performance. While higher production volumes may expand export capacity, the extent to which additional output flows into export markets depends on product quality, plantation productivity, and absorption by domestic processing industries. Cross-country

analyses show that production levels and harvested area significantly affect trade values, although their net impact is mediated by economic distance and trade agreements [23]. In Indonesia, several studies report a positive relationship between production and exports; however, its influence is often weaker than that of prices and exchange rates, reflecting supply-side constraints and persistent quality issues, such as limited fermentation capacity. Exchange rates theoretically stimulate exports when domestic currencies depreciate, as export prices become relatively cheaper in foreign currency terms. Empirical evidence from agricultural commodities supports the sensitivity of export flows to real exchange rates and exchange rate volatility [24]. In cocoa markets, ARDL and VAR-based studies across different contexts consistently identify exchange rates as a dominant short- and long-run determinant of export performance, including in Indonesia [25].

Inflation affects export performance through its impact on production and logistics costs as well as price competitiveness. In Indonesia, recent ARDL-based analyses indicate that higher domestic inflation tends to constrain cocoa export performance unless offset by productivity gains or sufficient currency depreciation [26]. More broadly, macroeconomic literature emphasizes that global inflation cycles and monetary policy influence commodity export flows through partner-country demand and interest rate channels [27].

Overall, the literature suggests that export performance varies across cocoa product categories—such as beans, powder, liquor, and other processed products—in response to economic variables and policy instruments. Export duties generally suppress raw bean exports while potentially supporting certain processed products. World prices and

exchange rates emerge as the most consistent determinants across product types, whereas production and inflation influence exports indirectly through price transmission mechanisms and downstream industrial capacity.

Based on recent developments, the state of the art in cocoa export research highlights several key patterns. World prices are the most robust determinants of cocoa export performance across countries and periods [22]. Export duties are widely regarded as a policy instrument capable of promoting downstream processing [19], [20], [21]. However, empirical findings on their impact remain mixed, depending on industrial structure, market power, and the specific cocoa products analyzed.

Although export duties are widely used as a policy instrument to promote downstream industrialization, empirical evidence on their effectiveness in supporting processed exports remains inconclusive. Previous studies have mainly focused on the impact of export duties on raw commodity exports, such as crude palm oil or mineral resources, while limited attention has been given to their implications for processed product exports in agricultural commodity sectors. In the case of Indonesia's cocoa industry, existing studies largely discuss downstream policies from a descriptive or policy perspective, with limited empirical analysis examining how export duties affect the export performance of processed cocoa products.

Addressing these gaps, this study analyzes the effects of cocoa bean export duties, domestic production, and reference prices on Indonesia's processed cocoa export performance using time-series data for the period 2017–2023. The empirical analysis focuses specifically on cocoa powder exports,

which represent one of the major processed cocoa products and an important indicator of downstream development in the Indonesian cocoa industry. By examining the relationship between cocoa bean export duties and cocoa powder export volumes, this study aims to provide empirical evidence on how export duty policies influence value-added cocoa exports.

This study contributes to the existing literature by explicitly incorporating export duty data since 2017 and comprehensively analyzing its impact on the export performance of multiple cocoa products, including not only raw cocoa beans but also processed products such as cocoa powder. Most previous studies focus on a single product or primarily examine the effects of general economic variables—such as prices and production—without longitudinally accounting for fiscal policy instruments like export duties. Accordingly, this study offers a novel contribution by examining the long-run relationship between export duty policy and cocoa export performance in its processed forms, thereby providing a stronger empirical basis for evaluating Indonesia's national cocoa industry policy and insights into how such policies can stimulate value-added creation in downstream cocoa products.

Conceptually, this study contributes by linking export duty policy with downstream export performance through an input-market transmission framework. Unlike conventional studies that examine export taxes only in relation to raw commodity exports, this study emphasizes the indirect effects of export duties on processed product exports. This study contributes to the literature and provides empirical evidence on the effectiveness of export duty policies in promoting processed agricultural exports, a topic that remains underexplored in the context of commodity-based economies.

To clarify the analytical scope, this study examines Indonesia's national cocoa export performance using time-series data for the period 2017–2023. The analysis is limited to cocoa powder exports, measured in export volume (kg), as recorded in official trade statistics. Therefore, this study aims to evaluate the effectiveness of cocoa bean export duties in influencing Indonesia's cocoa powder export performance by examining both the short-run and long-run relationships between export duty rates, international cocoa prices, domestic production, and export volumes.

