Demand Analysis of Ethiopian Coffee in Japan

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ABSTRACT

Ethiopia is the largest coffee producer in Africa. One of the major markets for Ethiopian coffee is Japan. This paper, therefore, analyzed the determinants of demand for Ethiopian coffee in the Japanese market. The Linear Approximate Almost Ideal Demand System (LA/AIDS) model was used to estimate a system of expenditure share equations for Ethiopian coffee and its competitors. Quarterly time series data from 1988 to 2009 were obtained for the analysis. Empirical results indicated that most of the slope coefficients were statistically significant and in accordance with microeconomic theory. The demand for Ethiopian coffee was determined by its price, price of substitutes, the contamination dummy variable, and total expenditure in the Japanese market. Ethiopian coffee demand was found to be elastic and this has an implication in pricing policy.

Keywords: Linear Approximate Almost Ideal Demand System (LA/AIDS), expenditure share, coffee, Ethiopia, Japan

บทคัดย่อ

เอธิโอเปียเป็นประเทศผู้ผลิตกาแฟรายใหญ่ที่สุดในทวีปแอฟริกา หนึ่งในตลาดหลักของกาแฟจากเอธิโอเปียคือ ประเทศญี่ปุ่น งานวิจัยนี้ทำการวิเคราะห์ปัจจัยที่เป็นตัวกำหนดอุปสงค์กาแฟจากเอธิโอเปียในตลาดญี่ปุ่น โดยใช้แบบจำลองอุปสงค์เชิงเส้นใกล้สมบูรณ์ในการประมาณระบบสมการส่วนแบ่งค่าใช้จ่ายสำหรับกาแฟจากเอธิโอเปียและจากประเทศคู่แข่ง ข้อมูลที่ใช้เป็นข้อมูลรายไตรมาสตั้งแต่ปี 2531 ถึง 2552 ผลการวิเคราะห์พบว่า ค่าสัมประสิทธิ์ที่กะประมาณได้ส่วนใหญ่มีนัยสำคัญทางสถิติและสอดคล้องกับทฤษฎีเศรษฐศาสตร์จุลภาค อุปสงค์กาแฟจากเอธิโอเปียถูกกำหนดโดยราคากาแฟจากเอธิโอเปีย ราคาสินค้าทดแทนจากประเทศคู่แข่ง ตัวแปรหุ่นแทนการปนเปื้อน และค่าใช้จ่ายโดยรวมสำหรับการนำเข้ากาแฟในตลาดญี่ปุ่น อุปสงค์กาแฟจากเอธิโอเปียมีความยืดหยุ่นมาก ซึ่งสามารถใช้เป็นนัยสำหรับนโยบายการกำหนดราคาได้

คำสำคัญ: แบบจำลองอุปสงค์เชิงเส้นใกล้สมบูรณ์ ส่วนแบ่งค่าใช้จ่าย กาแฟ เอธิโอเปีย ญี่ปุ่น

INTRODUCTION

Coffee is produced in more than 50 developing countries generating income for approximately 25 million smallholder producers (Department for International Development [DFID], 2004), and employing an estimated 100 million people (Natural

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Resources Institute [NRI], 2006). In 2004, the total quantity of coffee produced in the world was estimated at 116.06 million bags (1 bag = 60 kg) and production increased to over 128.09 million bags in 2008 of which 107.40 million bags were consumed worldwide by both domestic producers and importers. The trend in world coffee production and consumption during the period 2004 through 2008 showed an increase of 9.39 and 5.4 percent, respectively (International Coffee Organization [ICO], 2010).

Ethiopia is the largest coffee producer in Africa and the seventh largest in the world. Since 1907, when commercial production effectively began in the country, it has produced coffee Arabica and has been the third largest producer after Brazil and Colombia. The annual production of coffee has increased significantly from 2.7 million bags in 2000 to over 4 million bags in 2008 (ICO, 2010). Coffee has dominated the Ethiopian export trade for a number of years. Historically, coffee has accounted for over 60 percent of Ethiopia's total export revenue (LMC, 2000).

