

The Impact of Economic Openness on Indonesian Spice Exports to The United States: Gravity Model Approach

Herdiana Anggrasari¹, Aura Dhamira²

¹ Department of Agribussines, Faculty Agriculture, UPN Veteran Yogyakarta, Yogyakarta, 55281, Indonesia and herdiana.anggrasari@upnyk.ac.id

² Department of Agribussines, Faculty Agriculture, UPN Veteran Yogyakarta, Yogyakarta, 55281, Indonesia and aura.dhamira@upnyk.ac.id

ABSTRACT

The existence of a free market increases the level of competition between countries because non-tariff barriers are reduced. This phenomenon is a serious concern amidst the issue of liberalization and international economic integration because each country has the same interest in gaining maximum benefit from open market access. This study uses a modified or developed gravity equation model (extended gravity model) to analyze the effect of economic openness on the flow of Indonesian spice export trade to the United States. This study reveals how the openness of the United States economy significantly affects the flow of Indonesian spice trade, both in the short and long term. With the strengthening of bilateral relations between the two countries, Indonesia has the opportunity to optimize spice exports and facilitate trade negotiations in the international market.

Keywords: *Bilateral, Economic Liberalization, Global Trade Policy, International Trade, Indonesia*

1. INTRODUCTION

Indonesia has had bilateral relations with the United States since 1949 [1]. In trade relations, the United States is one of the 5 largest trading partner countries for Indonesia after China, Singapore and Japan [2]. It is estimated that the trade in goods and services between the US and Indonesia reach \$47.5 billion in 2022, with \$12.1 billion in exports and \$35.4 billion in imports. US imports of goods from Indonesia increased around 27.7 percent (\$7.5 billion) from 2021, and 92 percent higher compared to 2012 [3]. One of the products imported by the United States is spices, and the quantity of global spice trade has indeed continued to increase since the 1960s [4]. The growth of population, economic pressures, health concerns, the rising expense of synthetic products, and increasing awareness of environmental sustainability all contributes to this demand [5]. This is also in line with the demand for spices in the United States. In 2021, the US imported spices worth \$419 million, making it the world's largest spice importer [6] with Indonesia as one of the countries that has spice trade relations with the United States.

Based on UN COMTRADE data, the value of Indonesian spice exports to the United States shows significant potential. In 2021, spice exports reached US\$156 million, which has increased quite significantly compared to 2011 which was only US\$137 million, an increase of 14.4%. This shows that the United States is a market that has great potential for export purposes. [7] stated that there was an increase in demand for pepper from Indonesia, followed by the United States market share experiencing rapid growth. On the other hand, this country is also an optimistic market for nutmeg, anise and cardamom commodities from Indonesia [8], as well as vanilla commodities which have comparative and competitive advantages, supported by great potential to be exported to United States market [9]. [10] in their research concluded that cinnamon have competitive and comparative advantages in the United States market. Apart from that, UN COMTRADE also noted that the United States is ranked in the top 5 as destination countries for Indonesian spice exports in 2022.

In the current era of economic openness, it provides greater opportunities for Indonesia to expand its spice market share in the United States. Economic openness measures how involved a country is in trade with other countries, including spice export activities from Indonesia. The importance of knowing the economic openness of trading partner countries has also been explained, by knowing the condition of economic openness of trading partner countries, especially the United States, Indonesia can be more aware of market access to these markets and optimize their exports potential. Apart from that, stronger cooperation between the two countries by understanding the needs and policies of each country can create a mutually beneficial relationship. On the other hand, it also provides opportunities and challenges for companies or business actors [11]. Domestic spice traders are expected to increase their knowledge, quality and competitiveness of spices from Indonesia in the international market. Therefore, the United States as a partner country which has a high demand for spices is the right object for this research.