Specifically, this study investigates whether export duties imposed on cocoa beans contribute effectively to the development of Indonesia's downstream cocoa industry. It focuses on the relationship between export duties and the export performance of processed cocoa products, particularly cocoa powder. By examining this relationship, the study seeks to provide empirical evidence on the extent to which export duties support the government's downstream industrialization objectives.

Based on the theoretical and empirical considerations discussed above, this study tests the following hypotheses:

- H1: Cocoa bean export duties have a significant effect on Indonesia's cocoa powder export performance.
- H2: Cocoa prices have a significant effect on Indonesia's cocoa powder export performance.
- H3: Domestic cocoa production has a significant effect on Indonesia's cocoa powder export performance.

RESEARCH METHOD

This study employs a quantitative approach to analyze the relationships and effects of several independent variables on the dependent

variable [34], namely Indonesia's cocoa powder export volume. The scope of the study focuses on cocoa powder export performance during the period 2017–2023, which exhibits year-to-year fluctuations. The analysis aims to identify the determinants of changes in cocoa powder export volume, considering both government policy instruments and global economic conditions.

The selection of the 2017–2023 period is based on data availability and consistency considerations. Monthly data for all research variables—particularly cocoa powder export volume, export duty rates, and reference prices—are fully and consistently available from official sources during this period. For earlier or more recent periods, some variables are either unavailable or recorded inconsistently due to changes in reporting systems, which could introduce estimation

bias. Therefore, the 2017–2023 period is chosen to ensure data quality, analytical reliability, and the validity of estimation results within the Error Correction Model (ECM) framework. The study utilizes secondary time-series data obtained from official institutions, including the Ministry of Finance, Statistics Indonesia (BPS), and Bank Indonesia.

Based on the theoretical arguments and empirical evidence discussed above, this study develops a research framework linking cocoa bean export duties, international cocoa prices, and domestic cocoa production to cocoa powder export performance. Inflation and the exchange rate are included as control variables to account for relevant macroeconomic conditions. The proposed research framework and hypothesized relationships are presented in Figure 1.

Research Framework

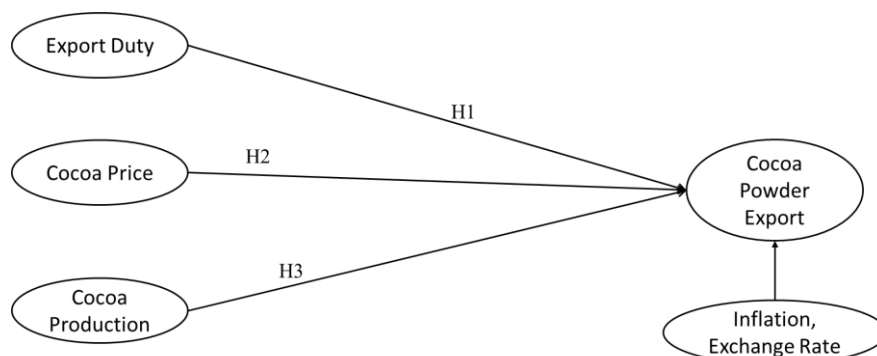


Figure 1. Research Framework

This research adopts a conclusive research design with a causal type, aiming to examine cause–effect relationships among variables [28]. The independent variables include export duty rates, international reference prices, and national cocoa production. Inflation and the nominal exchange rate are incorporated as control variables. The dependent variable is the volume of cocoa exports.

The population consists of all monthly observations of Indonesia's cocoa export volume from 2017 to 2023. The sample is determined using purposive sampling, based on predefined criteria related to the selected time period and the availability of relevant data.

Table 1 presents the operational definition of the research variables. The export duty variable represents government levies

imposed on exported goods in accordance with Law No. 17 of 2006 and Government Regulation No. 55 of 2008, with a maximum tariff rate of 60 percent. Export duty rates are determined through Minister of Finance

regulations, which specify the types of exported goods subject to export duties and the applicable tariff rates during specific periods.

