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Determinants of Cocoa Bean Trade in the International Market: Gravity Model Approach

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ABSTRACT

Cocoa beans are one of Indonesia's primary export commodities, ranking fourth in terms of foreign exchange earnings. Under conditions of free trade, this study aimed to analyze the determinants of the export value of Indonesian cocoa beans compared to its competitors in West African countries (Ivory Coast, Ghana, and Nigeria). The research method used is the gravity model with panel data from 2000 - 2020, using STATA 14.2 and Microsoft Excel. The results indicate that the variables significantly affecting the export value of cocoa beans are economic distance, production, export volume, the population of exporting countries, harvested area, exchange rate, and membership in AFCFTA. Other variables are not significant. This study concludes that the effect of export volume and production of cocoa beans, economic distance, and exchange rate are positive, while the effect of membership in AFCFTA is negative. However, this study is unable to analyze the factors that influence the trade of Indonesian cocoa beans and its competitor countries to the import destination country (Malaysia) as well as the export of cocoa beans (raw or roasted). Future research direction includes exploring Indonesia's post-COVID-19 international trade strategy and food safety issues.

1. INTRODUCTION

Residents of a country engage in foreign or international trade with residents of other nations based on mutual agreements. International trade promotes industrialization, advancements in transportation, globalization, the existence of multinational companies, increased income/growth, reduced unemployment, enhanced efforts for poverty alleviation, and inflation control [1-6]. Trade liberalization refers to the removal (or reduction) of barriers to trade between countries, such as the abolition of international trade taxes and the loosening of regulatory or institutional arrangements that hinder trade [7].

Trade liberalization can enhance trade performance by improving the trade balance position. While a favorable trade balance is beneficial for the economy, a deficit is detrimental [8]. A surplus in the trade balance suggests an increase in income from exports. The trade literature over the past few decades supports the idea that better institutions and governance will increase international trade flows [9-13] and asserts that the level of institutional quality in both exporting and importing countries increases the volume of trade between them. Additionally, weak institutions can impede trade and lead to poor manufacturing export performance [14, 15].

Agreements in trade accords are crucial for regional integration. If designed efficiently, member countries can increase investment, economic growth, and social welfare through augmented trade flows [16]. Countries are using the strategy of Regional Trade Agreements (RTAs) for global trade expansion, and its popularity is expected to continue growing [10]. RTAs increase trade among member countries and discourage trade with non-members [17-20]. Almost all countries participate in at least one RTA [10].

Thus, it is not surprising that many developing countries have initiated several trade agreements to improve their trade balance performance. The number of regional trade agreements (RTAs), such as AFTA and AFCFTA, has increased rapidly over the last few decades. A regional trade agreement (RTA) is an agreement between two or more countries where trade is facilitated by removing trade barriers among the involved countries [10, 20-22]. Becoming a member of a Free Trade Agreement (FTA) can also enhance trade in agricultural flows [23]. Typically, in developing countries, higher protection is given to the agricultural sector [24].

As a developing country, Indonesia boasts abundant natural and human resources, which can be harnessed for its economic development. Agriculture is among Indonesia's leading and most significant economic sectors, capable of boosting its economic growth through international trade. The Agriculture, Forestry, and Fisheries sector contributed significantly to GDP growth in the third quarter of 2021, ranking among the top four sectors with the largest contribution to the Indonesian economy in 2021. Meanwhile, one sub-sector with considerable potential in the Indonesian agricultural industry is the plantation sector, which contributed around 34.07 percent to the total GDP of the Agriculture, Forestry, and Fisheries sector in the third quarter of 2021 [25].

Cocoa is one of Indonesia's mainstay exports in the plantation sub-sector. Cocoa exports are still dominated by beans 80% [26]. Cocoa bean trade in the international market is not only produced by Indonesia. Cocoa beans produced by

West African countries (Ivory Coast, Ghana, and Nigeria) have quality standards favored by the European market, due to good fermentation and high taste [27].