Until now, studies related to Indonesian spice commodity exports still revolves around the development of spice commodity exports such as nutmeg, anise and cardamom and their influence on the Indonesian economy, which was previously carried out by [8]; also studies about competitive and comparative advantages conducted by [12] and [13] who looked at the competitive and comparative advantages of Indonesian spice commodities in the world market in general and the United Arab Emirates market in particular. There is not much research linking spice exports with the economic openness of spice importing countries, especially the United States. Therefore, it is important to carry out research which aims to determine the impact of the openness of the United States economy on spice exports from Indonesia.

2. LITERATURE REVIEW

2.1 *International Trade Theory and the Gravity Model Approach*

International trade is defined by [14] as a commercial activity conducted by a country of origin toward a country of destination, often facilitated by multinational corporations (MNCs). This process encompasses the movement of goods, services, capital, labor, technology, and trademarks. In line with this, Chacholiades (1978) emphasizes that international trade represents the exchange of goods and services between residents of different countries, where nations tend to specialize in commodities that can be produced at a lower relative cost. Fundamentally, [15] posits that trade is the result of the interaction between supply and demand that transcends sovereign borders.

The evolution of international trade thought began with the Mercantilist school, which emphasized achieving a current account surplus by maximizing exports and minimizing imports through protectionist policies [16]. This perspective was later critiqued by Adam Smith through the Theory of Absolute Advantage, which argues that free trade with minimal government intervention (*laissez-faire*) benefits all parties if each nation specializes in commodities it produces most efficiently [17]. Subsequently, David Ricardo and John S. Mill developed the Theory of Comparative Advantage, stating that trade gains are determined by the relative efficiency of labor use rather than mere absolute cost differences [18].

Modern comparative theory, as developed in the Heckscher-Ohlin (H-O) model, explains that trade is driven by differences in factor endowments across countries.

According to this model, a nation will export goods that intensively use the factors of production (capital or labor) that are abundant and inexpensive within that country [17]. Conversely, Michael E. Porter introduced the Competitive Advantage Theory, arguing that a nation's competitiveness does not stem solely from abundant natural resources or low labor costs, but is significantly bolstered by the government's role in fostering a competitive industrial environment [16]. Beyond production factors, [19] highlights that variations in income and consumer tastes also drive trade; specifically, an increase in a nation's income tends to lead to a rise in the consumption of foreign goods or imports.

To analyze trade flows empirically, the Gravity Model has become a widely adopted approach. Initially applied by Tinbergen (1962) and Pöyhönen (1963), this model is inspired by Newton's Law of Universal Gravitation. It assumes that the volume of trade between two nations is determined by their economic scale (mass) and the resistance created by distance [20]. Specifically, bilateral trade flows are positively correlated with the Gross Domestic Product (GDP) of both countries and negatively correlated with the geographical distance between them [21]. Contemporary developments of the Gravity Model allow for the inclusion of broader variables, such as great-circle distance calculations to represent physical barriers [22]. This model is frequently utilized in policy research due to its ability to analyze various determinants, ranging from macroeconomic variables like exchange rates to social factors such as population and political systems, as well as cultural variables like common language. According to Supriana (2013), the flexibility of the Gravity Model makes it an effective tool for evaluating the impact of economic cooperation policies, whether at the bilateral, regional, or multilateral levels.

2.2 *Economic Openness*

The primary objective of international trade agreements is to reduce or eliminate trade barriers. Global trade liberalization, through international cooperation frameworks, carries positive implications for world economic growth. In this context, a sound development policy should encompass three fundamental elements: ecological security, livelihood security, and food security. According to [23], global trade liberalization demands market openness and limitless business opportunities (a borderless world), facilitated by the elimination of import duties and other trade impediments.

Participation in international trade is inherently free and voluntary. From an internal perspective, Chacholiades (1978) posits that a nation's decision to engage in international trade is a choice; therefore, trade is ideally expected to be mutually beneficial. In a closed economic system (autarky), a nation can only consume goods and services to the extent of its own production capacity. However, through an open economy, a country has the opportunity to consume beyond its production capabilities due to differences in relative prices in the production process, which encourage specialization. Free trade tends to increase trade gains through deeper levels of specialization, subsequently driving up trade volume [19].