Table 1. Operational Definitions and Measurement of Variables

No	Variable	Indicator	Unit	Data Source
1.	Cocoa Powder Export Volume (Y)	Monthly cocoa export volume	Kg	Statistics Indonesia (BPS)
2.	Export Duty Rate (X1)	Monthly cocoa export duty rate	Percent (%)	Ministry of Finance
3.	International Cocoa Price (X2)	Monthly world cocoa reference price	USD/MT	Ministry of Trade
4.	National Cocoa Production (X3)	Total national cocoa production per month	Thousand MT	Statistics Indonesia (BPS)
5.	Inflation Rate	Monthly inflation rate in Indonesia	Percent (%)	Statistics Indonesia (BPS)
6.	Nominal Exchange Rate	USD/IDR exchange rate	Rupiah	Bank Indonesia

Source: Authors Own Calculation (2025)

In Indonesia, the export duty on cocoa beans is determined using a price-based tiered tariff system, in which the applicable duty rate follows a predefined schedule linked to the international reference price of cocoa beans. When the reference price increases, the export duty rate rises according to specific tariff brackets; conversely, when the price declines below a certain threshold, the duty rate decreases or becomes zero. Once the reference price exceeds the upper threshold, however, the duty rate remains constant at the maximum level. This rule-based mechanism implies that export duty adjustments are partly driven by international price movements rather than purely discretionary policy changes. Consequently, although the potential for policy endogeneity cannot be eliminated, the tariff structure reflects an institutionalized pricing rule rather than ad hoc policy interventions.

International cocoa prices represent global benchmark prices formed through supply–demand interactions in the international market. This study uses the export reference prices established by the Ministry of Trade, expressed in USD per metric ton (USD/MT). National cocoa production refers to total cocoa output from all plantations in Indonesia, obtained from BPS and measured in thousand metric tons. Inflation is measured as Indonesia’s monthly inflation rate in percentage terms over the 2017–2023 period. The exchange rate variable represents the nominal monthly exchange rate of the Indonesian rupiah against the US dollar.

The dependent variable in this study is the export volume of Indonesian cocoa powder classified under HS Code 1805. It represents the total quantity of cocoa powder exported from Indonesia, measured in kilograms on a monthly basis. This volume is calculated based on Export Declaration (PEB) documents [29].

This study applies the Error Correction Model (ECM), which enables the analysis of both short-run and long-run relationships among variables. The choice of ECM is motivated by the characteristics of the data and the research objectives. The variables analyzed are time-series data that are theoretically linked in the long run, particularly export duties, domestic production, international prices, and cocoa powder export volume. ECM allows for simultaneous testing of short-run adjustment dynamics in response to policy changes or external shocks, while ensuring long-run equilibrium through the error correction mechanism. Thus, the model is suitable for examining how cocoa exports respond to changes in export duties in the short term and how the system converges back to long-run equilibrium following deviations. The ECM equation is specified as follows:

$$\Delta NX = \beta_0 + \beta_1 \Delta BK + \beta_2 \Delta HI + \beta_3 \Delta PN + \beta_4 \Delta IN + \beta_5 \Delta NT + ECT_{(t-1)} + \varepsilon$$

Description of Variables:

NX = Cocoa export volume

BK = Export duty rate

HI = International cocoa price

PN = National cocoa production

IN = Indonesia's inflation rate

NT = Nominal USD/IDR exchange rate

Δ = First Difference

ECT = Error Correction Term

ε = Error term

Data analysis is conducted using multiple linear regression within the ECM framework, employing STATA software for statistical analysis, hypothesis testing, and time-series estimation. Prior to regression estimation, the data are subjected to a series of diagnostic tests, including stationarity, cointegration, normality, heteroskedasticity, multicollinearity, and autocorrelation tests. An F-test is used to examine the simultaneous effects of the independent variables on the dependent variable, while t-tests are applied to assess the partial effects of individual variables [32].

Descriptive statistical analysis is also employed to summarize data characteristics, including mean, median, standard deviation, minimum, and maximum values for each variable. The results are expected to provide empirical evidence on the factors influencing Indonesia's cocoa export volume in both the short run and the long run.

RESULT AND DISCUSSION

Descriptive statistics are employed to summarize and present the characteristics of the data in a clear and interpretable manner. In this study, descriptive measures include the mean, median, minimum, maximum, and standard deviation for each research variable. The descriptive statistics are presented in [table 2](#).