Japan is one of the major markets for Ethiopian coffee. Japan imports coffee from 34 countries, the major ones being Brazil, Colombia,

Indonesia, Vietnam, Ethiopia, and India (in that order). These countries represent more than 75 percent of the total coffee import volume in Japan (ICO, 2010). Moreover, they rigorously compete to get a greater share of the Japanese coffee market. During 2002−2009, Brazil dominated the Japanese market in terms of both the volume and value imported, followed by Colombia and Indonesia, while Ethiopia was the fourth from 2002 to 2006 but then dropped to fifth place (Table 1).

As shown in Table 1, the volume of Ethiopian coffee exported to Japan has decreased from its peak of 0.64 million bags in 2006 down to 0.14 million bags in 2008 and then even further to 0.02 million bags in 2009. That is, the coffee market share in Japan held by Ethiopian coffee decreased from around 8.77 percent in 2006 to an almost negligible level (0.30%) in 2009 (Table 2).

The steady decline in coffee export to Japan might be associated with coffee quality problems and changes in the attitudes of Japanese consumers. Furthermore, the serious and sharp cutback in Ethiopian coffee imports might have occurred because of a contamination problem. So, in order to increase demand for Ethiopian coffee in Japan, it is

Table 1   Volume of coffee imports in the Japanese market (millions of bags)

Country	Year							
	2002	2003	2004	2005	2006	2007	2008	2009
Brazil	1.80	1.90	1.80	2.10	2.10	2.10	1.80	2.02
Colombia	1.50	1.30	1.60	1.60	1.50	1.30	1.40	1.32
Indonesia	0.98	0.98	1.00	0.96	1.00	0.86	0.89	0.90
Vietnam	0.51	0.37	0.43	0.47	0.52	0.74	0.92	0.97
Ethiopia	0.54	0.53	0.63	0.51	0.64	0.49	0.14	0.02

Source: ICO, 2010.

Table 2   Volume share of Ethiopian coffee export in the Japanese market

Year	Ethiopian coffee export (millions of bags)	Total Japanese imports	Share of Ethiopian coffee (%)
2006	0.64	7.30	8.77
2007	0.49	7.30	6.71
2008	0.14	7.10	2.00
2009	0.02	7.10	0.30

imperative to identify the factors that affect its demand.

Interestingly, studies concerning the demand for Ethiopian coffee in international markets, especially Japan, are either incomplete or non-existent. To identify factors affecting demand for Ethiopian coffee and its competitors in Japan, the concept of Marshallian demand was applied. The Linear Approximate Almost Ideal Demand System (LA/AIDS) model was employed due to its desirable properties and wide application. The results of this paper will further add to relevant policy and strategy recommendations in an effort to increase demand for Ethiopian coffee in the Japanese market.

Related literature

A number of studies on the demand for coffee in the USA have used aggregate data and found that the demand was price inelastic (Goddard & Akiyama, 1989; Lawrence, Phillips, Riftkin, & Saleh, 1977; Okunade, 1992; Yeboah, 1992). Lawrence et al. (1977) pointed out that the changing lifestyles of consumers might contribute to a decrease in consumption. Studies by Lawrence et al. (1977), Okunade (1992) and Yeboah (1992) found a negative income elasticity of demand, indicating that coffee resembles an inferior good meaning that when the income of consumers increases, the purchase of this good decreases as consumers shift to consume a higher quality coffee. However, Abaelu and Manderscheid (1968) found that mild coffee varieties showed income elasticity (that is, they were perceived as high-quality luxury goods), and that the other two groups, Brazilian Arabica and Robusta, had negative income elasticities of demand.

According to Ronning (1991), institutional changes, particularly the International Coffee Agreements (ICAs), have greatly influenced international coffee exports and imports in the past. The last agreement was suspended in 1989 due to increased dissatisfaction among both the producing and importing parties (Gilbert, 1996). When the ICAs were in place, Brazilian coffee exports

increased markedly in the US market relative to the market for Colombian coffee and others in the mild group. Conversely, when the ICAs were suspended, the market share of Colombian coffee and others in the mild group increased relative to Brazilian coffee.