The export value of Indonesian cocoa beans from 2018 to 2020 fluctuated. Many trade barriers can cause a fluctuation in the export value of cocoa beans. First, membership in international trade organizations, such as existing FTAs on a regional scale, for example, AFTA (ASEAN FTA), and AFCFTA (African Continental FTA). Second, countries are also faced with political stability. Political relations are a major determinant of consumer and trading firm emotions, and consequently the interactions between importers, and exporters. Second, tariffs reduce international trade, resulting in more unemployment [28], and increasing consumer prices.

Due to international trade, Indonesia's cocoa bean production is mostly exported to foreign countries. In 2019, the top five importing countries for Indonesian cocoa beans were the United States, Malaysia, India, China, and the Netherlands. Malaysia is the largest alternative country for Indonesia's cocoa bean exports, seen from its close geographical distance, and similarity in FTA membership. Export volume to Malaysia reached 80,590 tons, 22.48% of the total export volume of Indonesian cocoa beans [29].

Based on the world's largest cocoa-producing country, Ivory Coast ranks first as a cocoa bean exporter in the world with a contribution of 51% to total cocoa bean production. Ghana (24%), Ecuador (8%), Cameroon (7%), Nigeria (6%), and Indonesia (5%). Indonesia is ranked sixth among the world's cocoa bean exporters (International Cocoa Organization (ICCO), 2021). The position of Indonesian cocoa bean exporters (position 6) fell compared to the previous year, this was exacerbated by the declining export value of cocoa beans. Indonesia has established cooperation with international trade organizations, such as AFTA, to gain export benefits to Malaysia. The competitive position of Indonesian cocoa beans is not sufficiently attractive to Malaysian consumers. With this research, it will be known the factors that influence the flow of trade. So that it can provide input and consideration for the Government in making policies related to the cocoa bean trade.

Since trade liberalization has several economic, and non-economic components, this paper will limit itself only to the economic impact on the export value of cocoa beans with the gravity model. Therefore, the non-economic dimension will not be addressed. In addition, other factors that were not included in the study were considered constant (ceteris paribus). The innovation and novelty of this study is the analysis of trade and competitiveness of Indonesian cocoa beans against its 3 competing countries (Ivory Coast, Ghana, and Nigeria) using the Gravity Model, and there is a dummy variable for the implementation of the cocoa export tax before and after the implementation of the tax, and membership in FTAs.

The Gravity Model is widely used to measure the effects of Regional Trade Agreements (RTAs) on trade flows [18, 24, 30-42]. The gravity model assesses a country's trade flows and is very important in determining a country's export or import potential [9, 40]. It is assumed that trade between countries is proportional to the country's income measured in GDP and directly proportional to the distance or transportation costs between trading partners [43]. Suvannaphakdy and Toyoda [19] using import tariffs as an additional variable in the gravity model. Most studies analyzing the effects of trade use panel data regression to find empirical results [9, 34, 36, 40, 44-54]. However, several studies have shown that regional trade agreements do not affect a country's growth, and the need still needs to be determined [55, 56].

This article is organized as follows. Section 2 describes the data, and the methodology applied. Section 3 shows the empirical results Section 4 presents the discussion. The last part (Section 5) presents the conclusion.

2. METHODOLOGY

This study applied the Gravity Model method, which has been evaluated. The gravity model is applied to international trade; the mass of a country is usually represented by its economic size measured in terms of aggregate output or gross domestic product (GDP), while its geographical distance measures barriers or barriers to trade with its trading partners [40, 57]. The economic distance formula used refers to research Inayah et al. [58], as Eq. (1):

$$JE_j = DIS_j x \frac{GDP_j}{\sum GDP_j} \quad (1)$$

where, JE_j=economic distance between importing country and country j (km); DIS_j=geographical distance between the capital city of the importing country and the capital city of the country j (km); GDP_j=GDP of country j (USD); and GDP_j=total GDP of all countries j (USD).

The econometric tools of gravity modeling in recent decades have been significantly enriched due to the advent of modified gravity equations based on the theory: of fixed or random effects options [59, 60]. The gravity model has the advantage of greater credibility than other regression models. According to Reyes et al. [61], one of the advantages of the gravity model is that the empirical model can be easily augmented to consider additional control and policy variables.