For many nations, increased trade openness serves as a catalyst for export growth, which plays a vital role as an engine of national economic growth. The foreign exchange

earned from exports can be utilized to finance imports and develop domestic economic sectors. Theoretically, there is a positive correlation between export growth and the accumulation of foreign exchange reserves, import growth, domestic output expansion, increased employment opportunities, public income, and Gross Domestic Product (GDP) growth [24]. Conversely, international trade from an import perspective presents two primary challenges. First, foreign exchange reserves may deplete if the value of imports exceeds that of exports. Second, an increase in imports contributes little to export growth if it consists primarily of consumer goods rather than capital goods or intermediate inputs necessary for domestic production activities [24]

3. METHODS

In this study, secondary time series data for 33 years (1989-2021) was used, it includes export and import data from UN Comtrade (comtrade.un.org), GDP data from World Bank Development Indicators (www.worldbank.org), exchange rate data obtained from International Financial Statistics (www.unctad.org), data as a geographic proxy (distance) comes from the Center d'Etudes Prospectives et d'Informations Internationales (CEPII: www.cepii.fr), and other supporting sources. The spice commodities studied are limited based on the Harmonized Commodity Description and Coding System (HS) codes sourced from UNComtrade including codes 0904 (pepper, chili, capsicum), 0905 (vanilla), 0906 (cinnamon), 0907 (cloves), 0908 (nutmeg, mace, cardamom), and 0910 (biopharmaceuticals) for spice commodities.

This research uses a gravity equation model that has been modified (extended gravity model) to analyze the influence of economic openness on bilateral export flows between Indonesia and the United States on spice commodities in aggregate. The basic model specifications used in this research are written in the following equation:

$$\ln X_{ij} = K_{ij} + \beta_1 \text{GDP}Ci + \beta_2 \ln \text{GDPC}j + \beta_3 \ln JE_{kij} + \beta_4 \text{OP}j + \beta_5 \ln \text{ER}ij + e_{ij} \quad (1)$$

Information:

X_{ij} = bilateral export value of spice commodities from country I to country j

$\text{GDP}Ci$ = constant GDP of country i

$\text{GDPC}j$ = constant GDP of country j

JE_{kij} = economic distance between countries i and j

$\text{OP}j$ = economic openness of country j

$\text{ER}ij$ = currency exchange rate of country i against j

e_{ij} = error term

I = Indonesia

J = United States

The economic distance between countries i and j is the product of the geographic distance between Indonesia and each trading partner country through the comparison of GDP between the trading partner country and each trading partner country [25]. Economic distance is expressed in kilometers (km). Openness is economic openness which can be measured using the formula:

$$\text{O}j = (\sum M + \sum X) / \text{GDP} \quad (2)$$

Where M is Country j's Imports; X is country j's Exports; GDP is the Gross Domestic Income of country j. The level of economic openness is part of the sum of exports and imports to GDP [26].

The data analysis method approach used is the Error Correction Model (ECM). ECM utilizes residuals or errors from long-term relationships to balance short-term relationships because in the short term there is a possibility that an imbalance will occur between these variables [27]. Therefore, the next stage is to form an ECM model. The stationary equilibrium error (et) in the long-term

equation will be $et-1$ (ECT/Error Correction Term) which is one of the variables in the short-term equation. Therefore, the short-term equation is as follows:

$$\Delta \ln X_{ij} = K_{ij} + \Delta \beta_1 G D P C_i + \Delta \beta_2 \ln G D P C_j + \Delta \beta_3 \ln J E K_{ij} + \Delta \beta_4 O P_{ij} + \Delta \beta_5 \ln E R_{ij} + \Delta \beta_6 \ln E C T + \varepsilon_{ij} \quad (3)$$

Information:

ECT = Error Correction Term

Δ = difference between the value of the current year (t) and the previous year (t-1)