Table 2. Descriptive Statistics of Cocoa Powder Export Volumes and Their Determinants in Indonesia (2017–2023)

<i>Variabel</i>	<i>N</i>	<i>Mean</i>	<i>Std. Dev</i>	<i>Min</i>	<i>Max</i>
<i>NX</i>	84	8,457,586	1,637,006	3,791,319	12,330,219
<i>BK</i>	84	5,36	2,90	-	15,00
<i>HI</i>	84	2,464.96	377.41	1,886,39	3,950,62
<i>PN</i>	84				283,485,000
<i>IN</i>	84	3,07	1,15	1,32	5,95
<i>NT</i>	84	14,427	670.82	13,319	16,367

Source: Author's calculations based on BPS, Ministry of Finance, Ministry of Trade, and Bank Indonesia data (2025)

The cocoa export volume variable (NX) records a mean value of 8,457,586 with a standard deviation of 1,637,006, indicating substantial dispersion around the mean. The minimum value is 3,791,319, while the maximum reaches 12,330,219. This wide range reflects significant fluctuations in export performance over the observation period, which may be driven by changes in global demand, trade policy adjustments, and other external factors.

The export duty rate (BK) has an average value of 5.36 percent, with a maximum of 15 percent and a minimum of 0 percent. The standard deviation of 2.90 percent indicates notable variation across periods, reflecting changes in the intensity of government policy interventions related to the regulation of cocoa exports.

International cocoa prices (HI) have a mean of 2,464.96 USD/MT and a standard deviation of 377.41, indicating moderate variability during the study period. The minimum price of 1,886.39 USD/MT and the maximum of 3,950.62 USD/MT reflect substantial fluctuations in the global cocoa market. Such volatility may be associated with changes in international demand, exchange rate movements, and broader commodity market dynamics.

National cocoa production (PN) records a mean of 56,311,458 and a standard deviation of 57,640,538, indicating considerable dispersion in production levels. The substantial difference between the minimum value of 11,120,000 and the maximum value of 283,485,000 suggests pronounced variation in recorded production during the study period. This variability may reflect differences in production capacity, supply-side constraints, and cyclical conditions in the cocoa sector.

Inflation (IN) averages 3.07%, with a standard deviation of 1.15 percentage points and values ranging from 1.32% to 5.95%. The relatively limited range suggests that inflation was comparatively stable over the study period, although fluctuations may still have affected domestic production costs and export competitiveness. These descriptive statistics provide context for examining the potential relationship between domestic macroeconomic conditions and cocoa export performance.

The nominal exchange rate (NT) has an average value of 14,427 IDR/USD with a standard deviation of 670.82. The exchange rate fluctuates between a minimum of 13,319 and a maximum of 16,367, reflecting notable but manageable volatility typical of an open economy. Such movements can directly affect international trade performance by altering export price competitiveness.

Time Series Regression Analysis

The regression analysis begins with an examination of time-series properties to ensure valid estimation results. Stationarity is tested using the Augmented Dickey–Fuller (ADF) test to detect the presence of unit roots [29]. The results indicate that only cocoa export volume (NX) and national cocoa production (PN) are stationary at the level form, while export duty rates (BK), international cocoa prices (HI), inflation (IN), and the exchange rate (NT) are non-stationary.

Consequently, all variables are transformed using first differencing. Subsequent tests confirm that all variables become stationary at the first-difference level, indicating that they are integrated of order one (1). A Johansen cointegration test is then conducted to examine the existence of long-run relationships among variables. The results reveal two cointegrating relationships,

implying the presence of long-run equilibrium between the dependent and independent variables. Accordingly, the Error Correction Model (ECM) is deemed appropriate for further analysis.

Prior to interpretation, classical assumption tests are conducted to assess model adequacy (Ghozali, 2021). The normality test yields a Prob > chi² value of 0.2791, indicating normally distributed residuals. Variance Inflation Factor

(VIF) values for all variables are below 10, suggesting no multicollinearity issues. The autocorrelation test reports a Prob > chi² value of 0.0714, indicating the absence of autocorrelation, while the Breusch–Pagan test yields a Prob > chi² value of 0.8034, confirming homoskedasticity. Overall, the ECM specification satisfies the required diagnostic criteria and is suitable for inference. The long-run Effects test results are presented in [Table 3](#).

Table 3. Long-run Effects of Cocoa Bean Export Duties and Macroeconomic Variables on Cocoa Powder Export Volumes in Indonesia (2017–2023)

Variable	Coefficient	Probability
<i>BK</i>	-364824.8000	0.001
<i>HI</i>	2784.9960	0.002
<i>PN</i>	-0.0025	0.309
<i>IN</i>	-352962.4000	0.008
<i>NT</i>	1309.8460	0.000
<i>C</i>	-14100000	0.000
R-squared	0.4324	
Adj R-squared	0.396	
F-Statistic	11.89	
Prob>F	0.0000	

Source: Author's calculations based on BPS, Ministry of Finance, Ministry of Trade, and Bank Indonesia data (2025)

The F-test results indicate that the probability value is 0.0000, which is below the 5% significance level. This finding demonstrates that the independent variables jointly have a statistically significant effect on Indonesia's cocoa export performance in the long run. Thus, the results provide evidence that the explanatory variables, considered collectively, are relevant to explaining long-term changes in cocoa exports.