2.1 Data collection methods

This study analyzes Indonesia and its competitors in West Africa (Ivory Coast, Ghana, Nigeria). The choice of countries following factors explains the choice of countries that are relatively within the same regional area, and their economies are comparable in size. Second, they relate to nearly the same agreement and organization. In particular, Ivory Coast and Ghana are the world's largest producers and exporters countries. Our dataset consists of a cross-section: of 4 countries and a time series: of 21 years, yielding 84 observations. Data accessed in 2000-2020. Table 1 provides an overview of the description of variables and data sources.

For our study, the following hypotheses were formulated:

Hypothesis 1. The GDP of the exporting country hinders the value of exports.

The value of exports is significantly related to GDP [62]. Although this dependence can hardly be considered, a country's Gross Domestic Product (GDP) is one indicator for producing the country's export commodities.

Hypothesis 2. The GDP of the export destination country (Malaysia) stimulates the value of exports.

On the one hand, the importing country's GDP growth contributes to higher export values [63]. For importing countries, the greater the GDP, the higher the imports of these commodities.

Hypothesis 3. Economic distance hinders export value.

It is clear that in the presence of transportation costs. The profits received by a country from international trade are getting smaller [64]. Distance is the basis for building gravity models [65]. If the distance between countries is getting closer, the value of exports will increase.

Hypothesis 4. Cocoa bean production stimulates export value.

Production indicates the strength of supply in trade. The higher the production, the more exports of these commodities will be:

Hypothesis 5. Cocoa bean productivity stimulates export value.

Competitiveness can be identified with productivity; namely, the output level produced for each input used [66]. This increase in productivity can be caused by an increase in the number of physical inputs of capital and labor, an increase in the quality of the input used, and an increase in technology (total factor productivity).

Hypothesis 6. The real exchange rate hinders the value of exports.

The real exchange rate of a country is inversely proportional to the export value and directly proportional to the country's imports. The real exchange rate of a country is high (appreciation), and the price of that country's domestic goods becomes relatively more expensive compared to increasing the number of imports of goods from abroad [67].

Hypothesis 7. World cocoa bean prices stimulate export value.

This hypothesis assumes that it is possible that when the world cocoa bean price rises, it will encourage producers to sell goods to export destination countries [68].

Hypothesis 8. The volume of world cocoa bean exports stimulates export value.

This hypothesis assumes that as the export volume increases, the export value of cocoa beans will also increase.

Hypothesis 9. The population of the exporting country constrains the value of exports.

In this hypothesis, it is assumed that population growth will reduce the supply of export commodities from the exporting country.

Hypothesis 10. Harvested area stimulates export value.

This hypothesis assumes that the optimal harvested area will increase production and productivity. As a result, exports will increase.

Hypothesis 11. AFCFTA membership dummy stimulates export value.

In this hypothesis, it is assumed that becoming a member country of AFCFTA will result in fewer export barriers, increasing the value of exports.

Hypothesis 12. A dummy export tax hinders the value of exports.

In this hypothesis, it is assumed that the export tax will cause prices to be expensive; so that it can reduce the number of exports.

Table 1. Description of dependent variable and independent variable

Variable	Description	Data Source
Y_{ij}	Export value (US$)	UN Comtrade
GDP_{jt}	Malaysia's real GDP (US$)	World Bank
GDP_{it}	Exporting the country's Real GDP (US$)	World Bank
DIS_{ij}	Economic distance (km)	http://indonesia.distanceworld.com/dc
$PROD_{it}$	Production (tons)	FAO (Food and Agriculture Organization)
$PROTY_{it}$	Productivity (tonnes/ha)	FAO (Food and Agriculture Organization)
ER_{ij}	Real exchange rate (local currency unit (LCU)/US$)	World Bank
$PRICE_{it}$	The world price of cocoa beans (US$/MT)	Federal Reserve Economic Data
VOL_{it}	Export volume (tons)	FAO (Food and Agriculture Organization)
POP_{it}	Population (people)	World Bank
$AREA_{it}$	Harvested area (ha)	FAO (Food and Agriculture Organization)
$DFTA_{it}$	*Dummy variable* membership of cocoa exporting countries in AFCFTA	AFCFTA
$DTAX_{it}$	*Dummy variable* export tax	Ministry of Agriculture

2.2 Data analysis

The equations of the gravity model [69] are expressed using the traditional gravity model in calculating trade flows with natural logarithm functions to get more accurate results [70]:

$$In\ Y_{ij} = \beta_0 + \beta_1\ InX_j + \beta_2\ InX_i + \beta_3\ InD_{ij} + \beta_n\ InX_n + \mu \quad (2)$$

where, Y=Dependent variable; β (0, 1, 2, 3)=Coefficient; X_i, X_j, D_{ij}, X_n=Independent variables.

