

## Market Structure and Competition of Indonesian Cocoa Beans Exports in the Malaysian Market

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### Abstract

Indonesian cocoa is a leading commodity that is able to be exported to other countries such as Malaysia. Exporting countries compete with each other for the Malaysian market, even though world demand for cocoa beans continues to increase. The study aims to identify the competitive position, elasticity, and market structure of Indonesian cocoa beans and exporting countries in the Malaysian market. The research data source is secondary from ITC Trade Map, from January 2017 to December 2023. The variables used are the value and quantity of cocoa bean exports from 8 exporting countries in Malaysia. The analytical used are Almost Ideal Demand System (AIDS) approach to determine level of competition and Herfindahl-Hirschman Index (HHI) and Concentration Ratio (CR) analyses to see market structure. The results of the HHI show that cocoa bean exports in the Malaysian have a high degree of market concentration, with CR4 reaching 71% and CR8 reaching 91%. The AIDS results that expenditure elasticity is negative, indicating that Indonesian cocoa beans are inferior good. The elasticity itself is negative, indicating that Indonesian cocoa beans are inelastic. Cross price elasticity, Indonesia has substitution relationships with Ecuador, Ghana, and Cameroon, and complementary relationships with Côte d'Ivoire, Nigeria, Papua New Guinea, and Uganda.

**Keywords:** AIDS model, cocoa, elasticity, HHI Index, market structure

### INTRODUCTION

Cocoa is one of the most significant plantation commodities in Indonesia. It is asserted that cocoa is a superior commodity due to its capacity to contribute to the country's foreign exchange through export activities in the international market. In terms of global production, Indonesia is ranked seventh, and first in Asia, with a total output of 180,000 tonnes (ICCO, 2024). With regard to the global market, Indonesia occupies the 13<sup>th</sup> position in terms of cocoa product exports.

The cocoa exported by Indonesia to the international market comprises a variety of products, including raw materials, semi-finished products, and finished products. The majority of exported cocoa products are processed or manufactured, comprising 94.96% of the total. The remaining exports are in the form of primary products or cocoa beans (Ministry of Agriculture, 2023). The exported processed cocoa products include cocoa butter, chocolate, cocoa paste, and cocoa powder. In the category of intermediate products (HS 1803, 1804, and 1805), Indonesia is positioned as the fourth-largest exporter globally.

Conversely, cocoa beans (1801) represent only the sixteenth-largest export in the world (International Trade Centre, 2024). Indonesia's exported cocoa products align with the global demand for cocoa.

According to the International Cocoa Organization (2024), the global demand for cocoa beans has increased from 4,994 thousand tonnes in 2021 to 5,050 thousand tonnes in 2022 (Figure 1), representing a significant growth in consumption. In that year, a deficit of 57 thousand tonnes was observed, indicating a shortage of cocoa beans to meet global demand. In 2023, it is estimated that global demand for cocoa beans will reach 4,751 thousand tonnes, while the supply or production of cocoa beans is projected to be only 4,332 thousand tonnes. This indicates that in 2023, the production or supply of cocoa beans will remain insufficient to meet global demand.

The rise in global demand has led to intense competition among cocoa bean exporting countries to secure market share. In 2023, Côte d'Ivoire emerged as the leading exporter of cocoa beans in the international market, followed by Ghana, Ecuador, Nigeria, and Cameroon (International Trade Centre, 2024). Based on data obtained from the International Trade Centre (2023) in 2018-2023 the main exporting country of cocoa beans is still occupied by Cote d'Ivoire with an average export of 1,509,291 tonnes/year. Followed by Ghana (578,726 tonnes/year), Ecuador (329,226 tonnes/year), Nigeria (260,603 tonnes/year), and Cameroon (226,346 tonnes/year). In 2023, Indonesia only exported 14,451 tonnes of cocoa beans on the world market. The majority of Indonesia's cocoa beans are exported to Malaysia, with the remainder distributed to other countries including the Philippines, the USA, India, the Netherlands, Belgium, and Japan (International Trade Centre, 2024).