Houston, Santilla, and Marlowe (2003) studied the US demand for mild coffee and found that the US import demand for Colombian coffee was highly responsive to its own price, the price of Mexican coffee and the price of soft drinks. Demand was price inelastic and income elastic and Mexican coffee appeared to be a significant competitor (cross-price elasticity = 0.856). The study showed that the US demand for Mexican coffee was sensitive to its own price, the price of Colombian coffee and the ICA.

The Almost Ideal Demand System (AIDS) developed by Deaton and Muellbauer (1980) has been widely used in several demand analyses. However, due to its non-linearity, the AIDS model was modified and known as the Linear Approximate Almost Ideal Demand System (LA/AIDS). In addition, the own-price and cross-price elasticity formulae suggested by Chalfant (1987) have been commonly employed in many studies (Asche, Bjorndal, & Salvanes, 1998; Lee, Kennedy, & Hilbun, 2008; Poudel & Walter, 2008; Seale & Merchant, 2002). Asche et al. (1998) used the LA/AIDS model to evaluate the demand for salmon from different origins and for different product types in the European market. They considered fresh Atlantic salmon, frozen Atlantic salmon, and frozen Pacific salmon as the three main products. Weak separability was implicitly assumed among the three products. In the LA/AIDS model, they employed the corrected Stone price index, which they argued satisfied the commensurability property. The AIDS model was also used by Seale and Merchant (2002) to analyze the US red wine market. For the purpose of analysis, they considered the US wine imports from seven regions—Italy, France, Spain, Australia, Chile, the rest of the world, and domestic production—as potential substitutes/complements. Poudel and Walter (2008) employed the LA/AIDS model to examine the

demand for imported shrimp by the United States and the European Union (EU). They considered Asia, South America, and Central America in order to estimate US imports. Asia, South America, and the rest of the world were considered in estimating the European imports. In their study, they found all own-price elasticities for US demand to be elastic while all-price elasticities associated with the EU demand were found to be inelastic. In addition, estimated cross-price elasticities suggested substitution among import sources. According to Poudel and Walter (2008), expenditure elasticities of demand for shrimp originating from Asian countries were found to be highly elastic in the US market and the same result was found for expenditure elasticities of demand for shrimp from South America in the European market.

Another study by Lee et al. (2008) also used a modified version of the AIDS model (restricted source differentiated AIDS) to estimate import demand for wine in the South Korean market. In this study, wines from different sources of origin were considered. In addition, red, white, and sparkling wine were investigated; however, white and sparkling wine were combined as one homogenous good. Sources of imported red and white wine were the United States, Italy, Chile, France, Australia, and the rest of the world. In their study, French wine was shown to be a substitute for the others, while wines from the other countries besides France were shown to be complementary with one another. Expenditure elasticity of demand for Chilean white wine was shown to be the largest among all the others (Lee et al., 2008).

Theoretical model

Deaton and Muellbauer (1980) first developed the Almost Ideal Demand System (AIDS), which is non-linear. The advantages of the system are; it is able to give an arbitrary first-order approximation to any demand system; it satisfies the axioms of choice exactly; it aggregates perfectly over consumers; it has a functional form which is consistent with previous household budget data; it is simple to estimate in its linear approximate form; and it can be used to test the restrictions of homogeneity and symmetry (Deaton & Muellbauer, 1980). Blanciforti and Green (1983) noted an additional property to the desirable properties mentioned by Deaton and Muellbauer (1980) that the AIDS model does not require strict substitution limitations implied by the additive demand models such as the Linear Expenditure System (LES). Deaton and Muellbauer (1980) started their approach by setting a specific class of preferences, which represented an exact aggregation over consumers, known as the Price-Independent, Generalized-Logarithmic (PIGLOG) consumer preferences. The PIGLOG is represented through the consumer cost or expenditure function, which is defined as the minimum expenditure necessary to attain a specific utility level at given prices. By applying Shephard's lemma with the expenditure function, the AIDS model in which the expenditure share of a food category is a function of prices and the related food expenditure can be shown as Equation 1:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln P_i + \beta_i (\ln X - \ln P) \qquad (1)$$