According to the theory of gravitational equations, an equation of gravity in this research is proposed as follows:

$$\begin{aligned} In\ Y_{ij} = {} & \beta_0 + \beta_1\ InGDP_{jt} + \beta_2\ InGDP_{it} \\ & + \beta_3\ InDIS_{ij} + \beta_4\ InPROD_{it} \\ & + \beta_5\ InPROTY_{it} + \beta_6\ InER_{ij} \\ & + \beta_7\ InPRICE_{it} + \beta_8\ InVOL_{it} \\ & + \beta_9\ InPOP_{it} + \beta_{10}\ InAREA_{it} \\ & + \beta_{11}\ InDFTA_i + \beta_{12}\ InDTAX_{it} \\ & + \mu \end{aligned} \quad (3)$$

where, Y=Export value of cocoa beans from country i to country j in year t (US$); GDP_{jt}=real GDP of the importing country of destination (country j) in year t (US$); GDP_{it}=Real GDP of the exporting country (country i) in year t (US$); DIS_{ij}=Economic distance (km); PRO_{it}=Cocoa bean production (tons); $PROTY_{it}$=Cocoa bean productivity (tons/ha); ER_{ij}=The real exchange rate (local currency unit (LCU)/US$); $PRICE_{it}$=World cocoa bean price in year t (USD/MT); VOL_{it}=Export volume of cocoa beans of country i in year t (tonnes); POP_{it}=Population of the country (people); $AREA_{it}$=Area of cocoa beans harvested (ha); $DAFCFTA_{it}$=Dummy variable of membership of cocoa exporting countries in AFCFTA; $DTAX_{it}$=Dummy export tax variable; μ=Error; β_0=Constant; β_1, β_2, β_3, β_4, β_5, β_6, β_n=Regression Coefficient.

2.3 Model selection

If the regression model parameters tend to change, the results are unreliable and cannot be used for forecasting or policy formulation. To detect a structural change in the

relationship between the dependent variable and the independent variable (an easy test is to use the Chow test [71].

Chow Test / Restricted Test (F-Test) is a test to choose whether the model used is Pooled Least Square or Fixed Effect. In this test, the following hypothesis is carried out:

H_0: *Pooled Least Square*

H_1: *Fixed Effect Model*

The basis for rejecting H_0 is to use F-statistics as formulated by *CHOW*.

$$CHOW = \frac{(RSSS - URSS)/(N-1)}{URSS/(NT-N-K)} \quad (4)$$

where, *RRSS*=Restricted Residual Sum Square (is the Sum of Square Residual obtained from panel data estimation with pooled least square/common intercept model); *URSS*=Unrestricted Residual Sum Square (is the Sum of Square Residual obtained from panel data estimation with fixed effect model); *N*=Total cross-section data; *T*=Number of time series data; *K*=Number of explanatory variables.

If the calculated F statistic exceeds the critical F value at a certain significance level, or if the value of (Prob > F) = 0 means (Prob > F) < = 0.05, then there is sufficient evidence to reject the null hypothesis so that the model to be used is a fixed effect model, and vice versa.

Hausman Test. This test determines whether the fixed effect or random effect model is selected. This test is carried out with the following hypothesis:

H_0: *Random Effect Model*

H_1: *Fixed Effect*

The null hypothesis will be rejected if the chi_2-statistical wald value > chi-square table value or if (Prob > Chi_2). If the value of (Prob > Chi_2) = 0 means (Prob > Chi_2) < (0.05) (Gujarati and Porter 2009).

