

## ANALYSIS OF INDONESIAN COFFEE EXPORT DEMAND IN THE UNITED STATES USING THE AIDS MODEL

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### Abstract

*Indonesia is the fourth largest coffee producing country in the world after Brazil, Vietnam and Colombia. Of the total production, around 67% of the coffee is exported while the rest (33%) is used to meet domestic demand. The level of domestic coffee consumption based on the results of the 1989 LPEM UI survey was 500 grams/capita/year. Coffee entrepreneurs estimate that coffee consumption in Indonesia has reached 800 grams/capita/year. Likewise, within 20 years the increase in coffee consumption has reached 300 grams/capita/year. (AEKI 2022). competition research on Indonesian coffee in the United States market by using the Almost Ideal Demand System (AIDS) method. The use of the AIDS model is used to analyze the position and level of competition between coffee exporting countries (Indonesia, Vietnam, and Brazil and Colombia) from each export destination country, namely the United States. the estimation results on the AIDS model of Indonesian coffee in the United States market get an R-Square value of 0.4136 percent. Vietnam in the United States market obtained an R-Square value of -0.216 . Brazil in the United States market obtained an R-Square value of 0.44%. Columbia in the United States market obtained an R-Square value of 0.4488%. Coffee from Indonesia competes with coffee from Vietnam, Brazil and Columbia. The cross-price elasticity obtained between the price elasticity of Indonesia-Vietnam coffee is positive at 0.9443, and the price elasticity value of Indonesia-Brazil coffee is 0.0330, the price elasticity value for Indonesia-Columbia coffee is 0.5854. The expenditure elasticity values obtained by Indonesian coffee were 0.4479, Vietnam coffee were 1.7403, the expenditure elasticity values for Brazil and Columbia coffee were 1.0155 and 0.9042. in the United States Market.*

**Keywords:** coffee; AIDS Model; Elasticity

### 1. INTRODUCTION

Coffee is one of the plantation commodities that has an important role in economic activities in Indonesia, because it is one of the mainstay export commodities for the country's foreign exchange earner. The Indonesian Coffee Exporters Association (AEKI) states that Indonesian coffee is well known in the world and can be accepted in foreign countries. This is an opportunity for Indonesia to take advantage of the positive impacts of trade activities (AEKI 2017). Most of Indonesia's coffee production is exported rather than consumed domestically. In 1980 the export volume of Indonesian coffee was 238 677 tons then in 2016 the export volume increased to 412 370 tons. Coffee is exported in the form of green beans (97.1 percent) and the rest is in processed form (roasted and powdered) as much as 2.9 percent (BPS 2017). Most of the coffee exported was Robusta coffee with 76.7 percent while Arabica coffee with 23.3 percent (Ministry of Industry 2015). Indonesian coffee exports in 1980–2017 fluctuated but tended to increase with an average growth of 3.39 percent per year. The destination countries for Indonesian coffee exports are spread to various continents in the world such as Europe, Asia and the United States. In 2013, Indonesia exported 33.9 percent of Indonesia's total exports to Europe. Then, 24.3 percent were exported to Asia and 17.6 percent were exported to the United States. Through this it can be seen that the number of Indonesian coffee exports is very large for the three continents with a total of 75.8 percent of all Indonesian coffee exports. Even so, Indonesia's coffee market share is not yet comparable to the large amount of Indonesian coffee exports. In 2003, the share of the Indonesian coffee market in the United States was only 3.8 percent, even in Europe only 1 percent. When

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compared to the total world coffee exports, Indonesia is only able to play a role of approximately 6 percent, which is still very low (Trade Map 2018).