Partial t-test reveal that the export duty rate (*BK*) has a negative and statistically significant effect on cocoa exports in the long run. The estimated coefficient is -364,824.8, with a probability value of 0.001, indicating that the

relationship is statistically significant at the 5% level. This result suggests that an increase in the export duty rate is associated with a decline in cocoa exports, highlighting the potential influence of export taxation on Indonesia's cocoa trade performance.

International cocoa prices (*HI*) exhibit a positive and statistically significant relationship with cocoa exports in the long run. The estimated coefficient is 2,784.996, with a probability value of 0.002, indicating that the effect is statistically significant at the 5% level. This finding suggests that higher international cocoa prices are associated with increased cocoa export volume, potentially reflecting

stronger incentives or improved returns in international markets.

In contrast, national cocoa production (PN) does not have a statistically significant effect on cocoa exports in the long run. The estimated coefficient is -0.0025 , with a probability value of 0.309 , which exceeds the 5% significance threshold. Although the coefficient is negative, the statistical results do not provide sufficient evidence of a long-run relationship between domestic cocoa production and export performance in this model.

Inflation (IN) has a negative and statistically significant effect on cocoa exports in the long run. The estimated coefficient is $-352,962.4$, with a probability value of 0.008 , indicating

statistical significance at the 5% level. This result suggests that higher domestic inflation is associated with lower cocoa export volume, potentially reflecting increased domestic costs and reduced price competitiveness over time.

The exchange rate (NT) demonstrates a positive and statistically significant relationship with cocoa exports in the long run. Its estimated coefficient is $1,309.846$, with a probability value of 0.000 , indicating a statistically significant effect at the 5% level. This finding suggests that exchange rate depreciation is associated with an increase in cocoa export volume, which may be consistent with improved price competitiveness in international markets.

Table 4. Short-run Effects of Cocoa Bean Export Duties and Macroeconomic Variables on Cocoa Powder Export Volumes in Indonesia (2017–2023)

Variable	Coefficient	Probability
D(BK)	-195938.30	0.0120
D(HI)	2077.27	0.0480
D(PN)	-0.0024	0.2830
D(IN)	444083.80	0.2430
D(NT)	1053.98	0.0070
ECT(-1)	-0.64	0.0000
C	17155.13	0.8930
R-squared	0.4125	
Adj R-squared	0.3661	
F-Statistic	8.89	
Prob>F	0.0000	

Source: Author's calculations based on BPS, Ministry of Finance, Ministry of Trade, and Bank Indonesia data (2025)

The F-test in [Table 4](#) reports a probability value of 0.0000 , indicating that all independent variables jointly have a significant effect on cocoa export volumes in the short run. The partial estimation results reveal that changes in export duty rates (ΔBK) have a statistically significant and negative effect on cocoa exports

in the short run, with a probability value of 0.0120 and a coefficient of $-195,938.30$.

Changes in national cocoa production (ΔPN) have a negative but statistically insignificant effect on cocoa powder export volumes in the short run. The estimated coefficient is -0.0024 , with a probability value of 0.2830 (> 0.05). This

indicates that changes in national cocoa production do not significantly affect cocoa powder export volumes in the short run.

Changes in inflation (ΔIN) are not statistically significant in the short run, with a probability value of 0.243 and a positive coefficient of 444,083.80. Inflation changes (ΔIN) are not statistically significant in the short run (probability value of 0.243), despite exhibiting a positive coefficient. The Error Correction Term ($ECT_{(-1)}$) has a coefficient of -0.64 and is statistically significant at the 1 percent level. This indicates that approximately 64 percent of short-run deviations from long-run equilibrium are corrected within one period, confirming a relatively rapid adjustment process.

Discussion

The estimation results indicate that the export duty rate (BK) has a negative and statistically significant effect on Indonesia's cocoa export volumes in both the long run and the short run. In the long run, the coefficient of $-364,824.8$ with a probability value of 0.001 suggests that a one percentage point increase in the export duty rate is associated with a decrease in cocoa powder export volume of approximately 364,824.8 Kg. In the short run, the ECM results similarly show a negative and significant effect of export duties, with a coefficient of $-195,938.30$ and a probability value of 0.012 (< 0.05). This finding indicates that changes in export duty policy are rapidly transmitted to exporters' decisions, resulting in immediate reductions in export volumes.