LM Test (Lagrange Multiplier Test). LM Test or *The Breusch - Pagan LM Test* was used as a statistical consideration in selecting the Random Effect Model versus the Pooled Least Square model. Testing the hypothesis:

H_0: *Pooled Least Square*

H_1: *Random Effect Model*

The basis for rejecting H_0 is the LM statistic that follows the Chi-Square distribution. If the value of Chi-Square) < (0.05), accept H_1, and vice versa.

3. RESULTS AND DISCUSSION

In this study, the gravity model is used to analyze the determinants of the export value of cocoa beans from Indonesia and its competitors to Malaysia. There are fourteen independent variables used in this model. The data consists of time series data from 2000 to 2020 and cross-sectional data from the four main exporting countries. There are two general approaches in panel data regression, namely the Fixed Effects Model (FEM) and Random Effects Model (REM) [72]. In this study, Random Effects is the best model to apply, based on the following model selection test.

3.1 Chow test

In terms of the value of Prob > F, the value of (Prob > F) PLS = 0.0000 < = 0.01. Prob value > F (FEM) = 0.000 < = 0.01. So, Ho is rejected, so the model to be used is the Fixed Effect Model.

3.2 Hausman test

If the value of (Prob > Chi_2) does not appear, this study uses an estimate of the Random Effect Model.

3.3 Lagrange multiplier - Breusch pagan test

In this study, the value of Chi-Square = 0.0000 < (0.05) means that in this study, using an estimate of the Random Effect Model.

3.4 Gravity model

Modeling results that not all variables are significant (Table 2). Testing criteria by comparing the P-Value (critical value) with the statistical test value (α).

Table 2. Estimation result of determinant factors of Indonesian cocoa bean export (Random effect model)

Variable	Coefficient	Probability
Constant	8.33e+08	0.003***
Malaysia's real GDP (US$)	206.9077	0.219
Exporting the country's Real GDP (US$)	116.4885	0.391
Economic distance (km)	59267.92	0.070*
Production (tons)	568.238	0.016**
Productivity (tonnes/ha)	-1.03e+09	0.006***
Real exchange rate (local currency unit (LCU)/US$)	-27.30108	0.003***
The world price of cocoa beans (US$/MT)	8746.309	0.645
Export volume (tons)	2774.757	0.000***
Population (people)	-2.343111	0.004***
Harvested area (ha)	-349.4358	0.003***
Dummy variable membership of cocoa exporting countries in AFCFTA	-3.28e+08	0.054*
Dummy variable export tax	4.17e+07	0.335
R-Square		0.7347
Wald Chi_2		165.14
Prob>Chi_2		0.0000

Notes: 1. *** Significant at 1% of significance level; 2. ** Significant at 5% of significance level; 3. * Significant at 10% of significance level.

Based on the panel data regression results shown in Table 2, two independent variables have significantly affected the export value of Indonesian cocoa beans and their competitors to Malaysia. Meanwhile, other independent variables do not significantly affect the export value of cocoa beans. In addition, the R-Square of the regression model is 0.7347, which means that the independent variable applied in this model can determine the export value of cocoa beans by 73.47%. In comparison, 26.53% is explained by other variables not included in the model. Meanwhile, the F-statistics shows that the regression model is valid because the p-value (Prob>Chi_2) is smaller than 0.05.

The results of this study indicate that the exchange rate, cocoa bean export volume, population, and harvested area significantly affect the export value of cocoa beans at a significance level of 1%. At the same time, the cocoa bean production variable has a significant effect on the 5% significance level. The variables of economic distance and membership in AFCFTA have a significant effect at a significance level of 10%. Based on the coefficients calculated from the independent variables, the gravity model equation is developed as follows:

$$
\begin{aligned}
In\, Y_{ij} = {} & (8.33e+08) + 206.9077\, InGDP_{jt} \\
& + 116.4885\, InGDP_{it} \\
& + 59267.92\, InDIS_{ij} \\
& + 568.238\, InPROD_{it} \\
& + (-1.03\mathrm{e}+09)\, InPROTY_{it} \\
& + (-27.30108)\, InER_{ij} \\
& + 8746.309\, InPRICE_{it} \\
& + 2774.757\, InVOL_{it} \\
& + (-2.343111)\, InPOP_{it} \\
& + (-349.4358)\, InAREA_{it} \\
& + (-3.28\mathrm{e}+08)\, InDFTA_{i} \\
& + (4.17\mathrm{e}+07)\, InDTAX_{it} + \mu
\end{aligned} \tag{5}
$$