Where w_i is the expenditure share of coffee from country i in the Japanese market. The present study focuses on the import demand analysis of Ethiopian coffee and its major competitor countries, Brazil and Colombia. Therefore, coffee imported from all other countries has been aggregated into a variable labeled *Others*. Hence, the subscript i represents Ethiopia, Brazil, Colombia and Others. P_j is the coffee price of the four sources. α_i, β_i and γ_{ij} are parameters to be estimated. X is the total expenditure on coffee imports into Japan in each period of time, and ln P is the translog price index given in Equation 2:

$$\ln P = \alpha_0 + \sum_{i=1}^{4} \ln P_i + 1/2 \sum_{i=1}^{4} \sum_{j=1}^{4} \gamma_{ij} \ln P_i \ln P_j$$
$$(2)$$

The translog price index in Equation 2 is non-linear. Deaton and Muellbauer (1980) suggested a linear approximation of the non-linear AIDS model by using the Stone index given as Equation 3:

$$\ln P^* = \sum_{i=1}^{4} w_i \ln P_i, \qquad (3)$$

Where $P*$ is assumed to be approximately linearly proportional to P. Therefore, by using the Stone index, the AIDS has been termed as the "Linear Approximate Almost Ideal Demand System" (LA/AIDS). Therefore, from Equation 1 it is possible to derive Equation 4:

$$w_i = \alpha_i + \sum_{j=1}^{4} \gamma_{ij} \, ln \, P_i + \beta_i (ln \, X - ln \, P*) \qquad (4)$$

There are three sets of restrictions (Equations 5ะ7) implied by economic theory imposed on the parameters of the estimation in the LA/AIDS:

Adding up: $\sum_{i=1}^{4} \alpha_i = 1,\ \sum_{i=1}^{4} \beta_i = 0,\ \text{and} \ \sum_{i=1}^{4} \gamma_{ij} = 0,$

$$\qquad (5)$$

Homogeneity: $\sum_{j=1}^{4} \gamma_{ij} = 0 \quad \forall_i$ $\qquad (6)$

Symmetry: $\gamma_{ij} = \gamma_{ji} \quad \forall \ i \neq j.$ $\qquad (7)$

Finally, as the budget shares sum to unity due to the adding up condition, the error covariance matrix will be singular. Therefore, to solve this problem, for the four demand equations, only three demand equations were estimated, and then the parameter estimates for the fourth equation (Others) were generated from them. The three equations were estimated simultaneously using Seemingly Unrelated Regression (SUR). The parametric constraints of the homogeneity and symmetry conditions were also taken into account.

The formula for estimating the partial-own and cross-price elasticities of demand (E_{ij}) suggested by Chalfant (1987) is given in Equation 8:

$$E_{ij} = -\delta_{ij} + \frac{\gamma_{ij}}{w_i} - \frac{\beta_i}{w_i} w_j, \qquad (8)$$

Where E denotes Marshallian elasticities, δ_{ij} is the Kronecker delta ($\delta_{ij} = 1$ for $i = j$; $\delta_{ij} = 0$ for $i \neq j$), and are the average market share of coffee from country i and j, and γ_{ij} and β_i are parameters estimated from the LA/AIDS (i, j = Ethiopia, Brazil, Colombia and Others). Expenditure elasticity ($\eta_i = 1 + \frac{\beta_i}{w_i}$) for the LA/AIDS is represented by Equation 9:

$$\eta_i = 1 + \frac{\beta_i}{w_i} \eta_i = 1 + \frac{\beta_i}{w_i} \qquad (9)$$

Data

This paper employed 22 years of quarterly time series data from 1988 to 2009, providing a total of 88 observations. The data on the value and quantity of coffee were obtained from the Japanese Ministry of Trade database (Japan Customs Office, 2010). Prices are in dollars per tonne. The total value of coffee imported into the Japanese market was applied for the total expenditure in the demand system. Along with the relative prices and total consumption expenditure, a dummy variable for the contamination that captures the effects of the cutback in Ethiopian coffee by the Japanese importers during 2008 to 2009 was included in the Ethiopian estimated model.