Despite Malaysia being the primary consumer of Indonesia cocoa beans, it still faces competition from other countries that export cocoa beans to the Malaysian market. The export development trend of cocoa bean exporting countries to the Malaysian market fluctuates. There is a notable decline in Indonesian cocoa bean export volume from year to year. The growth of Indonesian cocoa bean export volume to the Malaysian market from 2012 to 2023 exhibited a decline, with an average growth rate of -13.20%. The greatest quantity of cocoa beans exported from Indonesia was recorded in 2013, with a total of 120,032 tonnes exported. In that year, Indonesia held the position of primary exporter of cocoa beans to Malaysia. Nevertheless, by 2023, Indonesia had only managed to export 14,451 tonnes of cocoa beans to Malaysia. This decline in exports was precipitated by a concomitant decline in the national cocoa production. Indonesian cocoa production in 2018 was 200,000 tonnes, declining to 160,000 tonnes in 2022 (International Cocoa Organization, 2023). In accordance with this, the export volume of cocoa beans to Malaysia is also undergoing a decline. Meanwhile, the development trend in Cote d'Ivoire shows that it tends to increase, namely from 48,189 tonnes in 2012, rising to its peak in 2021 reaching 192,894 tonnes. In addition to the decline in cocoa bean production, this was also caused by an increase in domestic demand for cocoa bean processing raw materials.

The fluctuating export volume of cocoa beans to the Malaysia market suggests that there are factors that cause Malaysia's demand for cocoa beans to change on an annual basis. Such shifts in cocoa bean exports will have an impact on the market structure that has emerged. The competitive position of Indonesia in the Malaysian market for cocoa beans is significantly shaped by the competitiveness and elasticity of its goods. The elasticity of

goods is contingent upon fluctuations in price, demand, and expenditure within the domestic market. The existence of elasticity allows for the measurement of the response of demand and expenditure to price changes.

Prior research has indicated that Indonesian cocoa paste is complementary with the Netherlands, while it is substitutable with Germany (Naully *et al.*, 2014). When viewed from the perspective of price elasticity alone, cocoa bean exporting countries, namely Indonesia, Ghana, and Côte d'Ivoire, exhibit negative values (Zikria *et al.*, 2019). Rifin (2013), posits that cocoa beans produced in Indonesia and Ghana are complementary in the international market. Similar research on other commodities, such as coffee, has indicated that Indonesian coffee and coffee from Brazil and Colombia have a substitution relationship in the United States market. Conversely, Indonesian coffee has been found to have a complementary relationship with Vietnamese coffee (Habibulah *et al.*, 2023). A review of the market structure of cocoa commodities in the global market reveals that Côte d'Ivoire, Ghana, Indonesia, and Nigeria exert a dominant influence on the global market for cocoa beans, with the capacity to produce concentrates of varying degrees of concentration on the supply side (Nabhani, 2024). The market structure of cocoa beans is characterised by a high market concentration, as indicated by an HHI value of 1.916 and a CR4 of 76%. This is indicative of a monopoly market structure (Hanafi & Tinaprilla, 2017). A research gap and limitation is that the discussion of market structure and intercommodity competition is still separate and these two things are not discussed simultaneously in one study. Research in the field of market structure, employing CR and HHI analysis, is unable to examine the relationship between competition among exporters. To address this problem, the discussion needs to be sharpened by adding AIDS

model analysis, which is able to examine competition among exporters. The continuation of market structure research in this area will serve to clarify the discussion in the study.

The extant literature reveals a paucity of studies that simultaneously examine the elasticity and market structure of cocoa bean products in the Malaysian market. Malaysia, the world's primary importer of cocoa bean products, is a crucial player in this field of research. Given its status as a major market for cocoa beans, it is essential to investigate the competitive position of these products in Malaysia, particularly in relation to Indonesia and other exporting countries. This study, therefore, aims to identify the competitive position of elasticity and market structure of cocoa beans of Indonesia and other exporting countries in the Malaysian market.

## MATERIALS AND METHODS

This study on the market structure and competition of cocoa exports in the Malaysian market employs secondary data from the International Trade Centre (ITC) Trade Map, spanning the period from January 2017 to December 2023. The data employed in this study is in the form of a time series, comprising export value (thousands of dollars) and export quantity (kilograms). The countries included in this study are the principal exporters of cocoa to the Malaysia market, namely Côte d'Ivoire, Ghana, Ecuador, Nigeria, Cameroon, Indonesia, Papua New Guinea, and Uganda. The Harmonised System (HS) code under examination is 1801 (cocoa beans, whole or broken, raw or roasted).