K = Intercept

$\beta_1 - \beta_5$ = Coefficient value of each short-term variable

β_6 = Error Correction Term (ECT) regression coefficient

ε_{ij} = error term

4. RESULTS AND DISCUSSION

All the variables used to analyze the factors affecting Indonesian spice exports to the United States are not at a fixed level, so the stochastic difference process is performed by reducing the time-series data by its unit root. The stochastic difference process transforms previously non-stationary time series data into stationary time series data with a constant mean and period-to-period difference. After carrying out stochastic differences, the variables for the value of exports of Indonesian spice commodities to the United States, constant Indonesian GDP, constant GDP of the United States, the economic distance between Indonesia and the United States, the openness of the United States economy and the exchange rate of Indonesia against the United States are stationary at the first difference. Then an Ordinary Least Square analysis was carried out to determine the influence of each variable on the flow of Indonesian spice commodity exports to the United States in the long term (table 1).

Table 1. Results of Analysis of Factors that Influence the Flow of Indonesian Spice Exports to the United States in the Long Term

Symbol	Variable	Sign	Koef.	t-hit	Prob
G D P C _i	Indonesia's constant GDP	+	0.000	6.415	0.000
Ln_G D P C _j	Constant GDP of the United States	-	6.586	- 4.966	0.000
Ln_J E K _{ij}	Economic Distance between Indonesia and the United States	-	0.526	- 0.548	0.589
O P _j	United States Economic Openness	+	13.860	3.445	0.002
Ln_E R _{ij}	Rupiah exchange rate against US\$	+	0.578	2.518	0.019
C	Constant	+	212.449	5.075	0.000
Adjusted R ²					0.821
F stat					26.728
Probability					0.000

Source: Secondary Data Analysis (UNCOMTRADE, 2023)

In the analysis results (table 1) it is known that the adjusted R² value is 0.821 or 82.1%. This shows that 82.1% of the variation in the dependent variable (the flow of exports of Indonesian spice commodities to the United States) in the long term can be explained by the independent variables, namely constant GDP of Indonesia, constant GDP of the United States, economic distance between Indonesia and the United States, economic openness of the United States, and Indonesia's exchange rate against the United States. The remaining 17.9% of the variation in the dependent variable is explained by other variables outside the model. Table 1 also shows that the P-value of the F test is 0.0000 (below the value of 0.01) so that the independent variables together have a significant effect on the flow of Indonesian spice commodity exports to the United States in the long term at the level

of 99% confidence. The results of the t test show that Indonesia's constant GDP, constant United States GDP, the economic openness of the United States and the Indonesia-United States exchange rate have a significant effect in the long term.

The results of the analysis (table 2) explain the influence of each variable on the export flow of Indonesian spice commodities to the United States in the short term. The results of the t test on the variables that are estimated to influence the flow of Indonesian spice commodity exports to the United States in the short term are the openness of the United States economy and the exchange rate.

Tabel 2. Results of Analysis of Factors Affecting the Flow of Indonesian Spice Exports to the United States in the Short Term

Symbol	Variable	Sign	Koef.	t-hit	Prob
Δ GDPC _i	Indonesia's constant GDP	+	0.000	1.324	0.200
Δ Ln_GDPC _j	Constant GDP of the United States	-	6.794	- 1.493	0.150
Δ Ln_JEK _{ij}	Economic Distance between Indonesia and the United States	-	0.292	- 0.189	0.852
Δ OP _j	United States Economic Openness	+	12.701	2.607	0.016
Δ Ln_ER _{ij}	Rupiah exchange rate against US\$	+	0.546	2.090	0.049
C	Constant	+	212.449	0.037	0.970
ECT (-1)	Error Correction Term	-	0.936	- 4.020	0.000
Adjusted R2					0,467
F stat					,955
Probability					,002

Source: Secondary Data Analysis (UNCOMTRADE, 2023)

Table 2 shows the error correction coefficient/ECT(-1) or speed of adjustment has a negative value and sign, namely -0.936. This coefficient is also statistically significant because it has a probability of 0.000 ($\alpha = 5\%$), which means the ECM specification model is valid. The figure shows that to adjust the actual value towards the new equilibrium value requires very rapid adjustment changes. Analysis of the ECT coefficient value concludes that there is an indication of a long-term relationship between variables. This indication means that every change in the past shock of one unit will result in a change in the value of Indonesian spice exports that is greater than one, and the shock will adjust to the new balance.

