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DETERMINANTS OF INDONESIAN COFFEE PRODUCTION AND CONSUMPTION IN THE DOMESTIC MARKET

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ABSTRACT

This study aims to analyze: (1) the effect of producer coffee prices, cocoa producer prices, coffee plantation area, export prices, and Indonesia's coffee exports on Indonesian coffee production; and (2) the effect of consumer coffee prices, tea prices, granulated sugar prices, real GDP per capita, and imported coffee prices on Indonesian coffee consumption. The research model employs a multiple linear regression model using data from 2010–2023. The findings indicate that simultaneously, producer coffee prices, cocoa producer prices, coffee plantation area, export prices, and coffee exports significantly affect Indonesian coffee production. Individually, producer coffee prices and plantation area have a significant positive effect, while cocoa producer prices and export prices have a significant negative effect on coffee production. However, coffee exports have a negative but insignificant effect. Indonesian coffee production is responsive to changes in plantation area but not responsive to changes in producer coffee prices, cocoa prices, export prices, or export volume. Simultaneously, consumer coffee prices, tea prices, sugar prices, real GDP per capita, and import coffee prices significantly affect Indonesian coffee consumption. Individually, only real GDP per capita has a significant positive effect on coffee consumption. Consumer coffee prices and sugar prices have a negative but insignificant effect, while tea prices and import coffee prices have a positive but insignificant effect. Indonesian coffee consumption is responsive to changes in real GDP per capita but not responsive to price changes.
Keywords: *Coffee, Production, Consumption, Price, Plantation Area, GDP Per Capita, Export, Import*

ABSTRAK

Penelitian bertujuan menganalisis: (1) pengaruh harga produsen kopi, harga kakao, luas areal perkebunan kopi, harga dan ekspor kopi Indonesia terhadap produksi kopi Indonesia; (2) pengaruh harga konsumen kopi, harga teh, harga gula pasir, dan GDP riil per kapita, dan harga kopi impor terhadap konsumsi kopi Indonesia. Model penelitian adalah model persamaan regresi linier berganda menggunakan data tahun 2010-2023. Temuan penelitian menunjukkan bahwa secara simultan harga produsen kopi, harga kakao, luas areal tanaman kopi, harga dan ekspor kopi Indonesia secara signifikan berpengaruh terhadap produksi kopi Indonesia. Secara individual, harga produsen dan luas areal tanaman secara signifikan berpengaruh positif, sedangkan harga produsen kakao dan harga ekspor kopi Indonesia secara signifikan berpengaruh negatif terhadap produksi kopi Indonesia. Namun ekspor kopi Indonesia berpengaruh negatif tidak signifikan terhadap produksi kopi Indonesia. Produksi kopi Indonesia responsif terhadap perubahan luas areal tanaman kopi, namun tidak responsif terhadap perubahan harga produsen kopi, harga kakao, harga ekspor dan ekspor kopi Indonesia. Secara simultan, harga konsumen kopi, harga teh, harga gula pasir, GDP riil per kapita, harga impor kopi Indonesia secara signifikan berpengaruh terhadap konsumsi kopi Indonesia. Secara individual, hanya GDP riil per kapita secara signifikan berpengaruh positif terhadap konsumsi kopi Indonesia. Pengaruh harga konsumen kopi dan harga gula pasir adalah negatif tidak signifikan, sedangkan pengaruh harga teh dan harga impor kopi Indonesia adalah positif tidak signifikan terhadap konsumsi kopi Indonesia. Konsumsi kopi di Indonesia responsif terhadap perubahan GDP riil per kapita, namun tidak responsif terhadap perubahan harga konsumen kopi, harga teh, harga gula pasir, dan harga impor kopi Indonesia.
Kata Kunci: Kopi, Produksi, Konsumsi, Harga, Luas Areal, GDP Perkapita, Ekspor, Impor

PENDAHULUAN

The coffee commodity makes a significant contribution to the national economy. First, coffee plantations create employment opportunities for thousands of coffee farmers and other economic actors involved in the agribusiness value chain, ranging from on-farm to off-farm activities, and including various supporting institutions such as farmer organizations, research and development institutions, financial institutions, government agencies, and coffee associations. Second, coffee exports contribute substantially to Indonesia's Gross Domestic Product (GDP). Third, in 2023, Indonesia ranked as the third-largest coffee producer in the world after Brazil and Vietnam, making coffee exports an important source of foreign exchange earnings. Fourth, in 2023, approximately 99.4 percent of Indonesia's coffee plantation area was owned by smallholders and contributed about 99.5 percent of total national coffee bean production. Fifth, most coffee plantations are located in rural areas; therefore, the development of coffee plantations in Indonesia represents a rural development strategy that can enhance income and welfare among rural populations.