The analytical method employed to examine the market structure of cocoa exports in the Malaysian market is quantitative analysis. This is conducted using the Herfindahl-Hirschman Index (HHI) and Concentration Ratio (CR), in

addition to the Almost Ideal Demand System (AIDS) model. The objective of this analysis is to examine competition through elasticity among cocoa exporters. Previous studies have employed HHI and CR analyses to examine market structure and concentration. For example, Junior *et al.* (2018), Sembiring *et al.* (2021), and Pujiharto & Wahyuni (2023) have utilised these analytical tools. The following is the mathematical formula of HHI (Baye & Prince, 2022):

$$HHI = 10,000 = \sum_{i=1}^n w_i^2 \quad (1)$$

The symbol  $w_i$  represents the share of firm  $i$ . If the symbol  $w_i$  is translated as  $S_i/ST$ ,  $S_i$  represents the sales of a firm  $i$  divided by  $ST$ , or total sales in the industry. The value of the Herfindahl-Hirschman Index ranges from 0 to 10,000. A value of 10,000 indicates that there is a single company operating within a given industry, whereas a value of 0 signifies the presence of a multitude of smaller companies within the same industry.

Concentration Ratio (CR) analysis is a method of measuring the output produced by the largest firms in an industry. This analysis most commonly calculates the four (CR4) and eight (CR8) largest firms in an industry. The following is the mathematical formula of CR (Bain, 1959):

$$CR_k = \sum_{i=1}^n w_i^2 \quad (2)$$

Bain, (1959) concentration ratio formula considers the number of dominating firms,

represented by the variable  $k$ , where ( $k = 1, 2, 3, \dots, n$ ). The symbol  $w_i$  is the same as the HHI formula, which reflects the share of firms in a particular industry, represented by the variable  $S_i/ST$ . CR4 is the concentration of the share of the four largest companies in the industry. The following is the classification of the concentration ratio established by Bain (1959):

This study employs the AIDS model to ascertain the competitive landscape among cocoa exporting countries in the Malaysia market. The application of the AIDS model in this study yields three principal results, namely, income elasticity, cross-price elasticity, and own-price elasticity or demand elasticity. The competition between countries is derived from the cross elasticity results of the AIDS model. A positive elasticity result indicates a substitution relationship between products, implying competition. Conversely, a negative result reflects complementarity or no competition between products. Other studies that have employed the AIDS model to analyse elasticity include those by Li *et al.* (2018); Dewanti *et al.* (2020); Lindström (2022); Carolin *et al.* (2024) and Forgenie *et al.* (2024). The following is the form of the AIDS model formula, as proposed by (Deaton & Muellbauer, 1980):

$$W_i = \alpha_i + \sum_{j=1}^n \gamma_{ij} \ln P_j + \beta_i \ln \left( \frac{x}{p^*} \right) \quad (3)$$

Description :

$W_i$  = Export share of the  $i$ -th exporting country in the Malaysian market

Table 1. Classification of market concentration levels

Concentration degree	CR (4)	CR (8)
Very high	75% >	90% >
High	65% – 75%	85% – 90%
Moderately high	50% – 65%	70% – 85%
Moderately low	35% – 50%	45% – 70%
Low	< 35%	< 45%

Source: Bain, 1959.

P = Exporting country's origin price  
 x = Total import value in the Malaysian market  
 p\* = Geometric price index stone =

$$\sum w_i \cdot p_i$$

The aforementioned equations comprise nine model equations, which encompass models for Indonesia, Côte d'Ivoire, Ghana, Ecuador, Nigeria, Cameroon, Papua New Guinea, Uganda, and the rest of the world (ROW) category. This equation was initially utilised by Deaton & Muellbauer (1980), who identified product demand through the AIDS model. Price within the AIDS model regression serves as a conduit between demand and supply. In alignment with demand theory, this model must satisfy the conditions of homogeneity, symmetry, and adding up. The following are the formulas and definitions of homogeneity, symmetry, and adding up:

#### a. Homogeneity

Homogeneity is a requirement that states that if a revenue and price change in the same proportion, the amount of demand for a particular commodity will remain constant. This situation represents the implementation of a homogeneous demand function with a zero degree of price and demand.