The error correction value of -0.936 indicates that the adjustment to the equilibrium condition of Indonesian spice exports is 1.0936 years ($1.000/0.936$). For example, the turmoil in the American economy that occurred in 2008. There was a surge in debt to reach US\$ 14.3 trillion, decreased levels of consumption and investment, and reduced ability of the private sector to support the country's economy. According to Prasmuko & Anugrah (2010); Putri (2017) the economic crisis in the United States in 2008 resulted in a decline in Indonesian exports to the United States the following year. When economic turmoil occurs, the flow of Indonesian spice exports to the United States will return to balance in approximately 1.0936 years.

If we compare the factors that influence the flow of Indonesian spice commodity exports to the United States, they are different in the long term and the short term. Comparison of factors influencing the flow of Indonesian spice commodity exports to the United States can be seen in table 3.

Tabel 3. Comparison of Factors that Influence the Flow of Indonesian Spice Commodity Exports to the United States in the Long and Short Term

Variabel	Long Term	Short Term
Indonesia's GDP	0.000***	0.000 ^{ns}
United States GDP (Ln)	-6.586***	-6.794 ^{ns}

Indonesia-US Economic Distance (Ln)	-0.526 ^{ns}	-0.292 ^{ns}
US Economic Openness	13.860 ^{**}	12.701 ^{**}
Exchange Rate IDR/US\$ (Ln)	0.578 ^{**}	0.546 ^{**}

Notes: *** = significant at the 99% confidence level ($\alpha = 0.01$)

** = significant at the 95% confidence level ($\alpha = 0.05$)

* = significant at the 90% confidence level ($\alpha = 0.1$)

Source: Secondary data analysis (UNCOMTRADE, 2023)

In the long term, the constant has an effect at the 99% level (p value <0.01) (see table 1). A regression coefficient of 212,449 shows that the flow of Indonesian spice commodity exports to the United States will increase by 212,449% if all independent variables are constant (*ceteris paribus*). The long-term impact of Indonesia's constant GDP is significant, whereas the short-term impact is non-significant. In the long term, Indonesia's constant GDP shows a positive coefficient, so the higher Indonesia's constant GDP, the higher the flow of Indonesian spice commodity exports to the United States. Wahyudi & Anggita (2015) also used a gravity model to examine Indonesia's aggregate trade with the top 10 export partners. The research results also showed that Indonesia's constant GDP had a significant positive effect. Many studies use a gravity model approach and show that Indonesia's GDP influences the flow of exports to Indonesia's trading partner countries [31], [32]

Constant GDP in the United States has a significant effect in the long term, but in the short term it does not have a significant effect. America's constant GDP has a negative coefficient which shows that the higher the United States' constant GDP, the lower the flow of Indonesian spice commodity exports to the United States. Every 1% change in constant GDP in the United States causes a decrease in the flow of Indonesian spice commodity exports to the United States by 6.586% in the long term and 6.794% in the short term.

Economic distance does not have a significant effect in the long and short term. Economic distance may have no influence on the size of exports (Messner, 2023). Countries that are far from each other economically can have the same level of exports as countries that have close economic distance. In this case, other factors such as trade policies, resource availability, and political stability can play a more important role in determining the size of exports and imports between countries.

Economic openness can be used to see how far the role of foreign trade is seen from the ratio between exports and imports to GDP. Economic openness could increase Indonesia's spice exports to the United States. The evaluation results show that the opening of the economy has a significant impact in both the long and short term. Every 1% change in US economic openness increases Indonesia's spice export flow to the US by 13.860% in the long run and 12.701% in the short run. Economic openness not only affects Indonesia's export trade growth, but also Indonesia's economic growth (Prastity, 2016).