Given the strategic importance of coffee, the Directorate General of Plantations has designated coffee as one of Indonesia's leading plantation commodities, alongside palm oil, cocoa, tea, and coconut (Direktorat Jenderal Perkebunan, 2014). However, Indonesia's coffee economy still faces several challenges, particularly those related to production and domestic consumption. Although plantation area and production tend to increase, domestic consumption absorption remains relatively low, potentially leading to production surplus issues.

The Center for Agricultural Data and Information Systems (2023) reports that during the period 1984–2022, Indonesia's coffee plantation area increased by an average of 0.99 percent per year, while coffee production grew by approximately 2.54 percent per year during 1984–2023. Between 2013 and 2022, coffee exports increased at an average rate of 0.75 percent per year. The Indonesian Chamber of Commerce and Industry has developed a roadmap forecasting coffee production, exports, and consumption for 2024–2026. During this period, production is projected to stagnate at around 789 thousand tons, exports are expected to increase from approximately 420 thousand tons in 2024 to 427 thousand tons in 2026, while consumption is projected to decline from 368 thousand tons in 2024 to 361 thousand tons in 2026 (Santika, 2024). According to the Center for Agricultural Data and Information Systems (2022), coffee consumption in Indonesia averages only 1.12 kg per capita per year, far below that of major coffee-importing countries, such as the United States (4.3 kg per capita per year), Japan (3.4 kg), Austria (7.6 kg), Belgium (8.0 kg), Norway (10.6 kg), and Finland (11.4 kg).

Based on data from the International Coffee Organization (ICO), the ratio of coffee consumption to production in Indonesia is 50.97 (Annur, n.d.). Furthermore, data from 2010–2023 show that average coffee consumption remained below 40 percent of average production (Figure 1.1). During this period, Indonesia's coffee bean production fluctuated slightly but exhibited an upward trend, with an average production of 710,470.21 tons. The lowest production was recorded in 2011 at 638,646 tons, while the highest reached 786,191 tons in 2021. Over the same period, coffee consumption also showed an upward trend but remained substantially lower than production each year, averaging only 274,161.86 tons or approximately 38.59 percent of average production. The lowest consumption was recorded at 199,980 tons in 2010 and 2011, while the highest reached 379,655 tons in 2022.

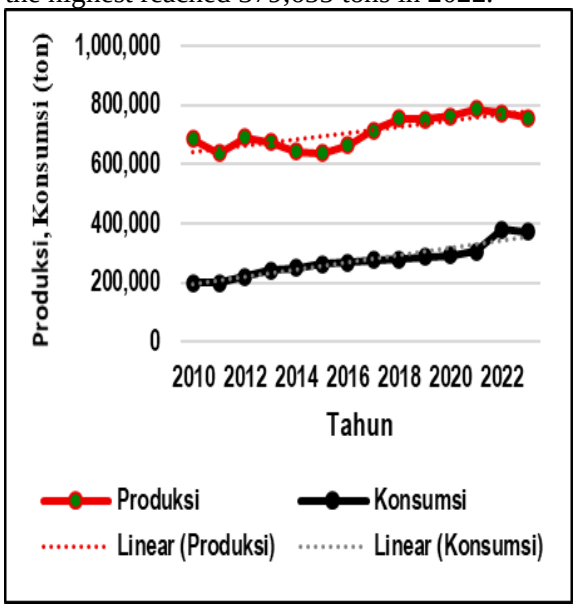

Figure 1. Indonesian Coffee Production and Consumption, 2010–2023
Source: Badan Pusat Statistik (bps.go.id), processed data

During the same period, coffee consumption in Indonesia also exhibited an upward trend; however, it remained substantially lower than production levels each year. Average consumption

amounted to only 274,161.86 tons, representing merely 38.59 percent of average coffee production. The lowest consumption level was recorded at 199,980 tons in 2010 and 2011, while the highest reached 379,655 tons in 2022.