$$\sum_{j=1}^n y_{ij} = 0 \quad (4)$$

#### b. Symmetry

The concept of symmetry can be defined as the cross-price reduction property of demand symmetry, which can be formulated as follows.

$$y_{ij} = y_{ji} \quad (5)$$

#### c. Adding Up

The addition of up is one of the conditions that describe the total expenditure occurring in the demand function as being

equal to the total income. The equation used does not require comprehensive detail; instead, only the most significant elements are necessary, namely the method employed and the resulting outcome.

$$\sum_{i=1}^n \alpha_i = 1, \sum_{i=1}^n \gamma_{ij} = 0, \sum_{i=1}^n \beta_i = 0 \quad (6)$$

Once the results of the AIDS model regression have been obtained and the requisite conditions of homogeneity, symmetry, and summation have been satisfied, the results will be processed by entering the coefficient results into the elasticity formula. Elasticity can be divided into three categories: income elasticity (expenditure), price elasticity of demand (uncompensated), and cross elasticity (compensated). The following are the formulas for the three elasticities.

#### 1. Income Elasticity

$$\eta_i = 1 + \frac{\beta_i}{w_i} \quad (7)$$

#### 2. Cross Price Elasticity

$$e^*_{ij} = -\delta_{ij} + \frac{\gamma_{ij}}{w_i} - w_j \quad (8)$$

#### 3. Price Elasticity of Demand

$$e_{ij} = -\delta_{ij} + \frac{\gamma_{ij}}{w_i} - \beta_i \left( \frac{w_j}{w_i} \right) \quad (9)$$

Description :

$\delta$  = Knocker delta when  $i = j$  then  $\delta = 1$ , otherwise = 0

## RESULTS AND DISCUSSION

### Market Structure of Cocoa Exports (HS 1801) in the Malaysian Market

The results of the Herfindahl-Hirschman Index (HHI) analysis of cocoa exports in the Malaysian market indicate a figure of 1,835.50 (Table 2). This HHI result exceeds 1,800, indicating that cocoa exports in the

Malaysian market are characterised by high concentration. A highly concentrated market is indicative of a small number of exporters with significant market power. In the Malaysian cocoa export market, this is evidenced by the dominance of a few key exporters, with the Côte d'Ivoire being the primary supplier. Indonesia, in comparison, occupies a relatively minor position in the Malaysian cocoa market

There is a correlation between CR analysis and HHI analysis. The greater the proportion of results derived from CR analysis, the greater the results obtained from HHI analysis. The result of the CR4 analysis, which comprises the four most prominent countries in terms of cocoa exportation within the Malaysian market, is 71%. This figure reflects a high degree of concentration in the cocoa export market in Malaysia. In accordance with previous research, the fewer companies or industries

that are dominant in the market, the greater the number of market concentration (Junior *et al.*, 2018; Pandey *et al.*, 2023). This is consistent with the HHI result, which also indicates a high degree of market concentration. The Malaysian market is dominated by four countries: Côte d'Ivoire, Ghana, Ecuador and Nigeria, which collectively account for 71% of the market (Table 3). Indonesia, a significant cocoa exporter, is not included in the aforementioned countries but is instead ranked among the top eight firms in the Malaysian market. The results of the CR8 analysis also indicate that cocoa exports in the Malaysian market are highly concentrated, with a figure of 91%.

The results of the HHI and CR analyses indicate that the cocoa export market in Malaysia is characterised by an oligopolistic structure. An oligopoly is a market structure

Table 2. HHI calculation results of major cocoa exporters in the Malaysian market

Countries	2017	2018	2019	2020	2021	2022	2023	Average
Côte d'Ivoire	809.14	603.72	1,184.63	1,285.16	1,556.69	1,398.58	884.32	1,103.18
Ghana	495.52	650.67	247.38	162.59	366.93	175.07	63.86	308.86
Ecuador	120.03	158.84	70.60	191.78	39.88	268.48	483.86	190.50
Nigeria	28.77	27.60	44.29	38.32	143.09	69.21	222.49	81.97
Cameroon	102.71	83.26	127.39	101.82	39.35	30.66	14.12	71.33
Indonesia	64.74	86.73	72.31	62.32	21.91	36.91	10.94	50.84
Papua NG	32.75	15.95	10.30	7.69	4.79	12.44	4.66	12.66
Uganda	10.33	4.10	7.96	5.26	3.92	1.33	4.78	5.38
Others	4.73	8.30	8.80	6.73	6.77	6.23	33.96	10.79
HHI	1,668.72	1,639.19	1,773.66	1,861.68	2,183.34	1,998.89	1,723.00	1,835.50

Source: Data processed, 2024.

