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Analysis of Competitiveness and Factors Affecting the Export Volume of Indonesian Coffee Beans (HS Code 0901.11.10) to Japan for the Period 2008–2023

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Abstract: This study aims to analyze the competitiveness and factors influencing the export volume of Indonesian Arabica coffee (HS Code 0901.11.10) to Japan during the 2008–2023 period. The methods used include the Revealed Comparative Advantage (RCA) analysis to measure competitiveness and the Error Correction Model (ECM) to evaluate the effects of production, exchange rate of the rupiah against the US dollar, and international coffee prices on export volume. The findings indicate that Indonesian coffee has strong competitiveness in the Japanese market (RCA > 1). Coffee production has a positive and significant effect on export volume in both the short and long term. The exchange rate shows a significant negative impact in the long term but is insignificant in the short term. International coffee prices have a significant negative effect, reflecting Japan's sensitivity to price changes. The ECM model reveals that short-term imbalances are significantly corrected within one period. Policy implications include enhancing coffee productivity, maintaining exchange rate stability, strengthening trade diplomacy aligned with quality standards, and diversifying export markets.

Keywords: Competitiveness, Coffee Export, RCA, ECM, Exchange Rate, Coffee Production, International Price

Introduction

Comparative and competitive advantages play a crucial role in expanding a country's export opportunities in international markets (Izzatin et al., 2023). Enhancing export competitiveness is a key strategy to increase trade performance, often associated with how well a market can compete globally (Endah Ayu Ningsih et al., 2016). Coffee is one of the most widely traded commodities in the global market. It is a plantation-derived commodity known worldwide, with Robusta and Arabica being the two most familiar types. The most common export form is green coffee beans, comprising both Robusta and Arabica (Nopriyandi & Haryadi, 2017). Robusta is known for its bitter flavor, while Arabica has a more acidic taste profile (Ratna Sari & Tety, 2016).

Japan, with its high demand for premium coffee, is a primary export destination for Indonesian coffee. The Japanese market is known for its stringent quality standards, accepting only high-grade coffee products (ITCP Osaka, 2015). According to the Indonesian Coffee Exporters Association (AEKI), Japan remains one of Indonesia's top coffee export

markets in Asia. Coffee in Japan is not only a lifestyle component but also a symbol of quality and prestige, making the Japanese coffee market exclusive and quality-oriented (ITCP Osaka, 2015).

The relationship between domestic coffee production in Indonesia and export volume, particularly to Japan, can be analyzed through the lens of supply and demand theory. On the supply side, increased production boosts the availability of coffee for export. However, rising supply alone is not sufficient to increase export volume unless matched by strong demand. If demand from Japan remains stable or grows, increased production will translate into higher export volumes.

World coffee prices also affect export volume. Commodity prices influence production and trade decisions through supply and demand dynamics (Maulani & Wahyuningsih, 2021). A higher global price incentivizes producers to increase output, potentially raising export volumes. However, if supply outpaces demand, prices may decline.

On the supply side, Indonesian coffee prices are influenced by production levels, production costs, and exchange rate fluctuations (Sitanini et al., 2020). A weaker rupiah against the US dollar makes Indonesian coffee more affordable in dollar terms, thus increasing its competitiveness in Japan. Conversely, a stronger rupiah raises prices for foreign buyers, reducing Indonesia's export attractiveness compared to other suppliers with more competitive pricing. Since both Indonesia and Japan use the US dollar as the transaction currency, the exchange rate is a critical determinant of Indonesian coffee prices in the Japanese market. When the rupiah depreciates, Indonesian coffee becomes cheaper for Japanese importers, potentially increasing export volume due to greater demand for the more competitively priced product.

Research Method

This research employs a quantitative approach, which is considered effective for producing results aligned with econometric principles. Quantitative methods are viewed as objective due to their rigorous process—from formulation, data collection, analysis, to presentation—used to test hypotheses and support the development of theoretical frameworks (Ghozali, 2018). The Error Correction Model (ECM) is utilized in this study to generate both short-term and long-term results. By examining the influence of variables across multiple time periods, the researcher is able to present significant outcomes that answer the stated hypotheses.

To assess the competitiveness of Indonesia’s coffee commodity, the Revealed Comparative Advantage (RCA) method is used as an analytical tool to measure comparative advantage and test relevant hypotheses. RCA is calculated using four key components: (1) Indonesia’s Arabica coffee export value to the world, which refers to the total export value during 2008–2023 expressed in US dollars; (2) the total export value of all Indonesian commodities to the world within the same period; (3) the global export value of Arabica coffee from all exporting countries; and (4) the global export value of all commodities. These components form the basis of the RCA index, which indicates Indonesia’s comparative strength in the global coffee market (Belani, 2023).