Meanwhile, over the period 2010–2023, Indonesia's coffee exports averaged 403,943.71 tons, equivalent to 56.86 percent of average production. Consequently, during this period, Indonesia experienced an average production surplus of 32,364.64 tons, or 4.55 percent of average production. Given that domestic consumption remains relatively low compared to production, future policies are required to manage production surpluses and encourage increased domestic coffee consumption. Therefore, it is essential to identify the economic factors that determine coffee production and consumption in Indonesia.

The production of goods and services can be analyzed using a production function, which describes the technical relationship between inputs and outputs. According to Salvatore (2022), output represents the transformation of various inputs (factors of production) into goods and services. Inputs consist of land (natural resources), capital, and labor, including entrepreneurial ability, which are utilized to produce goods and services. Damayanti (2022) explains that production theory discusses the types of inputs used, how they are managed in the production process, how input utilization affects output, and how combinations of inputs can maximize profits for producers. Demand for goods and services is generally associated with consumption, defined as the activities of individuals or households in using goods and services to satisfy their needs.

In conventional supply theory, the determinants of supply include the price of the good itself, prices of related goods, input costs, technology, number of producers, producers' objectives, government policy, and future expectations (Rahardja, 2006; Mankiw, 2007; Sukirno, 2022; Sihotang et al., 2023). As an export-oriented commodity, coffee production in Indonesia is closely related to coffee exports. In conventional demand theory, determinants of demand include the price of the good itself, prices of related goods, income, tastes, population size, income distribution, and future expectations (Rahardja, 2006; Mankiw, 2007; Sukirno, 2022; Sihotang et al., 2023).

Although coffee production in Indonesia has continued to increase, domestic consumption remains relatively low. This condition may result in production surpluses that could adversely affect coffee farmers and producers. Previous studies have identified several factors influencing coffee production and consumption in Indonesia; however, some important economic variables have not been fully incorporated into existing models. Tungga (2020), analyzing data from 2007–2019 across ten coffee-producing provinces, found that land area, coffee prices, and productivity significantly and positively affected coffee production. S et al. (2020), examining coffee supply and demand using data from 2005–2018, found that world coffee prices, export volume, and SP-36 fertilizer prices had a significant negative effect on coffee supply in Indonesia, while producer coffee prices had a significant positive effect. On the demand side, consumer coffee prices and population size had a significant positive effect, whereas GDP did not significantly affect coffee demand. Aristy and Rachman (2023), using data from 2010–2020, found that tea prices and Indonesia's GDP had a significant positive effect, while domestic coffee prices had a positive but insignificant effect on coffee demand. Similarly, Santoso et al. (2013), analyzing data from 1993–2009, found that tea prices, domestic coffee prices, population size, and income positively influenced coffee demand, although only income had a statistically significant effect.

The relationships among various economic variables in previous studies have not been fully consistent with theoretical, statistical, and econometric predictions. Therefore, in order to formulate appropriate policies for the development of Indonesia's coffee economy, previous research should be extended through a re-specification of the coffee production and consumption models. The novelty of this study lies not only in the use of updated data but also in the inclusion of new variables that were not incorporated in previous models. In the production model, cocoa producer prices are included as an alternative crop variable that was previously overlooked. This inclusion aims to explain why, in recent years, many coffee farmers in various regions of Indonesia have shifted from coffee cultivation to cocoa farming. In the consumption model, the price of imported coffee is introduced as an explanatory variable that was not considered in earlier studies. Although Indonesia is one of the world's largest coffee producers, it continues to import coffee annually from other producing countries.

METODE PENELITIAN

This study employs an econometric model in the form of a multiple linear regression equation. The analytical approach used is inferential statistics (inductive statistics), which involves statistical methods for analyzing sample data, estimating parameters, formulating and testing hypotheses, and drawing generalizable conclusions. The study focuses on analyzing the direction, magnitude, and impact of changes in each independent variable on the dependent variable.