This gravity model equation shows that the export value of cocoa beans to Malaysia will be 8.33e+08; if other indicators are equal to zero. Furthermore, if the economic distance is further away by 1 km, the export value of cocoa beans will increase by 59267.92 US$, ceteris paribus. If the production of cocoa beans increases by 1 ton, the export value of cocoa beans will increase by 568.238 US$, ceteris paribus. If the product still needs beans increases by 1 unit, the export value will decrease by 1.03e+09 US$, ceteris paribus. If the exchange rate increases by one unit, the export value of cocoa beans will decrease by 27.30108 US$, ceteris paribus. In addition, if the export volume of cocoa beans increases by one ton, the export value of cocoa beans will increase by 2774.757 US$, ceteris paribus. Likewise, with the increase in the population of the exporting country by one person, the export value of cocoa beans will decrease by 2.343111 US$, ceteris paribus. As for the harvested area, which increases by 1 ha, it will reduce the export value of cocoa beans by 349.4358 US$, ceteris paribus. Membership in AFCFTA on the dummy variable will increase the export value of cocoa beans by 4.17e+07 US$, ceteris paribus.

3.5 Discussion

The estimation results show that the GDP variable of the exporting country has no significant and positive effect on the export value of cocoa beans. The previous description aligns with researches [73-75], stating that Indonesia's GDP does not affect exports. Suryana et al. [26], which states that real GDP has a significant and positive effect on the export value of cocoa beans. According to Riyani et al. [76], when the GDP when exporting country's GDP increases, it will increase, thus increasing the opportunity for the exporting country to expand market reach through export trade [77]. The results of the estimation of a positive correlation between economic size and trade value found that the impact of these factors was not the same for goods based on the use of various production factors [78]. The high level of economic development is also conducive due to the growth of Real GDP in exporting countries resulting in changes in consumer preferences, which shift to technologically advanced goods in line with progressive economic developments.

This study also found that Malaysia's Real GDP had a negative and insignificant effect on the export value of cocoa beans. Based on the theory, real GDP shows the purchasing power and importing country's purchasing power and absorption capacity service [58]. Thus, real GDP growth will increase demand from importing countries. GDP size can show the size of a country's economy; a large importing country shows a larger GDP by importing people's income, and large incomes can impact demand for imported commodities [79, 80]. Negative GDP growth indicates a decline in people's purchasing power. The decline has an impact on decreased income and well-being. At the same time, the ability to buy imported products will receive a positive response from exporters regarding product delivery to the destination country.

This study reveals that economic distance has a positive and significant impact on the value of exports. The farther the distance from the exporter country to Malaysia, the export value of cocoa beans will increase. According to Wardani and Mulatsih [81], when the economic distance between exporting and importing countries increases, it will lead to higher costs for importing countries. Therefore, the demand for these commodities will decrease, and the export value of the country of origin will decrease. However, based on the results of this study, it was found that economic distance has a significant and positive effect on the export value, which means that transportation and logistics costs in the modern era are not a problem and can be minimized. According to the study of Wahyudi and Anggita [82], transportation and logistics costs are no longer trade barriers. In addition, West African competitor countries, such as Ivory Coast, Ghana, and Nigeria, have consumer interests because of the quality and taste the consumer market prefers. These producing countries actively export cocoa beans to maintain their competitive position in the international market [83].