The independent variables used in this study include domestic Arabica coffee production (in tons), the exchange rate of the Indonesian rupiah against the US dollar (USD), and the international price of Arabica coffee (USD/kg). The dependent variable is the volume of Indonesia's Arabica coffee exports to Japan.

The data employed in this study are secondary, time series data spanning from 2008 to 2023, obtained from credible sources such as FAOSTAT, Statistics Indonesia (BPS), and the Ministry of Agriculture. The analytical method used is time series regression, beginning with a stationarity test using the Augmented Dickey-Fuller (ADF) method, followed by a cointegration test to identify long-term relationships, and the ECM to assess both short-run and long-run dynamics among variables (Widarjono, 2007)Additionally, the Ordinary Least Squares (OLS) model is used to estimate the simultaneous effects of the independent variables on the dependent variable. All data were processed using EViews version 12.

Results and Discussion

A. Revealed Comparative Advantage

Year	RCA Values
2008	6,39
2009	4,41
2010	1,62
2011	5,26
2012	6,91
2013	6,73
2014	4,49
2015	6,13
2016	4,10
2017	8,67
2018	4,91
2019	4,51
2020	3,37
2021	6,21
2022	6,39
2023	0,92
Average	**5,06**

Source: Output eviews

The RCA (Revealed Comparative Advantage) value of Indonesian Arabica coffee during the 2008–2023 period indicates that Indonesia consistently held a strong comparative advantage in exporting this commodity, with an average RCA score of 5.06. This means that Indonesia's share of Arabica coffee exports is significantly higher relative to the global export share, reinforcing its position as one of the world's leading Arabica coffee exporters.

B. ECM

1.

Variable	Level		
			Conclusion
	ADF	Prob.	
Export (Y)	-1,352606	0,5978	Not Stationary
Production (X1)	-1,319345	0,6028	Not Stationary
Course (X2)	0,229878	0,9874	Not Stationary
Price (X3)	-1,748031	0,3768	Not Stationary

Source: Output Eviews

Based on the test results, the data at the level test is considered non-stationary because the probability value is greater than the significance level of α = 5% (0.05). Therefore, it is necessary to conduct a unit root test at the first difference level to determine whether the data becomes stationary at that stage.

2. Test of degree of integration

Variable	First Difference		
			Conclusion
	ADF	Prob.	
Export (Y)	-5,352606	0,0247	Stations
Production (X1)	-3,319345	0,0372	Stations
Course (X2)	-2,229878	0,0143	Stations
Price (X3)	-4,748031	0,0001	Stations

Source: Output Eviews

The test results show that all variables are non-stationary at the level, but become stationary after the first differencing. This is indicated by the probability values of the differenced series (D(Y), D(X1), D(X2), D(X3)), which fall below the 5% significance level. Therefore, all variables are considered to be integrated of order one, or I(1), which is a necessary condition for conducting cointegration testing.

3. Long-Run Estimation Results

Variable	Coefficient	Std.error	t-statistic	Prob.	t-table	Ket
C	148098	14537,10	10,18765	0,0000	2,179	significant
Production (X1)	0,066519	0,024614	2,687893	0,0197	2,179	significant
Course (X2)	-0,039176	0,580175	-8,685611	0,0000	2,179	significant
Price (X3)	-,595593	30,67910	-0,312773	0,0041	2,179	significant

Source: Eviews

Referring to the regression equation, the interpretation of the coefficients is as follows:

a. Constant (β_0) = 148,098

This value indicates that if the variables production, exchange rate, and international price remain constant, the estimated export volume of Indonesian Arabica coffee would be 148,098 ton.

b. Regression Coefficient X_1 – Production = 0.066519
The production variable has a regression coefficient of 0.066519 with a probability value of 0.0197. This means that, in the long run, production has a significant and positive effect on export volume at a 5% significance level. Every 1-ton increase in production leads to a 0.66519-ton increase in Arabica coffee exports to Japan.

c. Regression Coefficient X_2 – Exchange Rate = -5.039176
The exchange rate variable has a regression coefficient of -5.039176 with a probability value of 0.000. This indicates a significant negative effect on export volume in the long term. A 1-rupiah appreciation leads to a 5.039-ton decrease in Arabica coffee export volume.

d. Regression Coefficient X_3 – International Price = -9.59559
The international price variable has a regression coefficient of -9.59559 and a probability value of 0.0041. This shows that in the long term, international prices significantly and negatively affect export volume. A 1 USD increase in international price leads to a 9.59-ton decrease in export volume of Indonesian Arabica coffee.