The research utilizes secondary time-series data covering the period 2010–2023. The data were obtained from various sources, including Statistics Indonesia (BPS), the Ministry of Agriculture of the Republic of Indonesia, the Directorate General of Plantations of the Ministry of Agriculture, the Center for Agricultural Data and Information Systems of the Ministry of Agriculture, the Center for Economic and Business Data (Databoks), the International Coffee Organization (ICO), and other relevant sources. To address the first research objective, an econometric specification of Indonesia's coffee production model was formulated in the form of a multiple regression equation as follows:

$$SQ_t = \beta_0 + \beta_1 PP_t + \beta_2 PC_t + \beta_3 LA_t + \beta_4 PX_t + \beta_5 XQ_t + \varepsilon$$

(β_0 = konstanta; β_1, β_2, β_3, β_4, β_5 = parameter yang diestimasi; t = tahun; ε = e*rror term*).

SQt = Total coffee production in year t, defined as the total quantity of coffee beans produced by farmers or coffee producers in Indonesia, measured in tons.
PPt = Producer price of coffee in year t, defined as the price received by farmers or coffee producers for coffee beans produced and sold in the domestic market, measured in Indonesian rupiah per kilogram (Rp/kg).
PCt = Producer price of cocoa (as an alternative crop to coffee) in year t, defined as the price received by cocoa farmers or producers for cocoa sold in the domestic market, measured in Indonesian rupiah per kilogram (Rp/kg).
LAt = Coffee plantation area in year t, defined as the total land area in Indonesia allocated for coffee cultivation, measured in hectares (ha).
PXt = Coffee export price in year t, defined as the Free on Board (FOB) price received by Indonesian coffee exporters for coffee exported to other countries, measured in US dollars per ton (US$/ton).
XQt = Coffee export volume in year t, defined as the total quantity of coffee exported by Indonesia to other countries, measured in tons.

To address the second research objective, an econometric specification of Indonesia's coffee consumption model was formulated in the form of a multiple regression equation as follows:

$$CQ_t = \beta_0 + \beta_1 PK_t + \beta_2 PT_t + \beta_3 PG_t + \beta_4 GK_t + \beta_5 PM_t + \varepsilon$$

(β_0 = konstanta; β_1, β_2, β_3, β_4, β_5 = parameter yang diestimasi; t = tahun; ε = e*rror term*).

CQt = Total coffee consumption in year t, defined as the total quantity of coffee consumed by the Indonesian population, measured in tons.
PKt = Consumer price of coffee in year t, defined as the price paid by final consumers for ground coffee in the domestic market, measured in Indonesian rupiah per kilogram (Rp/kg).
PTt = Price of tea (as a substitute for coffee consumption) in year t, defined as the price paid by final consumers for tea in the domestic market, measured in Indonesian rupiah per kilogram (Rp/kg).
PGt = Price of granulated sugar (as a complement to coffee consumption) in the domestic market in year t, defined as the price paid by final consumers for sugar, measured in Indonesian rupiah per kilogram (Rp/kg).
GKt = GDP per capita in year t, defined as real Gross Domestic Product divided by the total population of Indonesia, measured in thousand rupiah per capita (Rp000 per capita).
PMt = Import price of coffee in year t, defined as the CIF (Cost, Insurance, and Freight) price paid by Indonesian importers for coffee purchased from other countries, measured in US dollars per ton (US$/ton).

The research model was estimated using the Ordinary Least Squares (OLS) method, and the data were processed using SPSS software. The adequacy of the model as an estimation tool was evaluated using econometric, statistical, and economic criteria.

Econometric Criteria

The econometric criteria were applied to determine whether the model is free from multicollinearity and autocorrelation problems. Multicollinearity was tested using Tolerance values and the Variance Inflation Factor (VIF). According to Ghozali (2018), the model is considered free from multicollinearity if the tolerance value is greater than 0.10 and the VIF value is less than 10.

Autocorrelation was tested using the Durbin–Watson (DW) test. The model is considered free from autocorrelation if the DW statistic lies within the interval $d_U < d < 4 - d_U$. If $d_L \leq d \leq d_U$or $4 - d_U \leq d \leq 4 - d_L$The Durbin–Watson test is inconclusive; therefore, autocorrelation is further examined using the Run Test. The decision rule for the Run Test at a significance level of $\alpha = 0.05$is as follows: if the asymp. Sig. (2-tailed) If the value is less than 0.05, the model exhibits autocorrelation; if it is greater than 0.05, the model does not exhibit autocorrelation. The statistical criteria were used to evaluate whether the model adequately explains the economic relationship between the independent and dependent variables. This evaluation is based on the coefficient of determination (R^2), the F-test, and the t-test