The estimation results show that the exchange rate of the rupiah against the United States has a significant effect in the long run with a coefficient of 0.578 in the long run and 0.546 in the short run. The weaker the exchange rate of Indonesia against the United States, the greater the spice exports from Indonesia to the United States. Each 1% change in Indonesia's exchange rate against the United States increases Indonesia's spice export flow to the United States by 0.578% in the long run and 0.546% in the short run. A weakening of the rupiah against the US dollar could increase Indonesia's spice exports to the US. Export players can take advantage of the depreciation of the rupiah to increase their exports. This result is line with research conducted by Aditama et al., (2015) which examined the influence of the exchange rate on the volume of Indonesian ginger exports. The research results show that when the rupiah strengthens against the US dollar (appreciation), the volume of exports decreases and conversely, when the rupiah weakens against the US dollar (depreciation), the volume of exports increases. Changes in exchange rates, both strengthening and weakening, affect export and import activities in the country (Herawati & Gustan, 2020; Nezky, 2013). Many research results explain that exchange rates influence trade flows between countries (Kanaya & Firdaus, 2015; Nuroglu & Kunst, 2014; Supriana, 2013).

This research shows that the openness of the United States economy influences the flow of Indonesian spice trade to the United States. Apart from that, other factors, namely Indonesia's constant GDP, United States constant GDP, and the exchange rate also influence trade flows. The opening of the US economy can be both an opportunity and a challenge for Indonesia to increase its market share in the US. Trade liberalization tightens competition in international markets, although Indonesia's competitiveness is very strong, the share of Indonesia's exports is decreasing (Anggrasari et al., 2023). Indonesia as a whole dominates the spice trade with its main trading partner countries, including the United States (Anggrasari & Mulyo, 2019). Indonesia has very strong comparative advantages in spice commodities, although Indonesia's competitive advantages is not as good. By adding value to Indonesian spice exports through innovation and technology, it is possible to boost the performance and competitive advantages of Indonesian spices (Saputro & Anggrasari, 2021). However, Indonesia needs to be wary with other world spice export competitors, namely Vietnam for pepper and cinnamon, India for pepper and nutmeg, the Netherlands for biopharmaceuticals, China and Madagascar for vanilla and cloves. Some of these export competitors are also the world's main producers of spice commodities. Spice commodity exporting countries are starting to compete to be able to produce spices in large quantities and of the best quality (Anggrasari & Mulyo, 2022).

Evaluation of quality standards and the quality of spices needs to be carried out because trade liberalization has resulted in the emergence of various types of non-tariff barriers. The existence of consumer protection institutions, which always evaluate and require products that are safe and do not contain chemical elements dangerous to human health, makes exporters to be careful in supplying high-quality goods and also requires farmers to grow according to the conditions of use standards (Ferry, 2013). America is one of the countries that imports spices from Indonesia. The United States provides requirements for spice commodities to be certified by the Food and Drug Administration (FDA) because spices are included in the food group, therefore they are required to fulfill food regulations in the United States (Direktorat Standardisasi dan Pengendalian Mutu, 2023). Without having a registration number issued by the FDA, exporters in Indonesia are not permitted to export to the United States, thus Indonesia needs to strengthen bilateral agreements with the United States.

Indonesia needs to strengthen trade relations so that it can make negotiations easier. The existence of bilateral cooperation makes both country more aware of what each country needs and makes it easier to establish joint agreements that are mutually beneficial to both parties. The Indonesian government can increase the role of agricultural attachés in spice trade diplomacy in the United States. Agricultural attachés abroad can provide information relating to market opportunities.

CONCLUSION

The US economy's openness positively impacts Indonesian spice exports in both the short and long term. Other influencing factors include GDP in Indonesia and the US, as well as exchange rate, which affects trade in the long term and plays a crucial role in the short term. Strengthening bilateral agreements with the US can enhance trade relations and ease negotiations. Through closer cooperation, both countries can better understand each other's needs, leading to mutually beneficial trade deals. By optimizing these factors, Indonesia can expand its market presence and strengthen its position in the global spice trade.

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