This is because many factors influence it, both internally and externally, including Indonesia's low contribution compared to other major world producing and exporter countries due to the problems it faces, including the decreasing area of coffee plantations in Indonesia, this is due to the area of coffee according to its exploitation status. In 1980-2018 consisted of smallholder plantations (95.37 percent) large state plantations (2.25 percent) private large plantations (2.48 percent) with coffee-producing plantation areas in Indonesia which decreased in the 2009-2018 average -average of -0, 06 percent per year. Then price changes (price uncertainty) are also a problem for Indonesian coffee, because Indonesian coffee export prices are lower when compared to other largest exporting countries such as Colombia, Vietnam and Brazil. Based on data from the Association of Indonesian Coffee Exporters and Industries (AEKI), that the export price of Indonesian coffee beans was US\$2.2/kg with a coffee export volume of 532.157 tonnes. Meanwhile, the export price of ground coffee reached US\$4.2/kg with an export volume of 1,867 tonnes. Based on data from the Association of Indonesian Coffee Exporters and Industry (AEKI), that the export price of Indonesian coffee beans was US\$2.2/kg with a coffee export volume of 532.157 tons. Meanwhile, the export price of ground coffee reached US\$4.2/kg with an export volume of 1,867 tons. Based on data from the Association of Indonesian Coffee Exporters and Industry (AEKI), that the export price of Indonesian coffee beans was US\$2.2/kg with a coffee export volume of 532.157 tonnes. Meanwhile, the export price of ground coffee reached US\$4.2/kg with an export volume of 1,867 tons.

Indonesia is the fourth largest coffee producing country in the world after Brazil, Vietnam and Colombia. Of the total production, around 67% of the coffee is exported while the rest (33%) is used to meet domestic demand. The level of domestic coffee consumption based on the results of the 1989 LPEM UI survey was 500 grams/capita/year. Coffee entrepreneurs estimate that coffee consumption in Indonesia has reached 800 grams/capita/year. Thus within 20 years the increase in coffee consumption has reached 300 grams/capita/year. (AEKI 2022). The average price of coffee on the domestic market in 2015 was IDR 28 969 per kg for arabica and IDR 19 135 per kg for robusta while the average world price in 2015 was \$3 526 per kg for arabica and \$1 941 per kg for robusta. Changes in the price of Indonesian coffee are inseparable from developments in world coffee demand and supply. The increasing demand for world coffee can be seen from the world's consumption of coffee which tends to increase, this affects the price of coffee on the international market which fluctuates but tends to increase. Seeing the potential and progress of Indonesian coffee sending requests to various European, American and Asian countries. In 2018, the number of coffee trades ranks as the fourth largest product in Indonesia after palm oil, rubber and coconut. The coffee trade value reached US\$ 1.19 billion.

This amount is the number of coffee beans that have been sent to several major countries in the world, one of which is America, Germany and European countries. Indonesia is one of the largest coffee exporters in the world and occupies the fourth position. In 2018 Indonesia was ranked fourth as the largest coffee exporting country in the world with a total of 666,000 tons of coffee. This figure is still quite far when compared to other countries such as Brazil, Vietnam and Colombia. And in 2018 Indonesian coffee is able to contribute around 7% of the world's coffee needs. Indonesia's coffee export value has fluctuated over the last 10 years, starting from 2009-2018. The export value of coffee used is in US\$ units. The data shows that the largest export value for Indonesian coffee is the United States and the lowest export value for Indonesian coffee is the United Kingdom. The export value of a commodity is affected by the volume of the commodity exported to the destination country. (ICOs 2017). Indonesia's coffee production ranks fourth after Brazil, Vietnam and Colombia with production output reaching 654,000 tons in 2017 or equal to 6.84 percent of world coffee production. Meanwhile, the state

Indonesian coffee export destinations are spread to various regions in the world such as Europe followed by Asia and the United States (UN Comtrade, 2019). Meanwhile, there are 2 types of coffee in the world from the four main exporting countries, namely robusta and arabica.

Countries that produce more robusta coffee (robusta coffee producers) are Indonesia and Vietnam while arabica coffee producing countries are Brazil and Colombia (ICO, 2019). Based on the description of the problem, to find out the condition of the Indonesian coffee trade in the main importing countries by paying attention to competitors, especially other major world importing countries such as Brazil, Vietnam and Colombia, it is necessary to carry out an analysis to see what is happening in the Indonesian coffee trade and other major world exporting countries (Brazil, Vietnam, Colombia) in the world's main importing countries (United States) so that the purpose of this study is to analyze Indonesian coffee prices and competitors & elasticity of coffee importing countries so that they can see the competitive position of Indonesian coffee. As a reference for Indonesian coffee exporters, in an effort to increase export volume coffee in the US market.