The coefficient of determination (R^2) measures the ability of the independent variables to explain the variation in the dependent variable. The F-test determines whether all estimated parameters are jointly significant, while the t-test examines whether each parameter is individually significant. Parameter significance was tested at the 5 percent significance level ($\alpha = 0.05$)

The economic criteria were applied to assess whether the estimated parameter signs are theoretically meaningful and consistent with economic theory. For the coffee production model, the theoretical expectations for the signs of the regression coefficients are as follows:

$$\boldsymbol{\beta_1, \beta_3, \beta_4, \beta_5 > 0}\textbf{(positive), and } \boldsymbol{\beta_2 <}$$
$$\textbf{0(negative).}$$

For the coffee consumption model, the theoretical expectations are:

$$\boldsymbol{\beta_1, \beta_3, \beta_5 < 0}\textbf{ (negative), and}$$
$$\boldsymbol{\beta_2, \beta_4 > 0}\textbf{(positive).}$$

A positive regression coefficient indicates that a change in an independent variable leads to a positive (direct) change in total coffee production or consumption. Conversely, a negative regression coefficient indicates an inverse relationship between the independent and dependent variables. To measure the responsiveness of coffee production and consumption to changes in the independent variables in each model, short-run elasticity coefficients were calculated using the following formula:

$$\textbf{E (Y/X) = β x (X/Y)}$$

E (YX) = Elasticity (responsiveness) of the dependent variable to changes in the independent variable

β = Estimated coefficient of the independent variable

X = Mean value of the independent variable

Y = Mean value of the dependent variable

Results and Discussion

The data processing results used to test for multicollinearity in the research model are presented in Table 1 In the production model, all independent variables namely the producer price of coffee beans (PPt), the producer price of cocoa (PCt), the coffee plantation area in Indonesia (LAt), the Indonesian coffee export price (PXt), and the Indonesian coffee export volume (XQt) have tolerance values less than 1 and VIF values less than 10.

Similarly, in the consumption model, all independent variables namely the consumer price of coffee (PKt), the price of tea (PTt), the price of granulated sugar (PGt), Indonesia's real GDP per capita (GKt), and the Indonesian coffee import price (PMt) have tolerance values less than 1 and VIF values less than 10. Therefore, it can be concluded that both the production model and the consumption model of Indonesian coffee are free from multicollinearity problems. Hence, the research models are appropriate to be used as empirical models with good predictive capability.

Table 1
Results of the Multicollinearity Test for the Indonesian Coffee Production and Consumption Models

Coffee Production Model			Coffee Consumption Model		
Free Variables	Collinearity Statistics		Free Variables	Collinearity Statistics	
	Tolerance	VIF		Tolerance	VIF
PP_t	0,452	2,215	PKt	0,603	1,658
PC_t	0,730	1,369	PTt	0,263	3,801
LA_t	0,614	1,627	PGt	0,116	8,627
PX_t	0,585	1,710	GKt	0,110	9,080
XQ_t	0,564	1,775	PMt	0,867	1,154

The data processing results used to test for autocorrelation in the research model are presented in Table 2. The number of observations in this study is $N = 14$, and the number of independent variables including the constant is $k = 5$. Using a significance level of $\alpha = 5\%$and

referring to the Durbin–Watson (D–W) table, the lower bound value is $d_L = 0.5052$ and the upper bound value is $d_U = 2.2959$. Thus, $4 - d_U = 1.7041$and $4 - d_L = 3.4948$.

Table 2
Autocorrelation Test Results for the Indonesian Coffee Production and Consumption Models

Model	d statistik	Testing Criteria	Conclusion
Coffee Production	2,793	$4\text{-}d_U \leq d \leq 4\text{-}d_L$	The test is inconclusive
Coffee Consumption	1,720	$d_L \leq d \leq d_U$ dan $4\text{-}d_U \leq d \leq 4\text{-}d_L$	Testing was inconclusive (*inconclusive*)

Source: Research data for the period 2010–2023 (processed)

Based on the d-statistic values in Table 2, the resence of autocorrelation in both the production model and the consumption model of Indonesian coffee is inconclusive. Therefore, as an alternative method to test for the existence of autocorrelation, the Run Test was employed. The results are presented in