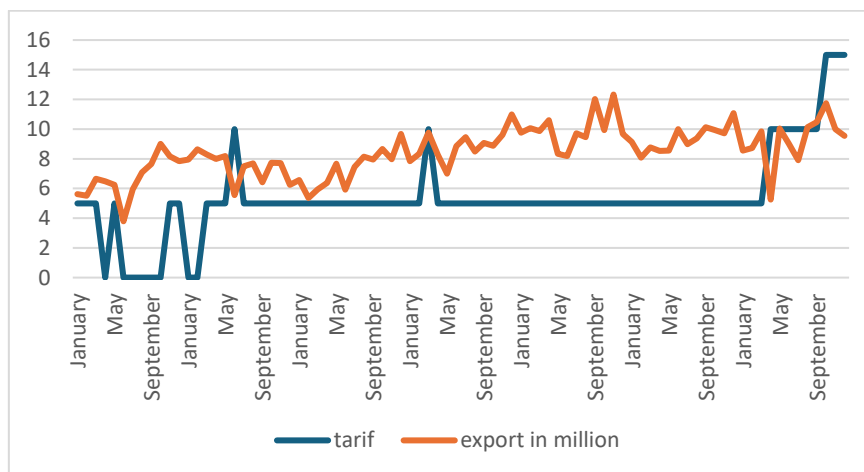


Figure 2. Rising cocoa bean export duty rates are not consistently associated with higher cocoa powder export volumes in Indonesia (2017–2023)

The graphical trend further supports this conclusion. As illustrated in [Figure 2](#), periods of increased export duty rates on cocoa beans are not consistently followed by sustained growth in cocoa powder export volumes. Although cocoa powder exports exhibit an overall upward trend, the growth appears volatile and does not accelerate in tandem with tariff increases. In several instances, sharp increases in tariff levels coincide with stagnation or

temporary declines in export volumes, indicating that upstream trade restrictions may weaken downstream export performance.

These results confirm that export duties can weaken the global competitiveness of Indonesian cocoa by increasing effective export prices [\[30\]](#). This outcome is consistent with studies by [\[31\]](#) as well as [\[33\]](#) which document a negative impact of export duties on the

volume and value of crude palm oil (CPO) exports.

From a theoretical perspective, these results are in line with international trade theory, which emphasizes that changes in relative prices induced by export taxes tend to reduce export competitiveness. Within the framework of export tax incidence, the burden of export taxation is not borne solely by raw material exporters but is partly transmitted to downstream industries through input price mechanisms, particularly when the supply elasticity of raw materials is low.

Consequently, although export duties on cocoa beans are intended to promote downstream processing, the empirical results suggest that the policy may also create unintended constraints for the cocoa powder industry. Export duties reduce incentives for raw cocoa bean exports and alter domestic price formation, but when processing capacity and efficiency remain limited, the increased domestic supply of cocoa beans does not automatically translate into higher processed exports. Previous studies show that export tax

policies can alter export composition but may also reduce international competitiveness and export growth [35]. In addition, fiscal burdens in the cocoa sector may increase production costs and weaken the competitiveness of processed cocoa exports [36]. Instead, adjustment costs, inefficiencies, and market rigidities may reduce the competitiveness of processed cocoa products in international markets.

The estimation results further show that international cocoa prices (HI) have a positive and statistically significant effect on Indonesia's cocoa export volumes in both the long run and the short run. In the long run, the coefficient of 2,784.996 with a probability value of 0.002 (< 0.05) indicates that increases in world cocoa prices lead to higher export volumes. In the short run, the ECM results also reveal a positive and significant relationship, with a coefficient of 2,077.27 and a probability value of 0.048 (< 0.05). These findings suggest that rising global cocoa prices enhance export incentives, consistent with trade and supply theories that predict higher export performance in response to favorable international price movements.