## 2. IMPLEMENTATION METHOD

### Data Determination Method

data in this study using time series data (time series). Time series data includes data structures, namely sector units and time units (Falah et al. 2016). The method of determining the data in this study includes coffee data including Indonesia, Vietnam, Brazil and Vietnam in importing countries, namely time series data, namely quarterly data from 2002 to 2021.

### Data analysis method

The analysis model used is the AIDS model approach using the SAS on Demand application. The selected coffee source countries are (Indonesia, Vietnam, and Brazil and Colombia). Meanwhile, the importing country is the United States. the country was chosen because it is an importer of coffee from the country (Indonesia, Vietnam, and Brazil and Colombia). continuously and has a high share of imports in international markets, especially the United States. The basic equation for the AIDS model (LA-AIDS) in this study is as follows:

Information :

$W_i$  = Share of coffee imports in source country and import in destination country

$P_j$  = Price of coffee from country of import

$X$  = Total value of coffee imports

$u_1$  = Standard error

$$w_i = \alpha_i + \sum_{j=1}^n \gamma_{ij} \log p_j + \beta_i \log \left( \frac{x}{(a)P} \right) + u_i$$

From these basic equations, in this study four equation models are formed for each exporting country (supplier) in the importing country's market. The equation for exporting countries, the dependent variable is the market share of the exporting country itself and the independent variable is the country's coffee price (Indonesia, Vietnam, and Brazil and Colombia). The equation is written as follows:

Indonesia  $W_i = \alpha_1 + \gamma_{11} \ln p_i + \gamma_{12} \ln p_v + \gamma_{13} \ln p_b + \gamma_{14} \ln p_c + \beta_1 \ln (X/(a)P^*) + u_1$

Vietnam  $W_v = \alpha_1 + \gamma_{11} \ln p_i + \gamma_{12} \ln p_v + \gamma_{13} \ln p_b + \gamma_{14} \ln p_c + \beta_1 \ln (X/(a)P^*) + u_2$

Brazil  $W_b = \alpha_1 + \gamma_{11} \ln p_i + \gamma_{12} \ln p_v + \gamma_{13} \ln p_b + \gamma_{14} \ln p_c + \beta_1 \ln (X/(a)P^*) + u_3$

Columbia  $W_c = \alpha_1 + \gamma_{11} \ln p_i + \gamma_{12} \ln p_v + \gamma_{13} \ln p_b + \gamma_{14} \ln p_c + \beta_1 \ln (X/(a)P^*) + u_4$

Theoretically, the AIDS model has several limitations stemming from the assumptions of the demand function. Three restrictions that must be included in the model so that the satisfaction maximization assumption can be met are as follows:

Adding  $U_p : \sum_i \alpha_i = 1, \sum_i \gamma_{ij} = 0, \sum_j \beta_j = 0$

Homogeneity  $: \sum_i \gamma_{ij} = 0$

Symmetry  $: \gamma_{ij} = \gamma_{ji}$

Homogeneity and symmetry restrictions can be entered into the model and tested empirically, while adding up restrictions have been fulfilled automatically in the conjecture model (Deaton and Muelbauer, 1980). This is because the budget share always increases to one (Chang and Nguyen, 2002).

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**Self-Price Elasticity**

$$e_{ii} = -1 + \frac{y_{ij}}{w_i} - \beta_i$$

There are several measures of self-price elasticity in the Almost Ideal Demand System model.