Table 3. CR4 and CR8 calculation results of major exporters in the Malaysian market

Countries	2017	2018	2019	2020	2021	2022	2023	Average
Cote d'Ivoire	28%	25%	34%	36%	39%	37%	30%	33%
Ghana	22%	26%	16%	13%	19%	13%	8%	17%
Ecuador	11%	13%	8%	14%	6%	16%	22%	13%
Nigeria	5%	5%	7%	6%	12%	8%	15%	8%
CR 4	67%	68%	65%	69%	77%	75%	75%	71%
Cote d'Ivoire	28%	25%	34%	36%	39%	37%	30%	33%
Ghana	22%	26%	16%	13%	19%	13%	8%	17%
Ecuador	11%	13%	8%	14%	6%	16%	22%	13%
Nigeria	5%	5%	7%	6%	12%	8%	15%	8%
Cameroon	10%	9%	11%	10%	6%	6%	4%	8%
Indonesia	8%	9%	9%	8%	5%	6%	3%	7%
Papua NG	6%	4%	3%	3%	2%	4%	2%	3%
Uganda	3%	2%	3%	2%	2%	1%	2%	2%
CR 8	94%	92%	91%	92%	92%	92%	86%	91%

Source: Data processed, 2024.

comprising two to ten firms in a single industry (Baye & Prince, 2022). In accordance with the CR results in the Malaysian cocoa export market, eight countries with a concentration ratio of almost 91% exert control over the Malaysian cocoa export market. Firms in oligopoly markets are typically strategically dependent on other firms. This strategic dependence may manifest in various forms, including output level alignment, pricing coordination, and price reduction trend synchronization.

The results of the HHI and CR analyses indicate that the cocoa export market in Malaysia is characterised by an oligopolistic structure. An oligopoly is a market structure comprising two to ten firms in a single industry (Baye & Prince, 2022). In accordance with the CR results in the Malaysian cocoa export market, eight countries with a concentration ratio of almost 91% exert control over the Malaysian cocoa export market. Firms in oligopoly markets are typically strategically dependent on other firms. This strategic dependence may manifest in various forms, including output level alignment, pricing

coordination, and price reduction trend synchronization.

### Competition Cocoa Exports (HS 1801) in the Malaysian Market

The R-squared value in this analysis demonstrates the extent to which fluctuations in the export market share of cocoa beans can be attributed to the independent variables employed in the model. An R-squared value that is positive and greater than zero indicates a significant relationship between the independent variables and cocoa bean export market share. The p-value for all exporting countries is significant at the 10% level of significance. This indicates that the independent variables employed in the regression model have been demonstrated to exert a statistically significant influence on the dependent variable, namely cocoa bean export market share. Consequently, it can be concluded that all the factors considered in this analysis contribute significantly to the explanation of the movement of cocoa bean export market share of the eight exporting countries in the Malaysian market.

Table 4. Coefficient and P-value of export share of cocoa beans of exporting countries

Countries	R-Square	P-Value
Indonesia	0.2110	0.0000
Cote d'Ivoire	0.1556	0.0080
Ecuador	0.1765	0.0005
Nigeria	0.1351	0.0007
Ghana	0.0403	0.0837
Papua New Guinea	0.4678	0.0000
Cameroon	0.0302	0.0028
Uganda	0.1700	0.0429

Source : Data processed, 2024.

Table 5. Market share of cocoa beans exporting countries in the Malaysian market

Countries	Market share
Cote d'Ivoire	32.52%
Ghana	16.31%
Ecuador	13.13%
Nigeria	8.32%
Cameroon	7.92%
Indonesia	7.06%
Papua New Guinea	3.53%
Uganda	2.30%

Source : Data processed, 2024.