Cocoa bean production showed significant results (at a 5% significance level) and was positive. This is to the hypothesis that an increase in cocoa bean production positively affects the export value of cocoa beans in the Malaysian market. This may occur due to contracts in international trade, where the exporting and importing countries have an agreement or contract regarding the total commodity of cocoa beans that must be provided. The exporting country unprovided cocoa beans to the importing country for a certain period according to by agreement. With increased cocoa bean production in exporting countries, the availability of cocoa beans will increase to meet consumer demand in the Malaysian market [84]. The positive value of the regression results corresponds to absolute advantage, the theory put forward by Adam Smith, which states that a country will produce and export certain commodities if the country has an absolute advantage over other countries. According to Wulansari et al. [85], if the production of a commodity is optimal, it is effective and efficient; and will affect the export competitiveness of these commodities. If a country has high-quality production factors, the production amount will also increase; therefore, countries can specialize in these products, which will affect the competitiveness of the international market. Results of research studies [86, 87], which determine the amount of production on competitiveness, positively influence the amount of production and export competitiveness. If there is an increase in production, that will increase export competitiveness [88].

Cocoa bean productivity showed significant results (at a significance level of 1%) and had a negative value. This is not the hypothesis; an increase in cocoa bean productivity positively affects the export value of cocoa beans in the Malaysian market. The factor causing the negative value of the productivity level for cocoa beans is the demand factor from importing countries in Malaysia, which want good product quality and quality. In contrast, high productivity does not guarantee good product quality and quality. High productivity will result in high input costs, so the ex-value of cocoa beans decreases; due to the influence of prices [78].

In addition, the results of this study indicate that the exchange rate has a significant and negative effect on the export value of cocoa beans at a significance level of 1%. This study is related to research by Kemal and Qadir [89], which also found that the real exchange rate affects exports in the long run. Yee et al. [90] explained that when the domestic currency depreciates, the price of foreign goods tends to be higher than that of domestic goods. Therefore, foreign consumers prefer to import goods, affecting exports [91]. This study's results support previous studies [92-94], which show that the rupiah exchange rate significantly negatively affects the export competitiveness of cocoa beans to Malaysia. If the value of domestic currency decreases against other countries' currencies (depreciation), it will increase export competitiveness. Conversely, if the value of the domestic currency increases against foreign currencies will tend to reduce export competitiveness.

However, in this study, the world cocoa bean price variable showed an insignificant effect on the value of cocoa exports and was positive. This shows that the size of the price of cocoa beans does not affect the export value of cocoa beans. The increase in world cocoa bean prices does not significantly affect the export value of cocoa beans. The world cocoa bean price variable also positively influences the export value of cocoa beans. The world cocoa bean price, which does not have a significant effect, can be caused by various parties involved in cocoa bean export activities. World cocoa bean prices have a very strong relationship with domestic cocoa prices. This is because cocoa bean traders in the main centers of Indonesian cocoa bean production, such as South Sulawesi, West Sulawesi, Central Sulawesi, and Southeast Sulawesi, use the New York stock price as a reference in setting cocoa prices at the farmer level [95].

The export volume on the study results shows that it is significant (at a significance level of 1%) and has a positive effect. The study results are by the hypothesis that export volume has a significant and positive effect. This means that an increase in the export volume of cocoa beans will increase the export value of cocoa beans. The export quota policy will affect the export volume of cocoa beans that can be exported to the Malaysian market. Knowing the export volume of cocoa beans; can estimate their demand from exporting countries. Widodo and Hartono [96] showed that the export volume of cocoa beans positively affects commodity demand in export destination markets. The results of this study support the results of previous research [94, 97, 98], all of which are decisive; the effect of export competitiveness on Indonesia's export volume is proven to exist a positive and significant influence between export competitiveness and export volume.

Meanwhile, this study found that the population of the exporting country had a significant effect (at a significance level of 1%) and had a negative value on the export value of cocoa beans. The study results are by the negative hypothesis, which implies that an increase in the population in the exporting country will decrease the export value of cocoa beans. When the population increases, there is an increase in the labor force. As a result, there is an increase in income and raises domestic consumers. So that the supply of export goods decreases, the finding is in line with the findings [99, 100].

The harvested area in the research results shows that it is significant. Using the gravity model examines Indonesian cocoa beans with competing countries in West Africa by the significant and positive hypothesis. The demand for cocoa beans exports from exporting countries continues to increase yearly, but there is limited land for plantation development that has yet to be done much. This is due to land conversion and not an optimal use of vacant lands, such as bare forests, shrubs, and grasslands [101]. However, in this study, the land area increased, and the export value decreased. This is due to the large number of lands that still need to be productive and optimal, so there are still many crop failures, crop yields that cannot be exported, and so on.