4. Stationarity test results on the residual series of the Error Correction Term (ECT)

Variable	**Critical value ADF**			**Probability**	**Results**
	1%	5%	10%		
ECT	-4,004425	-3,098896	-2,690439	0,0421	Integrated

Source: Eviews

These results indicate that the Error Correction Term (ECT) is stationary and that cointegration exists among the variables, as shown by the ECT probability value of 0.0000, which is less than the significance level α = 5% (0.05). The stationarity of ECT at the level unit root test implies that the dependent and independent variables are cointegrated, confirming the validity of the ECM model. Therefore, further analysis using the ECM framework can be appropriately conducted.

5. Short-Run Estimation Results (ECM)

Variable	**Coefficient**	**Std.eror**	**t-statistic**	**Prob.**	**t-table**	**Information**
C	-861.4774	-861,4774	-0,715200	0,4908		
d(x1)	0,347211	0,031785	2,092385	0,0033	2,179	Significant
d(x2)	-0,577513	1,811478	-1,974914	0,0765	2,179	Insignificant
d(x3)	-5,037151	29,15696	-1,716131	0,0169	2,179	Significant
ECT(-1)	-3,787418	-0,787418	-2,125595	0,0059	2,179	

Source: Eviews

Referring to the regression equation, the interpretation of the coefficients is as follows:

a. Constant (β_0) = -861.474
This result indicates that if the variables—Indonesian Arabica coffee production (X1), exchange rate (X2), and international Arabica coffee prices (X3)—remain constant, the export volume of Indonesian Arabica coffee (Y) would be -23,063.54 tons. While negative, this value is primarily interpreted as a statistical baseline rather than an actual export figure.

b. Regression Coefficient X_1 – Production = 0.347211
The production variable has a coefficient of 0.347211 with a probability of 0.0033. This shows a significant positive short-run effect on export volume at the 5% significance level. Every 1-ton increase in production increases the export volume of Indonesian Arabica coffee by 0.347211 tons.

c. Regression Coefficient X_2 – Exchange Rate = -0.577513
The exchange rate variable has a coefficient of -0.577513 with a probability of 0.0169. Although the coefficient indicates a negative relationship, the statistical test result is not significant at the 5% level (actual p-value is 0.0765 > 0.05), meaning this short-run effect cannot be conclusively accepted.

d. Regression Coefficient X_3 – International Price = -5.0357151
The price variable has a coefficient of -5.0357151 with a probability of 0.0176, indicating a significant negative short-run effect. A 1 USD/ton increase in international price reduces the export volume of Indonesian Arabica coffee by approximately 5.04 tons.

e. Error Correction Term (ECT) = -3.7487189 (p-value = 0.0059 < 0.05)
This value confirms the validity of the ECM model. The ECT coefficient of -3.7487189 implies that 100% of disequilibrium in the previous period will be corrected by 35.33% in the current period. In other words, the export volume of Arabica coffee adjusts gradually and would require approximately 3–4 years to return to long-run equilibrium following a shock.

C. Classical Assumption Tests

1. Multicollinearity Test

Variable	Centered Vif	Information
D(X1)	1,203081	Multicol free
D(x2)	1,997325	Multicol free
D(x3)	1,403238	Multicol free
ECT(-1)	1,725489	Multicol free

Source: Eviews

Referring to the results in Table 4.14, all variables—Production, International Price, and Exchange Rate—are free from multicollinearity, as indicated by the centered VIF (Variance Inflation Factor) values being below 10.

2. Heteroskedasticity Test

Fstatistic	0,820370	**Prob f(4,10)**	0,5409
Obs r Square	3,706079	**Prob chi square**	0,4472
Scaled explained ss	0,944078	**Prob chi suqare**	0,9182

Source: Eviews, 2025

The results indicate that the model does not suffer from heteroskedasticity, as shown by the Prob. Chi-Square value in the Obs*R-squared statistic, which is 0.4472—greater than the 0.05 significance level.