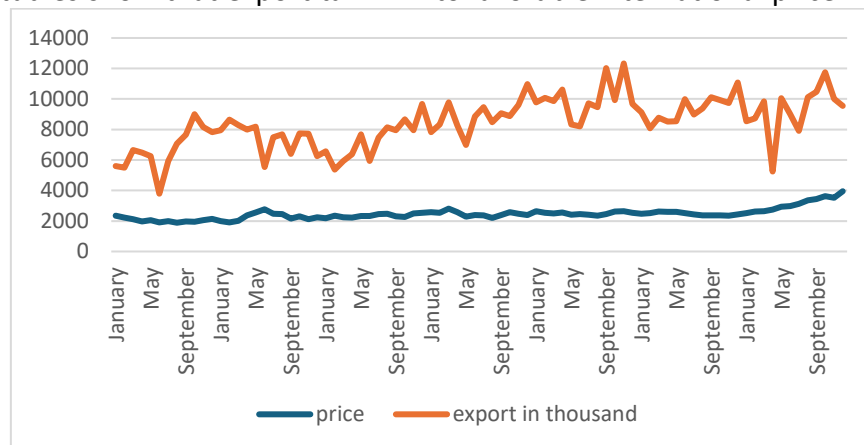


Figure 3. Increases in international cocoa prices are accompanied by higher cocoa powder export volumes in Indonesia (2017–2023)

The graphical evidence reinforces this result. As shown in Figure 3, the reference price of cocoa beans exhibits a clear upward trend over time, which is followed by a concurrent

increase in cocoa powder export volumes. The positive slope of both linear trend lines indicates a co-movement between cocoa bean prices and processed cocoa exports, implying

that periods of higher raw material prices tend to coincide with stronger export performance of cocoa powder.

This result is consistent with previous studies, such as [27] and [37], which find that international prices significantly influence CPO exports. The short-run significance of international prices also indicates that exporters respond relatively quickly to changes in global market conditions by adjusting export volumes or values. This suggests that international price movements can influence exporters' decisions even before longer-term market adjustments take place.

The combined long-run and short-run effects imply that international prices exert a tangible impact on export performance both immediately and after market adjustments. In the long run, exporters have sufficient time to adjust production, marketing strategies, and export volumes in response to sustained price changes [38], while in the short run, the response reflects more immediate price signals [39]. Accordingly, international cocoa prices emerge as a key determinant of export performance over both time horizons.

The findings indicate that international cocoa prices play an important role in determining export performance in both the short and long run. These findings are consistent with international trade theory, which identifies global prices as a primary determinant of export performance, particularly for widely

traded commodities. When international prices rise, production and export incentives increase as export margins become more attractive relative to domestic sales.

In contrast, the regression results indicate that national cocoa production does not have a statistically significant effect on Indonesia's cocoa export volume, either in the long run or in the short run. In the long run, the coefficient of -0.0025 with a probability value of 0.309 (> 0.05) suggests that increases in domestic cocoa production do not necessarily translate into higher export volumes. This result deviates from conventional supply theory, which posits that higher production should expand export capacity and strengthen a country's position in global markets [40], [41].

Similarly, in the short run, the negative but insignificant coefficient (-0.0024 ; probability value 0.283) indicates that increases in production are not immediately reflected in export performance. This outcome may be explained by the fact that a substantial share of domestic cocoa production is absorbed by local processing industries, so higher production does not automatically increase export supply. Moreover, production growth is not always accompanied by quality improvements that meet international standards, limiting its impact on export expansion. Structural constraints, such as limited processing capacity, logistical infrastructure, and access to export financing, may further weaken the transmission of production increases to global markets.

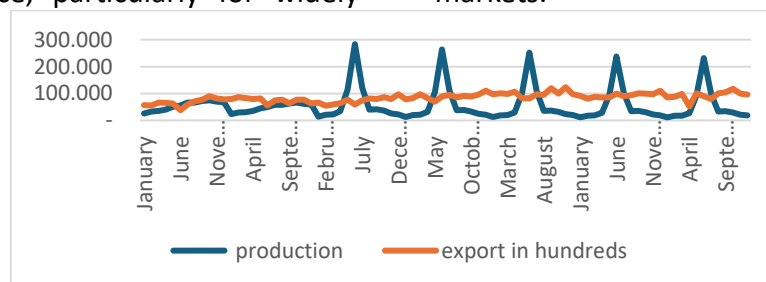


Figure 4. Fluctuations in national cocoa production are not consistently reflected in cocoa powder export volumes in Indonesia (2017–2023)

The graphical evidence supports this conclusion. As illustrated in [Figure 4](#), cocoa production exhibits pronounced seasonal spikes and substantial volatility over time, reflecting the cyclical nature of agricultural output. In contrast, cocoa powder export volumes display a relatively smoother and steadily increasing trend. The lack of synchronization between sharp production peaks and export movements suggests that fluctuations in raw cocoa supply are not the primary driver of processed export performance.