The FTA variable was also significant and negative to the value of cocoa bean exports to Malaysia at a significance level of 1%. Theoretically, an FTA will stimulate exports and trade between two or more participating countries by removing barriers, including tariffs and non-tariff. However, a study conducted by Riyani Rifin [102] shows that in Malaysia, the decline in the value of exports may be caused by several obstacles, such as import duties and tariff and non-tariff policies. The significance of the relationship between treaty institutions and trade is reflected in research that confirms how weak treaty institutions can restrict international trade with negative effects [103, 104]. In addition, poor institutional quality can hinder trade and lead to poor export performance [105]. Francois and Manchin [15] assert that the effect of treaty institutions on trade is most pronounced in low-income countries. This statement suggests that undertaking the Government's role to improve the quality of treaty institutions should be an important factor in gaining greater exchange relations, especially in developing countries [13]. Lack of technology, innovation, and investment in research has hindered the increase in the value of cocoa bean exports in Africa. This study provides important background information for the recently proposed African regional trade agreement, the so-called African Continental Free Trade Agreement (AFCFTA) by the African Union (AU) [105].

While the other dummy variable, namely, the export tax, is not significant and has a positive value on the export value of cocoa beans. This is not to the research hypothesis, meaning that when goods are subject to export taxes, the export value of cocoa beans continues to increase. Barriers to tariff and non-tariff trade make internationally traded products more expensive. Therefore, the demand for foreign products decreases if tariffs are imposed [98]. Maulana and Kartiasih [98] states that the export duty on cocoa beans has a significant and positive effect on the export value of cocoa beans. The positive and significant effect shows that the export duty policy has increased cocoa bean exports.

In formulating a strategy to increase the export value of Indonesian cocoa beans compared to its competitors in the Malaysia market, the Government of Indonesia needs to consider the real exchange rate, export volume of cocoa beans, population, harvested area, production, and productivity of cocoa beans, economic distance, and membership in the AFCFTA.

In addition, efforts are needed to improve the quality of Indonesian cocoa beans through efforts to increase human resources and develop reliable technology to obtain better grades to meet world consumer standards, so that Indonesian cocoa beans have a high bargaining position in international trade.

The Indonesian government, governments of cocoa bean export destination countries, and international trade organizations as well as export-import actors can try to remove obstacles in international trade such as discrimination against cocoa beans from certain countries. So that export-import

activities can run without any restrictions and obstacles that can be detrimental.

4. CONCLUSIONS

The gravity model used in this study shows no essential barriers limiting cocoa bean exports to Malaysia. This section summarizes the results obtained, discusses the limitations of our findings, and compares the conclusions with other investigations.

This paper aims to analyze the determinant factors using the gravity variable. Through the random effects model approach, it is known that economic distance, cocoa bean production, and cocoa bean export volume show a positive and significant effect. In contrast, the variables of cocoa bean productivity, exchange rate, population, harvested area, and the dummy variable of membership in AFCFTA show a significant effect. The government should take advantage of the income from export duties for cocoa beans for improvement and improvement in cocoa bean producing centers, provision of better quality seeds, and counseling to cocoa farmers as well as providing incentives or capital assistance, especially for small export-oriented companies to achieve economies of scale and reduce costs. production. Thus, imposing export duties on cocoa beans is more effective in developing cocoa bean production and export volume.

Our study used only four countries. The selection of these countries could lead to unexpected additional changes to our results. Therefore, this kind of investigation should be carried out for other countries. To evaluate the determinants of the export value of cocoa beans more precisely, other influencing factors should be assessed. In addition, related research can use cocoa beans derivative products such as cocoa powder, cocoa butter, and cocoa solids.

This study cannot analyze the factors that influence the trade of Indonesian cocoa beans and their competitor countries to the importing destination country (Malaysia) as well as the export of cocoa beans (raw or roasted). The future research direction is research on Indonesia's post-COVID-19 international trade strategy and food safety issues.

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