RESULTS AND DISCUSSION

Descriptive statistics

The descriptive statistics on the expenditure share, price, and expenditure reported in Table 1 show that while Brazil had the highest mean expenditure share (38.3%), it also had the lowest average price (1781.53US$/tonne). Although Ethiopia had the minimum average expenditure share (7.8%), its average price (1894.17US$/tonne) was nearly as high as that of Colombia (1996.54 US$/tonne) whose average expenditure share (30.1%) was the second highest.

Properties of the demand function

Besides the adding up condition that can be conveniently solved, the homogeneity and symmetry conditions were also tested. The homogeneity condition is also known as the "absence of money illusion" since the units in which prices and outlay are expressed have no effect on purchases (Deaton & Muellbauer, 1980). Basically, the homogeneity condition implies that if all prices and income are multiplied by a positive constant, say θ, the quantity demanded must remain unchanged. The symmetry condition restricts the cross-price derivatives of the demand functions to be identical. The Wald test was

employed to determine whether the homogeneity and symmetry conditions held. The test results showed that the homogeneity condition holds at the 5% significance level for all three main equations. The fourth equation (Others) represents the market share of coffee imported into Japan from the countries other than the three main countries of interest. As 19 countries are included in this group, the present study does not pay much attention to this equation due to its complex and less applicable interpretation.

In addition, the null hypothesis of whether the symmetry restriction holds was not rejected for two of the three main equations. However, the symmetry restriction was imposed for the LA/AIDS model since homogeneity and symmetry are met by utility maximization and homogeneity is entailed in the homogeneity of the cost function which is inherent in the AIDS model (Deaton & Meulbauer, 1980).

The LA/AIDS estimation results

Deaton and Muellbauer (1980) suggested that by using the Stone index in the AIDS, the model becomes linear in the parameters and the estimation can be carried out separately by using the Ordinary Least Squares (OLS) method, which is equivalent to maximum likelihood estimation for the system as a whole. Therefore, and firstly, the four budget share equations were estimated separately. For each equation, the serial correlation LM test was used to test for autocorrelation and the White test was used to test for heteroscedasticity. The test results showed that heteroscedasticity was not found, but autocorrelation was found in all four equations. Therefore, autocorrelation was addressed for each equation. Although the OLS method can be applied equation by equation in the LA/AIDS, as suggested by Deaton and Muellbauer, it would be appropriate only if the error terms in the equations were uncorrelated. However, it is possible that the error terms in the four equations are contemporaneously correlated. For this reason, the Seemingly Unrelated Regression (SUR) method was applied to estimate

the budget share equations as a system and correction for autocorrelation was also taken into account. Because the expenditure shares (w_i) of the four equations sum to unity, estimating the demand system composed of four shared equations would be singular. Therefore, the last equation (Others) was dropped to estimate the equation as a system using the SUR. The coefficients of the last equation can be calculated from the adding-up condition. Furthermore, another equation was alternatively dropped and the system was re-estimated in order to ensure the parameters and determine the standard errors of the last equation. The results were similar to those calculated from the adding-up restriction. The estimated parameters from the LA/AIDS model are shown in Table 3.

The own-price parameters were statistically significant for the Ethiopian, Brazilian and Others share equations, but not for the Colombian equation. However, among the 12 cross-price parameters, 8 estimated parameters were statistically significant (with at least a p value < .10). The expenditure parameters of the four equations, except for Colombia, were also statistically significant (with at least a p value < .10). In addition, the contamination dummy was statistically significant (p value < .01) with the correct sign as expected and in accordance with the thoughts of the Ethiopian government. The variable was negatively correlated with the demand for Ethiopian coffee.