A review of the market share distribution of cocoa beans at the Malaysian market level reveals that African countries exert a dominant influence, with Côte d'Ivoire at the vanguard with a 32.52% market share. This serves to confirm Côte d'Ivoire's position as a key player in the global cocoa industry, with Ghana occupying the second position with a market share of 16.31%. The preponderance of these African countries is indicative of their substantial production capacity, robust policy support, and efficacious management of the cocoa industry supply chain (Research Institute (IFPRI), 2017; Tham-Agyekum *et al.*, 2023). Meanwhile, Indonesia has a cocoa bean export market share of 7.06%, which places it sixth among the eight major exporting countries. This position demonstrates that Indonesia plays a notable role in the cocoa bean trade in the Malaysian market, although it still trails significantly behind Côte d'Ivoire and Ghana.

The expenditure elasticity value demonstrates the extent to which changes in expenditure influence the elasticity of demand

(Amri, 2022; Puspita & Agustina, 2020; Utami *et al.*, 2022). The results demonstrated that the expenditure elasticity value of Indonesian cocoa bean exports is negative, indicating that Indonesian cocoa beans are classified as inferior goods, with a value of 1.405 exceeding 1 ( $1.405 > 1$ ) (Baye & Prince, 2022). This value indicates that a 10% increase in cocoa exports in the Malaysian market would result in a 14.05% decrease in international demand for Indonesian cocoa beans. This demonstrates that cocoa beans from Indonesia are responsive to alterations in overall expenditure.

A reduction in demand for cocoa beans may result from an increase in imports by Malaysian importers for a number of reasons, including the perception that cocoa beans are less valuable than their processed counterparts, such as cocoa powder or chocolate, which are more profitable in the Malaysian market. An increase in cocoa exports in the Malaysian market leads to an increase in demand for processed products, while demand for raw cocoa beans as a basic commodity either stagnates or decreases (Suryana *et al.*,

Table 6. Expenditure elasticity values of major cocoa bean exporting countries in the Malaysian market

Countries	Income elasticity
Indonesia	-1.405
Cote d'Ivoire	1.763
Ecuador	1.352
Nigeria	3.076
Ghana	0.644
Papua New Guinea	-1.578
Cameroon	-0.296
Uganda	-0.124

Source : Data processed, 2024.

Table 7. Price elasticity of demand (uncompensated) of major cocoa bean exporting countries in the Malaysian market

Countries	Demand elasticity
Indonesia	-0.583
Cote d'Ivoire	-1.265
Ecuador	-0.121
Nigeria	-1.047
Ghana	-0.861
Papua New Guinea	-1.008
Cameroon	-0.900
Uganda	-0.887

Source : Data processed, 2024.



2014). When importers in the Malaysian market increase their imports, they tend to favour cocoa from other countries that are considered to have advantages in terms of both price and quality. This situation arises with Indonesian cocoa due to the fact that the average age of the cocoa trees in Indonesia has exceeded the typical productive period. The age of the cocoa trees affects both the productivity and quality of the beans (Saputro & Helbawanti, 2020). There are several examples of cocoa plantations in Indonesia that have reached the end of their productive lifespan. These include plantations in Blitar Regency, North Luwu Regency, and Bone Regency, which are over 20 years old (Luttyana & Hariyati, 2019; Yuniarsih *et al.*, 2021).

The value of demand elasticity (uncompensated) is negative for all eight cocoa bean exporting countries. The price elasticity value for Indonesian cocoa beans is -0.583, indicating an inelastic market. This is evidenced by the fact that an increase in the price of Indonesian cocoa beans in the Malaysian market by 10% will result in a 5.83% reduction in Indonesian export demand, assuming all other variables remain constant. This is in accordance with the theory of demand, namely that if there is a change in price, it will be responded to negatively or oppositely in the demand for the good. This implies that if there is an increase in the price of a good, it will reduce the amount of demand for that good (Aulia *et al.*, 2019). This finding is also confirmed by (Baye & Prince, 2022), who found a negative relationship between price and quantity demanded in the import share. Findings from other studies on other commodities such as rubber also suggest that an increase in world rubber prices will lead to reduced demand for synthetic rubber (Laily *et al.*, 2022). The absolute value of Côte d'Ivoire, Nigeria, and Papua New Guinea cocoa is greater than 1 (one). This

demonstrates that cocoa from these exporters is elastic or responsive to price increases (Baye & Prince, 2022).