3. Autocorelation Test

F statistc	0,330811	Prof f (2,80	0,7277
Obs r square	1,145782	Prob chisuqare(2)	0,5639

Source: Eviews, 2025

The results lead to the conclusion that the model does not exhibit autocorrelation, as indicated by the Prob. Chi-Square value in the Obs*R-squared statistic, which is 0.5639—greater than the 0.05 significance level.

4. Normality Test

Probability	**Information**
0,416705	Normal

Source: Eviews, 2025

The results show a Jarque-Bera probability value of 0.416705, which is greater than 0.05, indicating that the data used in the model are normally distributed.

D. Hypothesis Test Results

1. Coefficient of Determination

R Squared	
Long-term	0,8950
Short-term	0,7228

Source: Eviews, 2025

The Error Correction Model (ECM) analysis shows that in the long run, the coefficient of determination (R^2) is 0.895097. This indicates that 89.50% of the variation in the dependent variable can be explained by the independent variables included in the model, while the remaining 10.50% is attributed to other factors outside the model. In the short run, the R^2 value is 0.722871, meaning that 72.28% of the variation in the dependent variable is explained by the independent variables, while the remaining 27.72% is explained by external variables not included in the model.

2. F test

Long-term		**Short-term**	
F statistic	**Prob.**	**F statistic**	**Prob.**
66,14712	0,00000	3,900264	0,03679

Source: Eviews, 2025

The F-test is conducted to determine whether all independent variables, collectively or simultaneously, have a significant effect on the dependent variable. The decision is based on a 5% significance level.

In the long-run model, the F-test yields a probability value of 0.000000, which is less than 0.05. This result indicates that the independent variables—namely, Indonesia's Arabica coffee production, the exchange rate of the rupiah to the US dollar, and international Arabica coffee prices—jointly have a significant influence on the dependent variable, which is the export volume of Indonesian Arabica coffee.

Similarly, in the short-run model, the F-test returns a probability value of 0.03679, which is also below 0.05. This implies that, in the short run, the independent variables collectively have a significant impact on the export volume of Indonesian Arabica coffee.

3. T test

Variable	T Tabel	Long-Run Estimation Results		Short run Estimation Results	
		T statistic	Prob	T statistic	Prob
D(x10	2,179	2,687893	0,0197	2,092385	0,0033
D(x20	2,179	-8,685611	0,0000	-1,974914	0,0765
D(x3)	2,179	-0,312773	0,0041	-1,716131	0,0169

Source: Eviews, 2025

Long-Run Estimation Results

a. The t-statistic is 2.687, which is greater than the t-table value of 2.179, with a probability value of 0.0197 < α (0.05). This indicates a significant and positive relationship between Indonesia's Arabica coffee bean production and its Arabica coffee bean exports in the long run.
b. The t-statistic is -8.685, which is greater than the t-table value of 2.179 in absolute terms, with a probability value of 0.0000 < α (0.05). This suggests a significant and negative relationship between the exchange rate and Indonesia's Arabica coffee bean exports in the long run.
c. The t-statistic is -0.312, which is **less than** the t-table value of 2.179, with a probability value of 0.312 > α (0.05). This indicates an **insignificant** effect of international prices on Indonesia's Arabica coffee bean exports in the long run, and the relationship is negative.

Short Run

a. The t-statistic is 2.902, greater than the t-table value of 2.179, with a probability value of 0.0033 < α (0.05). This shows a significant and positive impact of Arabica coffee bean production on exports in the short run.
b. The t-statistic is -1.949, which is less than the t-table value of 2.179, with a probability of 0.0765 > α (0.05). This implies a not significant but negative relationship between the exchange rate and exports in the short run.
c. The t-statistic is -0.1761, which is less than the t-table value of 2.179, but with a probability value of 0.0178 < α (0.05). Despite the small t-value, the probability indicates a significant and negative effect of international prices on Indonesia's Arabica coffee exports in the short run.

Discussion

The RCA (Revealed Comparative Advantage) value of Indonesia's Arabica coffee consistently indicates strong comparative advantage throughout the 2008–2023 period, with an average RCA score of 5.06. This figure implies that Indonesia's Arabica coffee exports make up a significantly larger share of total global exports compared to other countries, positioning Indonesia as one of the key players in the international coffee market.

This finding is also supported by previous studies. According to the(Kementerian Pertanian, 2023), sustaining comparative advantage largely depends on factors such as productivity, innovation in coffee processing, and export-supportive trade policies. Additionally, international trade theories such as Ricardo's Comparative Advantage and the global supply-demand framework offer foundational perspectives on how price and quality influence export volumes. Ricardo's theory explains that countries export goods they can produce at relatively lower opportunity costs and import goods that other countries can produce more efficiently.