The Mashallian own-price and cross-price elasticities were calculated at their sample means and are shown in Table 4. The own-price elasticities carried *a priori* expected negative signs.

The own-price elasticity of demand for Ethiopian coffee was close to unitary elasticity (-1.051), while the own-price elasticities of demand for Brazilian and Colombian coffee were slightly inelastic (-0.91 and -0.94, respectively). The results implied that Japanese consumers are more responsive to the Ethiopian coffee price than to the price of coffee from Brazil or Colombia. The cross-price elasticities of demand for Ethiopian coffee on

Brazilian and Colombian coffee prices had negative signs, implying that Ethiopian coffee behaves as a complement to Brazilian and Colombian coffee. In other words, as the price of Brazilian or Colombian coffee decreases, not only the demand for that coffee will increase, but the demand for Ethiopian coffee will increase as well. However, the cross-price elasticity of demand for Ethiopian coffee on the price of Brazil coffee was very small (-0.257), indicating that they are only weak complements. Undoubtedly, coffee from the other countries besides the three main countries of interest behaves as a substitute good instead of as a complement since the cross-price elasticities had the larger positive sign (0.822). All expenditure elasticities indicated that coffee from all countries imported into Japan was a normal good.

Table 3 Summary statistics of market share, price and expenditure of coffee in the Japanese market

Variable	Mean	Standard Deviation	Minimum	Maximum
Market share				
W_E	0.078	0.033	0.004	0.147
W_B	0.383	0.053	0.282	0.521
W_C	0.301	0.050	0.182	0.406
W_O	0.239	0.063	0.102	0.387
Price (US$/tonne)				
P_E	1894.17	430.67	1017.99	2948.94
P_B	1781.53	538.93	934.63	3248.69
P_C	1996.54	590.75	110.15	3452.46
P_O	2182.58	568.74	1312.81	3620.10
Expenditure (US$)	115,557,190.00	31,265,341.00	59,969,677.00	183,829,560.00

Table 4 Parameter estimates for four coffee equations using the LA/AIDS model

	Dependent variable			
	W_E	W_B	W_C	W_O
P_E	-0.0012*	-0.0063	-0.0653***	0.0727***
	(0.0006)	(0.0186)	(0.0240)	(0.0215)
P_B	-0.0063	-0.0389*	-0.0645	0.1114**
	(0.0186)	(0.0188)	(0.0690)	(0.0504)
P_C	-0.0653***	-0.0645	0.0070	0.1240**
	(0.0240)	(0.0690)	(0.0875)	(0.0540)
P_O	0.0727***	0.1114**	0.1240**	-0.3083***
	(0.0215)	(0.0504)	(0.0540)	(0.0611)
X	0.0359*	-0.1915***	-0.0370	0.1925***
	(0.0189)	(0.0380)	(0.0373)	(0.0402)
CONT	-0.0646***			
	(0.0069)			
Weighted R^2	0.56	0.30	0.20	0.42

Standard error in parentheses

Levels of significance are shown as * = $p < .10$; ** = $p < .05$; *** = $p < .01$

All expenditure elasticities had signs that were consistent with what was expected from economic theory. The expenditure elasticity of demand for Ethiopian coffee was elastic (1.46), implying that Ethiopian coffee is a luxury good. The expenditure elasticity of demand for the Others group (1.806) too was highly elastic suggesting that coffee from this group of countries is a luxury good. On the other hand, the expenditure elasticities of demand for Brazilian and Colombian coffee were inelastic indicating that coffee from both countries is necessary in the Japanese market. This result was consistent with previous studies. Houston et al. (2003) found that Brazilian and Colombian expenditure elasticities were positive and less than unity implying that both commodities are necessities. However, a previous study by Abaelu and Manderscheid (1968) found negative income elasticity for Brazilian coffee suggesting that Brazilian coffee resembles an inferior good. The results from estimating expenditure elasticities showed that, in general, Ethiopian coffee is more desirable than the Brazilian and Colombian alternatives in the Japanese market. As expenditure on coffee imports increases by 1 percent, the demand for Ethiopian coffee will increase by 1.46 percent, while the demand for Brazilian and Colombian coffee will increase by less than 1 percent. However, based on the results of this study, the contamination dummy indicated a significant negative impact on the volume of coffee exported to Japan.