These findings indicate that export duty policy in Indonesia contributes to a gradual shift toward processed exports but does not yet represent a fully integrated downstream industrial transformation. The negative effect of export duties on processed exports suggests that fiscal policy instruments alone are insufficient to strengthen export competitiveness without parallel improvements in industrial capacity, logistics efficiency, and technological upgrading.

At the same time, increased national production may also signal that export duty policies have improved input availability for domestic processing industries. Lower input costs in the domestic market may enable firms to expand output of processed products. In this sense, national production does not only influence exports directly but may also reinforce the effectiveness of export duty policy by supporting downstream industrial development.

Overall, the findings of this study demonstrate that export duties exert a negative and significant effect on Indonesia's cocoa export volumes in both the short run and the long run. This implies that export duty policy must be designed selectively and aligned with the readiness and capacity of downstream

industries to ensure that industrialization objectives do not undermine export competitiveness. Excessively high export duty rates may suppress export performance when domestic processing capacity and efficiency remain suboptimal. Without sufficient investment in processing capacity, logistics infrastructure, and technology upgrading, export duties may reduce export competitiveness rather than stimulate downstream expansion.

The empirical results indicate that Indonesia's export duty policy on cocoa beans contributes to an export-based form of industrial downstreaming rather than a fully integrated industrial transformation. The significant long-run effect of export duties on cocoa powder exports suggests that the policy has altered firms' incentives and encouraged a gradual shift from raw cocoa bean exports toward processed cocoa products.

Furthermore, the significant effects of international cocoa prices and the exchange rate on export volume highlight the importance of macroeconomic stability and exporters' ability to respond to global market dynamics. Strengthening market information systems and price risk management mechanisms is therefore essential to enhance export resilience. Meanwhile, the insignificant effect of national production on exports indicates that production growth alone is insufficient to improve export performance without simultaneous improvements in product quality, supply chain efficiency, and upstream–downstream integration. Accordingly, cocoa development policies should focus on strengthening industrial structure and promoting sustainable competitiveness.

CONCLUSION

In the context of Indonesia's cocoa sector, export duties may reduce the competitiveness of processed cocoa exports. The findings indicate that export duties, and cocoa prices significantly affect Indonesia's cocoa powder export volume in both the long run and the short run. Export duties exert a negative impact on cocoa powder exports, while cocoa prices have a positive effect. National cocoa production does not have a significant effect on Indonesia's cocoa export volume in either the short or long run. The findings suggest that export duties may not automatically promote processed cocoa exports when domestic processing capacity remains limited. The results highlight the critical role of fiscal policy, global price dynamics, and macroeconomic conditions in shaping Indonesia's cocoa product export performance in both the short and long term. The government therefore needs to maintain a balance between revenue-oriented policies and export competitiveness to ensure the sustainability of the cocoa industry. Given the negative relationship identified between export duties and cocoa powder export volumes, policies related to export levies and cocoa plantation productivity need to be carefully evaluated to ensure that downstream industrial objectives do not unintentionally weaken export competitiveness. Policy adjustments that align export duty rates with international market conditions may help reduce potential trade distortions while maintaining incentives for domestic processing. The significant influence of international cocoa prices in both the short run and the long run underscores the importance of strengthening global market information systems and international trade

strategies. This would enable exporters to respond more swiftly to market opportunities during periods of rising global prices. This study has several limitations. First, the use of aggregate time-series data may mask heterogeneity across firms and subsectors within the cocoa processing industry. Second, the model does not include several potentially relevant factors such as logistics performance, regulatory quality, and non-tariff barriers, which may also influence export performance. Third, the assumption of linear relationships may not fully capture the dynamic responses of exports to export duties and international prices. In addition, the study does not explicitly address the potential endogeneity of export duty policy, as export duties may partly respond to global price movements and domestic market conditions. The relatively short observation period may also limit the generalizability of the findings. Furthermore, although the study assumes a transmission mechanism through domestic input prices, the empirical model only captures this relationship indirectly. Future research is encouraged to employ firm-level or industry-level panel data to capture structural heterogeneity and improve causal inference. The inclusion of additional explanatory variables and the application of alternative econometric approaches, such as ARDL models or instrumental variable estimation, would strengthen empirical robustness. Future research may consider logarithmic transformations to allow elasticity interpretation. Further studies may also explore non-linear relationships and differentiate the effects of export duties across various stages of cocoa processing.

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