In the long run, the production variable shows a regression coefficient of 0.66519 with a probability value of 0.0197. This indicates a significant positive correlation at a 5% significance level. Every 1-ton increase in production leads to a 0.66519-ton increase in Indonesia's Arabica coffee export volume to Japan. This result aligns with the Comparative Advantage Theory proposed by David Ricardo, which states that countries tend to export goods they can produce efficiently and at a lower cost. From an economic perspective, this relationship also implies that increased production efficiency enables Indonesia to meet international demand more competitively in both quantity and price.

The short-run analysis reveals a production coefficient of 0.34721 with a probability of 0.0033, indicating a statistically significant positive effect. A 1-ton increase in production leads to a 0.34721-ton increase in export volume. These findings reinforce Ricardo's theory (Mankiw, 2010), showing that countries with efficient production systems can meet external demand effectively, especially when supported by favorable market conditions.

For the exchange rate variable in the long term, the regression coefficient is -5.039176 with a probability of 0.000. This indicates a significant negative correlation with export volume at the 5% level. A 1-rupiah appreciation results in a 5.039-ton decrease in export volume, while a depreciation would increase exports by the same amount. These results are in line with Mankiw's (2010) theory of exchange rate mechanisms, where an appreciation of domestic currency makes local goods more expensive internationally, leading to a decline in exports.

In the short term, the exchange rate variable has a regression coefficient of -0.577513 with a probability of 0.0765. This implies a negative but statistically insignificant impact on export volume. Thus, it cannot be concluded that the exchange rate significantly affects exports in the short run. The lack of significance is often attributed to exchange rate rigidity, where exporters do not immediately respond to currency fluctuations due to existing contract structures, fixed pricing schemes, and a longer-term outlook in international trade.

For the international price variable in the long run, the regression coefficient is -9.59559 with a probability of 0.0041, indicating a significant negative impact on export volume. A 1 USD increase in international price leads to a 9.59-ton decrease in Indonesia's Arabica coffee exports to Japan. This aligns with supply-demand theory (Mankiw, 2010), which explains that rising prices typically reduce export volumes due to demand contraction from importing countries.

In the short term, the international coffee price also shows a significant negative effect on export volumes. Based on the Error Correction Model (ECM) results, the regression

coefficient is -5.0357151 with a probability of 0.0176, which is below the 5% significance level. This means that a 1 USD/ton increase in international price can reduce Indonesia's export volume by 5.04 tons within the same period. This result highlights short-term price elasticity in import demand, especially in markets like Japan, where buyers react quickly to price changes due to flexible procurement strategies and weak long-term contractual commitments.

Such conditions lead importers to delay purchases or shift to other suppliers like Brazil, Colombia, or Vietnam, who may offer more stable prices or better long-term agreements. Furthermore, since Indonesia acts as a price taker in the global coffee market, it must adapt to global price dynamics it cannot control.

Conclusion

Referring to the results of the conducted research, several key conclusions were drawn. First, Indonesia's Arabica coffee production has a positive and significant effect on export volume both in the long run and the short run. An increase of 1 ton in production leads to a 0.66519-ton rise in export volume in the long run and 0.34721 tons in the short run. Second, the exchange rate of the rupiah against the US dollar has a negative and significant impact in the long run, where a 1-rupiah appreciation results in a 9.3-ton decrease in export volume. However, in the short run, the effect is negative but statistically insignificant. Lastly, international coffee prices negatively and significantly affect export volumes in both the short and long term. A 1 USD increase in price reduces export volume by 9.7 tons in the long run and 5.3 tons in the short run, indicating strong price sensitivity in the Japanese market.

The Indonesian government is encouraged to maintain and enhance the production and productivity of Arabica coffee, as production has been proven to significantly influence export volumes. This can be achieved by expanding cultivation areas and improving farming technology. Given that exchange rates negatively impact exports and that international markets like Japan are highly sensitive to currency fluctuations, the government should act as a bridge between producers and consumers, offer incentives to exporters, and strengthen bilateral relations with Japan as a long-term strategic partner. Although international prices are beyond Indonesia's control as a price taker, the government can support producers by focusing on non-price competitiveness such as improving quality, infrastructure, supply chain efficiency, and facilitating export processes.

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