Table 3
Run Test Results for the Indonesian Coffee Production and Consumption Models

	Coffee Production Model	Coffee Consumption Model
	Unstandardized Residual	Unstandardized Residual
Test Value[a]	-5909.58451	2398.02246
Cases < Test Value	7	7
Cases >= Test Value	7	7
Total Cases	14	14
Number of Runs	9	5
Z	-.278	-1.391
Asymp. Sig. (2-tailed)	.781	.164
a. Median		

Source: Research data for the period 2010–2023 (processed)

In the Indonesian coffee production model shown in Table 3, the Asymp. Sig. (2-tailed) value is 0.781 > 0.05, and in the Indonesian coffee consumption model, the Asymp. Sig. (2-tailed) value is 0.164 > α = 0.05. These results indicate that there is no autocorrelation problem in either the production model or the consumption model of Indonesian coffee.

Thus, both models are appropriate to be used as empirical models with good predictive capability. The estimation results of the Indonesian coffee production model are presented in Table 4.

Table 4
Estimation Results Of The Indonesian Coffee Production Model

Free Variables	Regression Coefficient	t statistik	Significance	Elasticity Coefficient
(constant)	-1.073.057,8	-2.219	0,057	-
PP_t	8,313	3.780	0.005*	0,233
PC_t	-11,938	-3.649	0,006*	-0,357
LA_t	1,672	4.268	0,003*	2,882
PX_t	-54,223	-2.891	0,020**	-0,194
XQ_t	-0,178	-1.824	0,106	-0,101
		F Statistik: 17,862	0,000[b]	
$SQ_t = -1.073.057,8 + 8,313\ PP_t - 11,938\ PC_t + 1,672\ LA_t - 54,223\ PX_t - 0,178\ XQ_t$ (R^2 = 0,918; DW = 2,793; N = 14; *signifikan pada taraf α = 1%; **signifikan pada taraf α = 5%)				

Source: Research data for the period 2010–2023 (processed)

Based on the coefficient of determination (R^2) = 0.918, approximately 91.8 percent of the variation in Indonesian coffee production can be explained by all independent variables (producer price of coffee beans, producer price of cocoa, coffee plantation area in Indonesia, export price, and export volume of Indonesian coffee), while the remaining 8.2 percent is explained by other variables outside the research model.

Based on the F-statistic value of 17.862 with a significance level of 0.000, all independent variables jointly have a significant effect on Indonesian coffee production. Based on the t-statistics and significance values, individually all independent variables except the export volume of Indonesian coffee have a statistically significant effect on Indonesian coffee production.

The positive sign of the regression coefficient for the producer price of coffee beans is consistent with the theoretical prediction of the law of supply, where an increase in the producer price positively affects Indonesian coffee production. Indonesian coffee production is inelastic with respect to changes in the producer price, with an elasticity coefficient of 0.233. This implies that a 10 percent increase in the domestic producer price of coffee beans, ceteris paribus, increases Indonesian coffee production by only 2.33 percent. This finding supports previous studies (S et al., 2020; Tungga, 2020), which also found that producer-level coffee prices significantly affect coffee supply (production) in Indonesia.

The negative sign of the regression coefficient for the domestic cocoa price is consistent with theoretical predictions regarding competing goods. This negative relationship confirms that cocoa is an alternative (competing) crop to coffee in Indonesia. Indonesian coffee production is inelastic with respect to changes in domestic cocoa prices, with an elasticity coefficient of –0.357. This means that a 10 percent increase in the domestic cocoa price, ceteris paribus, leads to a 3.57 percent decrease in Indonesian coffee production. Previous studies (Maryanto et al., 2012; Sinaga, 2012) also reported that coffee farmers shifted to cocoa cultivation due to higher cocoa prices and agronomic advantages. These findings imply that an increase in domestic cocoa producer prices may encourage farmers to substitute coffee with cocoa, ultimately reducing Indonesian coffee production.

The inelastic response of coffee production to changes in both coffee and cocoa producer prices implies that fluctuations in domestic producer prices will not lead to substantial changes in Indonesian coffee production.