The elasticity of demand for Indonesian cocoa in the Malaysian market has an absolute value of less than one. This result demonstrates that Indonesian cocoa in the Malaysian market is inelastic, indicating that the quantity demanded is not responsive to price increases. The number of instances of a decline in demand for Indonesian cocoa in the Malaysian market will be less than the number of instances of an increase in price. A comparison of the absolute value of Indonesian cocoa demand elasticity with that of other exporters, including Côte d'Ivoire, Nigeria, Ghana, Papua New Guinea, Cameroon and Uganda, reveals that it is relatively low. This situation presents Indonesian cocoa exporters with an opportunity to implement pricing strategies that are advantageous to them.

Cross-price elasticity (compensated) is defined as the percentage change in the amount of goods consumed in response to price changes of other related commodities (Andreyeva *et al.*, 2010; Cornelsen *et al.*, 2015). The cross-price elasticity (compensated) enables the identification of the complementary or substitution relationship between commodities (Al-Mahish *et al.*, 2021). A positive cross-price elasticity indicates that the two goods in question are substitutes or that there is a competitive relationship between them. Conversely, a negative cross-price elasticity indicates that the two goods are complementary or that they only complement each other without competition (Koksall & Wohlgenant, 2016). The estimation of cross-price (*compensated*) price elasticity can assist in the determination of an appropriate price policy to influence the consumption of a good (Ikudayisi & Omotola, 2020; Landolsi & Miled, 2024). Moreover, cross-price elasticity allows us to ascertain the

Table 8. Cross price elasticity (compensated) of major cocoa bean exporting countries in the Malaysian market

Countries	Indonesia	Cote D'Ivoire	Ecuador	Nigeria	Ghana	Papua NG	Cameroon	Uganda
Indonesia		-4.341	1.949	-1.383	0.874	-1.092	1.023	-1.445
Cote d'Ivoire	-0.943		0.103	-0.456	1.585	-0.193	-0.129	0.781
Ecuador	1.049	0.255		-1.564	-4.201	1.779	-1.762	-0.921
Nigeria	-1.175	-1.784	-2.469		1.115	-1.470	1.277	0.011
Ghana	0.379	3.160	-3.382	0.568		-0.152	0.171	0.078
Papua NG	-2.183	-1.776	6.613	-3.461	-0.702		4.477	2.489
Cameroon	0.912	-0.528	-2.922	1.341	0.352	1.997		-0.510
Uganda	-4.440	-5.064	-5.258	0.040	0.551	-1.434	-1.756	

Source : Data processed, 2024

complementary or substitution relationship between the two exporting countries (Ding & Timmer, 2022; Lewis, 2014).

The analysis of cross-price (*compensated*) price elasticities among the major cocoa bean exporting countries in the Malaysian market reveals some significant patterns that indicate how changes in cocoa prices from one country can affect the demand for cocoa from another country. Some countries demonstrate a robust substitution relationship, with positive elasticities indicating that an increase in the price of cocoa beans from one country tends to enhance demand for cocoa from another country (Mahdi & Suprehatin, 2021; Yuliaty & Hutajulu, 2021). This implies direct competition in the Malaysian market, where cocoa exporters engage in intense competition for market share. Conversely, some country pairs demonstrate negative elasticities, which may signify intricate complementary relationships or potential interconnections in the supply chain that impact trade patterns. Furthermore, the table demonstrates that there are considerable discrepancies in the degree of responsiveness exhibited by different countries. It is evident that certain countries demonstrate particularly high levels of elasticity, both in positive and negative directions, which signifies a high degree of dependency or a substantial potential for demand to fluctuate in response to price alterations. Such findings have strategic implications for trade policy, price negotiations and international market

strategies, particularly for countries with high elasticities in their trade relationships.

The relationship between Indonesia and Côte d'Ivoire cocoa exhibits a negative or complementary value. This indicates that in the event of a 10% increase in Côte d'Ivoire's cocoa price, under the assumption that all other variables remain constant, the demand for Indonesia cocoa beans will decrease significantly by 43.41%. Conversely, the relationship between Indonesia and Ecuador cocoa prices is characterised by a positive or substitutive relationship. An increase of 10% in the price of cocoa from Ecuador will result in a 19.49% increase in demand for Indonesian cocoa in the Malaysian market.