- a.  $E_p = 0$  (Perfectly Inelastic)
- b.  $0 < E_p < 1$  (Inelastic)
- c.  $E_p = 1$  (Unitary Elastic)
- d.  $1 < E_p < \infty$  (Elastic) or  $E_p > 1$
- e.  $E_p = \infty$  (Perfectly elastic)

**Cross price elasticity**

on the value of cross-price elasticity of the Almost Ideal Demand System (AIDS) model, it shows that import source countries compete. This means that the value of  $E_c > 0$  indicates that coffee commodities originating from exporting countries have the same characteristics or are substitutes for each other.

**Spending Elasticity**

$$n_i = 1 + \frac{\beta_i}{w_i}$$

Several measures of the value of the expenditure elasticity of the Almost Ideal Demand System (AIDS) model are as follows.

- a.  $E_i > 0$  the value of  $E_i > 0$  indicates that coffee commodities originating from exporting countries are/are normal goods, so that when there is an increase in coffee import expenditure in importing countries, it will result in an increase in the share of coffee in the exporting country.
- b.  $E_i < 0$  This means that the value of  $E_i < 0$  indicates that coffee commodities originating from exporting countries are/are inferior goods, so that when there is an increase in coffee import expenditure in importing countries, it will result in a decrease in the share of coffee in the exporting country.

**3. RESULTS AND DISCUSSION**

The almost ideal demand system (AIDS) model in this study is used as an approach to analyze the demand for coffee in the United States market. The almost ideal demand system (AIDS) model is a model that is often used in empirical demand studies. In addition, this model is also used to estimate the competitiveness of commodities among exporting countries in the export destination market for these products (Rifin 2013). The results of this study want to know how the simultaneous equation with the dependent variable is the coffee export market with the independent variable being the price of each exporting country. In the demand function, the AIDS predictor model uses a restriction test. In this study, the Almost Ideal Demand System (AIDS) model is also used to analyze the factors that influence the demand for coffee imports from source countries (Indonesia, Vietnam, Brazil and Columbia) in the United States market based on the coefficient and p-value of each -each independent variable to find out how much influence the variable has. The dependent variable is the import share of coffee imports in the importing country while the dependent variable is the price of Indonesian coffee, Vietnam coffee price, Brazil coffee price and Columbia coffee price, the total import value of the importing country. The estimation results of the model will be discussed based on the results of data processing in each country imported to the United States.

**Indonesian coffee prices, Vietnam, Brazil and Columbia in the United States market.**

Based on the estimation results on the AIDS model of Indonesian coffee in the United States market, the R-Square value is 0.4136 percent. This value means that the variation in the proportion of Indonesian coffee import shares in the United States can be explained by the independent (free) variable of 0.4136 percent and the rest is explained by the independent

variables. The statistical p-value obtained from the estimation of the AIDS model in the United States market also shows good results, where the p-value obtained is less than 0.03 or it can be said to be significant at the 5 percent significance level ( $0.000 < 0.05$ ). This value means that the independent (independent) variables together can explain the dependent (bound) variable, namely the variable share of Indonesian coffee in the United States market. Furthermore, the variables that influence the share of demand for Indonesian coffee imports in the United States market are explained in the following table.

Table 1. Indonesian coffee prices and competitors in the US market

Variables Independent	Coefficient	t Value	P-values
constant	0.771 (0.547)	1.41	0.179
Indonesia	0.029 (0.01)	2.25	0.03
Vietnamese	-0.030 (0.01)	-2.70	0.07
Brazil	0.035 (0.01)	1.84	0.08
Columbia	-0.052 (-0.05)	-2.70	0.01
Total import value	-0.032 (0.027)	-1.18	0.25

### 1. Indonesian coffee price (lpi)

Based on the estimation results of the model, the variable price of Indonesian coffee is positively related to the share of demand for Indonesian coffee imports in the American market as indicated by a coefficient value of 0.029, which can be interpreted that if the price of Indonesian coffee increases by 1 percent, it will increase the share of Indonesian coffee imports in the American market by 0.029 percent, *ceteris paribus*. This indicates that when there is an increase in the price of Indonesian coffee, Indonesia will still benefit where the share or share of coffee imports from Indonesia in the United States market will continue to increase, but the variable price of Indonesian coffee has no significant effect, where the variable price of Indonesian coffee has a p-value value of  $0.03 > 0.05$ . Therefore,