The positive regression coefficient for coffee plantation area is consistent with theoretical expectations, indicating that coffee production increases as plantation area expands. Indonesian coffee production is highly responsive to changes in plantation area, with an elasticity coefficient of 2.882. This implies that a 10 percent increase in coffee plantation area, ceteris paribus, leads to a 28.82 percent increase in coffee production. This finding suggests that expanding the coffee plantation area can substantially increase production. However, land expansion should be accompanied by improved production techniques to enhance productivity. This result is consistent with Tungga (2020), who found a significant positive effect of plantation area on Indonesian coffee production.

The regression coefficient of the Indonesian coffee export price is negative and statistically significant. This negative sign contradicts theoretical expectations, as supply theory suggests that higher international export prices should encourage farmers to increase production. The negative relationship may be attributed to high price volatility in the international coffee market, meaning that higher export prices do not necessarily provide sufficient incentives for farmers to expand production. The elasticity of export price is –0.194 (inelastic), indicating that a 10 percent increase in export prices, ceteris paribus, reduces Indonesian coffee production by 1.94 percent. This finding supports S et al. (2020), who also found that world coffee prices negatively and significantly affect Indonesian coffee supply.

Similarly, the negative regression coefficient for Indonesian coffee export volume is inconsistent with theoretical expectations and is not statistically significant. The elasticity coefficient of –0.101 (inelastic) indicates that an increase in export volume is not necessarily followed by an increase in Indonesian coffee production. Theoretically, rising export volume should provide incentives for farmers to increase production. A negative relationship between export volume and Indonesian coffee production was also reported by S et al. (2020).

The estimation results of the Indonesian coffee consumption model are presented in Table 5. The coefficient of determination (R^2) = 0.906 indicates that 90.6 percent of the variation in coffee consumption in Indonesia can be explained by the independent variables (consumer price of ground coffee, tea price, sugar price, real GDP per capita, and Indonesian coffee import price), while the remaining 9.4 percent is explained by other variables outside the model.

Table 5. Estimation Results Of The Indonesian Coffee Consumption Model

Free Variables	Regression Coefficient	t statistik	Significance	Elasticity Coefficient
(constant)	-1.073.057,8	-2.219	0,057	-
(constant)	-70.242,4	-1,193	0,267	-
PK_t	-0,370	-0.341	0,742	-0,054
PT_t	0,829	1,458	0,183	0,240
PG_t	-4,285	-0,449	0,665	-0,213
GK_t	9,478	2,571	0,033*	1,270
PM_t	1,159	0,507	0,626	0,013
		F Statistik 15,451	0,001[b]	
CQ_t = -70.242,4 - 0,370 PK_t + 0,829 PT_t - 4,285 PG_t + 9,478 GK_t + 1,159 PM_t (R^2 = 0,906; DW = 1,720; N = 14; *signifikan pada taraf α = 5%)				

Source: Research data for the period 2010–2023 (processed)

The F-statistic value of 15.451 with a significance level of 0.001 indicates that all independent variables jointly have a significant effect on coffee consumption in Indonesia. However, based on the t-statistics, only Indonesia's real GDP per capita has a statistically significant positive effect on coffee consumption, while the other independent variables do not individually have a significant effect.

The consumer price of ground coffee has a negative relationship with coffee consumption in Indonesia, consistent with theoretical predictions (the law of demand), although it is not statistically significant. Indonesian coffee consumption is inelastic with respect to changes in the domestic consumer price of ground coffee, with an elasticity coefficient of –0.054. This implies that a 10 percent increase in the domestic consumer price of ground coffee, ceteris paribus, reduces coffee consumption by only 5.4 percent. The insignificant response of consumption to price changes may be associated with the strong coffee-drinking culture in Indonesia. For coffee consumers, coffee is considered an essential good that continues to be consumed regardless of price changes. This implies that increases in coffee prices are unlikely to substantially alter consumer purchasing behavior. These findings contradict Santoso et al. (2013), S et al. (2020), and Aristy & Rachman (2023), who found a positive relationship between coffee prices and coffee demand in Indonesia. Such a positive relationship is inconsistent with the law of demand, which predicts an inverse relationship between price and quantity demanded.

The positive sign of the regression coefficient for tea prices and the negative sign for sugar prices are consistent with economic theory, although neither is statistically significant. From the demand perspective, coffee and tea are substitute goods, while coffee and sugar are complementary goods. The positive but insignificant effect of tea prices found in this study is consistent with Santoso et al. (2013), but differs from Aristy & Rachman (2023), who found that tea prices have a significant positive effect on coffee demand in Indonesia.