Conclusions and policy implications

This paper examined the demand system analysis of coffee from Ethiopia, Brazil, and Colombia in the Japanese coffee market, especially focusing on the impact of prices and expenditure shares of Ethiopian, Brazilian and Colombian coffee. The Linear Approximate Almost Ideal Demand System (LA/AIDS) was applied using the SUR method. Quarterly data from 1988 to 2009 were collected to estimate the model.

Table 5 Own, cross, and expenditure elasticities for coffee demand in the Japanese market

	P_E	P_B	P_C	P_O	Expenditure(e_{iI})
W_E	-1.051	-0.257	-0.976	0.822	1.460
W_B	0.023	-0.910	-0.018	0.410	0.500
W_C	-0.207	-0.167	-0.940	0.441	0.877
W_O	0.241	0.403	0.456	-2.482	1.806

Elasticities are read from left to right and defined as follows:

1) Own-price elasticity of demand for a good is defined as

$$e_{ii} = \frac{\% \text{ change in } Q_i}{\% \text{ change in } P_i} = \frac{\partial Q_i}{\partial P_i} \times \frac{P_i}{Q_i}$$

2) Cross-price elasticity of demand for coffee is defined as

$$e_{ij} = \frac{\% \text{ change in } Q_i}{\% \text{ change in } P_j} = \frac{\partial Q_i}{\partial P_j} \times \frac{P_j}{Q_i}$$

3) Expenditure elasticity is defined as

$$e_{iI} = \frac{\% \text{ change in } Q_i}{\% \text{ change in } I} = \frac{\partial Q_i}{\partial I} \times \frac{I}{Q_i}$$

where Q_i represents quantity of good i

P_i represents price of good i

P_j represents price of another good j

I represents income (expenditure)

The estimated elasticities showed that Japanese import demand for coffee from Ethiopia, Brazil and Colombia was generally affected more by their own prices than the cross prices and the expenditure elasticity of demand. The own-price elasticity of demand for coffee from Ethiopia was elastic and close to unity, while for each of the other two the own-price elasticity of demand was inelastic and close to unity. Moreover, coffee cross-price elasticity showed that Brazilian and Colombian coffee are complementary goods. The expenditure elasticity of Ethiopian coffee demand was elastic, while for Brazil and Colombia it was inelastic. Based on the findings of the study, in order to improve the market share of Ethiopian coffee, the following policy implications should be addressed:

1. Coffee, from Colombia and Brazil which each hold high market shares in the Japanese market, was found to be complementary with the Ethiopian coffee. Furthermore, Japanese consumption of Ethiopian coffee demonstrated that its demand was slightly price elastic. Hence, the market share and revenue can be markedly increased by pricing policies that make the Ethiopian coffee lower and more competitively priced in the Japanese market. That is, since the own price of demand for Brazil and Colombian coffee is inelastic, these countries can increase the price to earn more revenue. This increase in price of a complementary good reduces the demand for Ethiopian coffee; thus, it would be better to consider other factors that affect the demand for Ethiopian coffee such as own price and the quality issues of Ethiopian coffee.

2. Ethiopia has established premium organic brands of coffee in Japan including Harrar, Jimma, and Sidamo. This could explain why the expenditure elasticity of Ethiopian coffee is elastic. If Japan imports more coffee, Ethiopian coffee exporters will benefit. However, based on the results of this study, the contamination dummy indicated a significant negative impact on the volume of coffee exported to Japan. The negative impact of the contamination variable implies that consumers in the Japanese

market seemed to lose confidence in Ethiopian coffee. Therefore, understanding the preference of the market and maintaining the quality standards of coffee in the Japanese market has to be given considerable attention to maintain and/or improve the market share and competitiveness of Ethiopian coffee.

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