### 2. Vietnam coffee price (lpv)

The estimation results of the model show that the independent variable price of Vietnamese coffee is also related to the share of demand for Indonesian coffee imports in the US market as indicated by the coefficient value of -0.030. The coefficient value of -0.030 is suspected because Vietnamese coffee and Indonesian coffee have a substitution relationship, so that when the price of one of the commodities from a competing country increases, it will increase the share or demand share of other competing countries, but this variable has no significant effect on the market share. demand for Indonesian coffee imports in the United States market. The Vietnamese coffee variable has a p-value of 0.07, so the Vietnamese coffee price variable has no significant effect at the 5 percent significance level (0.05) on the share of demand for Indonesian coffee imports in the United States market.

### 3. Brazilian Coffee Price (lpb)

Same with Indonesian and Vietnamese coffee prices, the results of the estimation show that the independent variable Brazilian coffee price is also positively related to the share of demand for Indonesian coffee imports in the United States market, which is indicated by a positive coefficient value of 0.035. The positive coefficient value is suspected because Brazilian coffee and Indonesian

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coffee have a substitution relationship, so that when the price of one commodity from a competing country increases, it will increase the share or share of demand from other competing countries, but this variable has no significant effect on the share of demand. Indonesian coffee imports in the United States market. The Brazilian coffee variable has a p-value of 0.08, so the Brazilian coffee price variable has no significant effect at the 5 percent significance level (0.

**4. Columbia Coffee Price (lpc)**

From the estimation of the independent variable the price of coffee from Columbia has a p-value of 0.01. The p-value is smaller than the 5 percent significance level (0.05). Thus, the variable price of coffee from Columbia has a significant effect on the share of Indonesian coffee imports in the US market at a significant level of 5 percent. The coefficient value obtained is -0.052, which means that when there is an increase in the price of coffee from Columbia by 1 percent, it will reduce the share of coffee imports from Indonesia in the United States market by 0.05 percent, ceteris paribus. This shows that there is a negative correlation between coffee from Columbia and coffee from Indonesia. It can also be assumed that the two have a complementary relationship, so that when there is an increase in the price of coffee from Columbia,

**5.Total value of imports (lpx )**

The total import value variable (lpx) has a negative coefficient value of -0.032% meaning that when the total import value (lpx) increases, it will increase the market share of Indonesian coffee imports in the United States market but this variable is significant with a p-value of 0.25<0, 05.

**The Elasticity of Coffee Importing Countries in The US Market.**

With AIDS, the model used in this study is a demand function that describes competition among the four coffee import source countries (Indonesia, Vietnam, Brazil and Columbia) in the import destination market in the United States market. As a demand function, the AIDS model must meet several basic requirements. namely symmetry and homogeneity, while the adding up properties are fulfilled automatically in the conjecture model (Deaton 1980). Both of these requirements are restricted to the estimated AIDS model with the consideration that these assumptions are the main characteristic of a demand function, but in this study no tests were conducted to check the effect of these restrictions on the estimated model.

The United States is a coffee importing country. Most of the coffee imported by the United States comes from Indonesia, Vietnam, Brazil and Columbia. Table 2 below shows the level of sensitivity or self-price elasticity and expenditure elasticity of each import source country in the United States market.

**Table 2. Expenditure Elasticity And Self-Price Of Coffee In The Importing Country Of The United States.**

No.	Country	Expenditure Elasticity	Self-Price Elasticity
1	Indonesia	0.4479	0.3784
2	Vietnamese	1.7403	0.0024
3	Brazil	1.0155	0.1289
4	Columbia	0.9042	<.0001

Based on table 2, it can be seen that the value of the expenditure elasticity of each import source country has a positive sign. This value indicates that coffee from the import source country is a normal good. The expenditure elasticity obtained from the four importing countries, Brazil is

the country that benefits the most when there is an increase in demand for coffee imports in the United States market, because when there is an increase in expenditure in the United States market, the share of coffee from Brazil will increase with the same proportion. higher than other import source countries. Meanwhile, when the US market increases its expenditure, the share of coffee from Vietnam decreases, especially because its share is taken by Brazil.