Based on the elasticity coefficient, Indonesian coffee consumption is inelastic with respect to changes in tea prices, with an elasticity value of 0.240. This means that a 10 percent increase in domestic tea prices, ceteris paribus, changes coffee consumption by only 2.4 percent. This suggests that changes in tea prices have a limited impact on coffee consumption, as for some consumers the two beverages are not perfect substitutes.

Coffee consumption in Indonesia is also inelastic with respect to changes in sugar prices, with an elasticity coefficient of –0.213. This implies that a 10 percent increase in domestic sugar prices, ceteris paribus, reduces coffee consumption by only 2.13 percent. This may occur because the proportion of coffee and sugar in coffee beverages is relatively fixed, making consumption less sensitive to sugar price changes.

The positive sign of the regression coefficient for Indonesia's real GDP per capita is consistent with theoretical expectations, indicating that increases in real GDP are associated with higher coffee consumption. Coffee consumption is elastic with respect to real GDP per capita, with an elasticity coefficient of 1.270. This means that a 10 percent increase in Indonesia's real GDP per capita, ceteris paribus, leads to a 12.70 percent increase in coffee consumption. This finding implies that economic growth, reflected in rising real income per capita, is a key factor driving increased coffee consumption in Indonesia. This result supports Santoso et al. (2013) and Aristy &

Rachman (2023), who also found a significant positive effect of GDP on coffee supply in Indonesia. However, it contradicts Larasti et al. (2019), who found a negative and insignificant effect of GDP on coffee supply in Indonesia.

The positive sign of the regression coefficient for Indonesia's coffee import price contradicts theoretical predictions. Theoretically, the coefficient should be negative: an increase in import prices would reduce import volumes, decrease domestic coffee supply, increase domestic prices, and consequently reduce coffee consumption. The positive relationship found in this study may be explained by two factors. First, imported coffee may act as a substitute for local coffee; thus, an increase in import prices may shift consumer demand toward locally produced coffee, increasing total domestic coffee consumption. Second, coffee demand in the domestic market may be relatively inelastic, so increases in import prices do not significantly affect overall consumption. Based on the elasticity coefficient (0.013), domestic coffee consumption is highly inelastic with respect to changes in import prices. A 10 percent increase in Indonesia's coffee import price, ceteris paribus, changes coffee consumption by only 0.13 percent.

CONCLUSION

1. The producer price of coffee beans in the domestic market, the producer price of cocoa in the domestic market, the coffee plantation area in Indonesia, the Indonesian coffee export price, and the Indonesian coffee export volume jointly have a significant effect on Indonesian coffee production. Individually, all variables except export volume have a statistically significant effect on coffee production. The producer price of coffee beans and plantation area have positive effects, while the producer price of cocoa, export price, and export volume have negative effects on Indonesian coffee production.
2. Indonesian coffee production is inelastic with respect to changes in the domestic producer price of coffee beans, the domestic producer price of cocoa, the export price, and export volume, but it is elastic with respect to changes in coffee plantation area. This indicates that the expansion of coffee plantation area has a substantial impact on increasing coffee production in Indonesia.
3. The consumer price of ground coffee in the domestic market, tea prices, sugar prices, real GDP per capita of Indonesia, and the Indonesian coffee import price jointly have a significant effect on domestic coffee consumption. However, individually, only real GDP per capita has a statistically significant effect on Indonesian coffee consumption.
4. Domestic coffee consumption is inelastic with respect to changes in the consumer price of ground coffee, tea prices, sugar prices, and import prices, but it is elastic with respect to changes in real GDP per capita. This implies that increases in real GDP per capita will have a substantial impact on increasing coffee consumption in Indonesia.

RECOMMENDATIONS

1. From the production perspective, policies aimed at increasing Indonesian coffee production should focus on expanding coffee plantation areas. However, such expansion should be accompanied by the adoption of improved production techniques in order to enhance coffee productivity.
2. From the consumption perspective, policies intended to stimulate coffee consumption in Indonesia should be directed toward increasing real GDP per capita. Economic growth that leads to higher real income per capita will contribute significantly to the growth of domestic coffee consumption.

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