The elasticities exhibited by Indonesia and Nigeria cocoa are negative, indicating that these two products are complementary. A 10% increase in the price of cocoa from Nigeria will result in a 13.83% decrease in demand for Indonesian cocoa in the Malaysian market, reflecting the complementary nature of the products. Furthermore, the relationship between Indonesia and Ghana cocoa prices demonstrates a positive elasticity, indicating that the two products are substitutes. This indicates that an increase of 10% in the price of Ghana cocoa will result in an 8.74% increase in demand for Indonesian cocoa.

The relationship between the price of cocoa beans from Indonesia and Papua New Guinea evinces a complementary nature, as

evidenced by a negative demand elasticity value. A 10% increase in the price of cocoa beans from Papua New Guinea, assuming that all other variables remain constant, would result in a 10.92% decrease in the demand for Indonesian cocoa beans. The relationship between Indonesia and Cameroon cocoa bean prices is characterised by a positive elasticity of demand, indicating a substitutive relationship. A 10% increase in the price of cocoa beans from Cameroon will result in a 10.23% increase in demand for Indonesian cocoa beans in the Malaysian market. The characteristics of Indonesian and Ugandan cocoa beans are complementary, as evidenced by the negative elasticity of demand. This indicates that a 10% increase in the price of cocoa beans from Uganda will result in a 14.45% decrease in the demand for Indonesian cocoa beans in the Malaysian market.

The results of the cross-price elasticity analysis indicate that Indonesia has a complementary relationship with Côte d'Ivoire, Nigeria, Papua New Guinea and Uganda. The complementary relationship between Indonesian cocoa and other exporting countries indicates that these countries occupy complementary positions or roles in the Malaysian market (Balai Informasi Standar Instrumen Pertanian, 2023). Indonesia is in a substitutive relationship with Ecuador, Ghana and Cameroon. In light of this substitutability, it is imperative that Indonesia exercise caution in its pricing strategy for cocoa in the Malaysian market. Price competition is a significant factor, as minor price discrepancies can result in substantial shifts in demand (Deka *et al.*, 2023). This substitutability renders Indonesia and other exporting countries' cocoa products susceptible to substitution in the Malaysian market (Hanafi & Tinaprilla, 2017). In their research on the competitiveness of Indonesia processed cocoa, Rahmadona & Naully (2023), found that a decline in Ecuador cocoa prices

may result in importers seeking lower prices, leading to an increase in purchases from Ecuador and a corresponding decline in demand for Indonesian cocoa.

Despite Indonesian reputation as a leading global cocoa bean exporter, it still imports a modest quantity relative to its exports for specific types of cocoa, as previously outlined. In 2022, the form of cocoa imported by Indonesia was predominantly in the primary form, namely cocoa beans, representing 66.5% of the total, while the manufactured form accounted for the remaining 33.5%. In 2019, Indonesia recorded cocoa imports from five main countries: Ecuador, Côte d'Ivoire, Malaysia, Cameroon, and Nigeria. These countries collectively accounted for 73.93% of Indonesian total cocoa import value from the world (Pusat Data dan Sistem Informasi Pertanian, 2023).

## CONCLUSIONS AND RECOMMENDATIONS

The Malaysian cocoa export market is characterised by a high level of market concentration, indicative of an oligopoly market structure. Cocoa beans from Indonesia are regarded as an inferior good in the Malaysian market, exhibiting inelasticity or unresponsiveness to price fluctuations. The Indonesian cocoa market in Malaysia exhibits a substitution relationship with cocoa from Ecuador, Ghana, and Cameroon, as well as a complementary relationship or direct competition with cocoa from Côte d'Ivoire, Nigeria, Papua New Guinea, and Uganda.

It is imperative that Indonesian cocoa undergoes replanting in order to enhance the quality and productivity of the crop. An increase in productivity could result in a greater number of export offers, thereby increasing the proportion of Indonesian cocoa exports in the Malaysian

market, which is currently relatively modest. Replanting could enhance the quality of Indonesian cocoa, thereby improving its position in the market. Furthermore, an improvement in quality could strengthen the bargaining position, enabling direct competition with Côte d'Ivoire, the dominant cocoa exporter in the Malaysian market.

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