Cross-price elasticity between coffee import source countries in the United States market is also needed. Table 3 shows the value of cross-price elasticity among the four source countries for coffee imports in the United States market.

Table 3. Cross-price elasticity of coffee in import countries of the United States.

No.	Country	Indonesia	Vietnamese	Brazil	Columbia
1	Indonesia		0.9443	0.0330	0.5854
2	Vietnamese	0.2864		0.0051	0.6661
3	Brazil	0.0121	0.1481		0.0933
4	Columbia	0.0064	0.0787	-0.0040	

Then the cross-price elasticity value obtained for coffee originating from Columbia and Indonesia is 0.0064, which means that when there is an increase in the price of imported coffee originating from Columbia by 1 percent, it will reduce the demand for coffee originating from Indonesia by 0.0064 percent in the United States market. the cross elasticity between Columbia and Vietnam is 0.0787, which means that when there is a 1 percent price increase for Columbia coffee, it will increase the demand for coffee from Vietnam by 0.0787 percent in the United States market and also the cross elasticity value between Columbia and Brazil is -0.0040 (inelasticity), which means that when there is a price increase of 1 percent for Columbia coffee, it causes a decrease in demand for coffee from Brazil by -0.0040 percent in the United States market.

This result is in line with Hong's research (2016) on the export price of coffee in the international market. The cross-price elasticity of Indonesian coffee is positive (substitution) with Colombian, Vietnamese and Brazilian coffee in the German market. Cross price elasticity of Colombian coffee is positive (substitution) with Indonesian, Vietnamese and Brazilian coffee in the German market. cross-price elasticity of Vietnamese coffee is positive (substitution) with Indonesian and Colombian coffee. Meanwhile, it has a negative value (complement) with Brazilian coffee in the German market. Cross price elasticity of Brazilian coffee is positive (substitution) with Indonesian and Colombian coffee. Meanwhile, it is negative (complementary) with Vietnamese coffee in the German market.

### Strategy Recommendations Regarding Indonesian Coffee Exports to The United States Market.

The mutual exchange relationship between coffee from Indonesia and its competitors is found in the United States market. In the United States market, there is a mutual relationship between coffee from Indonesia with Brazil and Columbia. Based on the results of this cross elasticity, the opportunity to win the market is seen in the United States market. Opportunities to win the competition can be exploited when there is an increase in the price of coffee originating from Brazil and Columbia. With an increase in coffee from Brazil and Columbia, the United States will switch to importing coffee from Indonesia, so that the share of coffee originating from Indonesia will increase. If this situation is found, then Indonesia can take advantage of it to increase Indonesian coffee exports to the United States. Indonesia needs to improve its promotion policy even more in the United States. For example, Indonesia can take part in various international coffee product exhibitions in the United States. Participation in these activities is very useful as a promotional event and opens opportunities to meet directly with buyers from abroad. In addition,

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producers will also have the opportunity to observe and study similar products offered by other countries as reference material for developing coffee products.

#### 4. CONCLUSION

Coffee from Indonesia competes with coffee from Vietnam, Brazil and Columbia. The cross price elasticity obtained between the price elasticity of Indonesia-Vietnam coffee is positive at 0.9443, and 0.0330 the price elasticity value for Indonesian-Brazilian coffee, the price elasticity value for Indonesian-Columbia coffee is 0.5854. The expenditure elasticity values obtained by Indonesian coffee were 0.4479, Vietnam coffee were 1.7403, the expenditure elasticity values for Brazil and Columbia coffee were 1.0155 and 0.9042. in the United States Market. The results of the competition analysis in the United States found a negative relationship with coffee from Brazil and Columbia which from these results said coffee from Indonesia competed with coffee from Brazil and Columbia, because there was a relationship of substitution. Meanwhile, coffee from Indonesia and Vietnam have a complementary relationship in the United States

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