International Competitiveness of Vietnamese Rice Sector : From the Viewpoint of Product Differentiation

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International Competitiveness of Vietnamese Rice Sector: From the Viewpoint of Product Differentiation

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This study clarifies the international competitiveness of the Vietnamese rice sector from the viewpoint of product differentiation. To estimate world demand for rice, we use a linear approximate almost ideal demand system model. The main results are as follows. First, the absolute value of own price elasticity of demand for Vietnamese rice is more than 1; therefore, lowering the price is an effective strategy for Vietnam. Second, expenditure elasticity of demand for Vietnamese rice is 3.846, the highest value among the major rice exporters (Vietnam, Thailand, India, and Rest of the world), so Vietnam can get the greatest advantage to expand exporting rice because we can expect that the world will spend more on rice. Third, based on the results of cross price elasticities, Vietnamese rice has an international competitiveness from the viewpoint of product differentiation because Vietnamese rice as a product differs from Thai and Indian rice, and their prices do not significantly affect the demand for Vietnamese rice.

Key words: International competitiveness, Product differentiation, Vietnamese rice, World demand

INTRODUCTION

Rice is the most important agricultural commodity of Vietnam, a developing country with an agriculture–based economy. Along with the special mission to ensure national food security, the rice industry also plays a crucial role in boosting economic growth through exports. Thanks to "Doi Moi," launched in 1986, Vietnam took the initial steps to change from a rice importing country to enter the export market as shown in Figure 1 and recently became one of the world's largest rice exporters.

"Doi Moi", in fact, were fundamental economic reforms which aimed at making transformation from centralized economy to open–market economy. To agriculture, essential efforts which the renovation program brought included giving land to farmers and allowing them to sell their own products to get benefits; encouraging the establishment of private businesses as well as stimulating individuals and households to operate their own small businesses. Besides, to strengthen Vietnamese competitive power in the international market, the government liberalized regulations for foreign investors and reduced trade barriers. As a result, Vietnamese agriculture has obtained recognized remarkable successes. Rice sector is not only capable to fulfill domestic demand but also to supply for exports with the large quantity only after Thailand and/ or India.

However, to gain competitive advantages over other players in the global market seems a challenging task for Vietnam. In fact, as Figure 2 shows, Vietnam's rice exports began decreasing recently, while other competitors (Thailand, India) are continuously expanding their rice export markets.

Consequently, the problem of how to increase Vietnamese rice's international competitiveness to expand exports has attracted attention from many researchers. For example, Nielsen (2003) examined the economic consequences of Vietnam's rice policy on rice production and exports. Lakkakula *et al.* (2015) used an econometric shift–share approach to analyze the factors affecting the change in the market shares of major rice exporting countries.

It can be seen that most previous research focused only on analyzing competitiveness from the productivity and agricultural support policy perspectives, but failed to address it from the product differentiation approach. The field requires a clearer understanding of world demand for Vietnamese rice to effectively measure the international competitiveness of Vietnamese rice sector, one of the most decisive factors affecting Vietnam rice exports.

Therefore, this study aims to clarify the international competitiveness of the Vietnamese rice sector from the viewpoint of product differentiation. This research will focus on world demand for rice rather than a specific country's demand because we want to clarify the worldwide tendency.

This paper is organized as follows. Section 2 gives a brief overview of the model used in the study. Section 3 describes the data and procedures. We interpret the estimation results in Section 4. We discuss the world demand for Vietnamese rice in Section 5, and summarize the results and describe the remaining issue for future research in Section 6.

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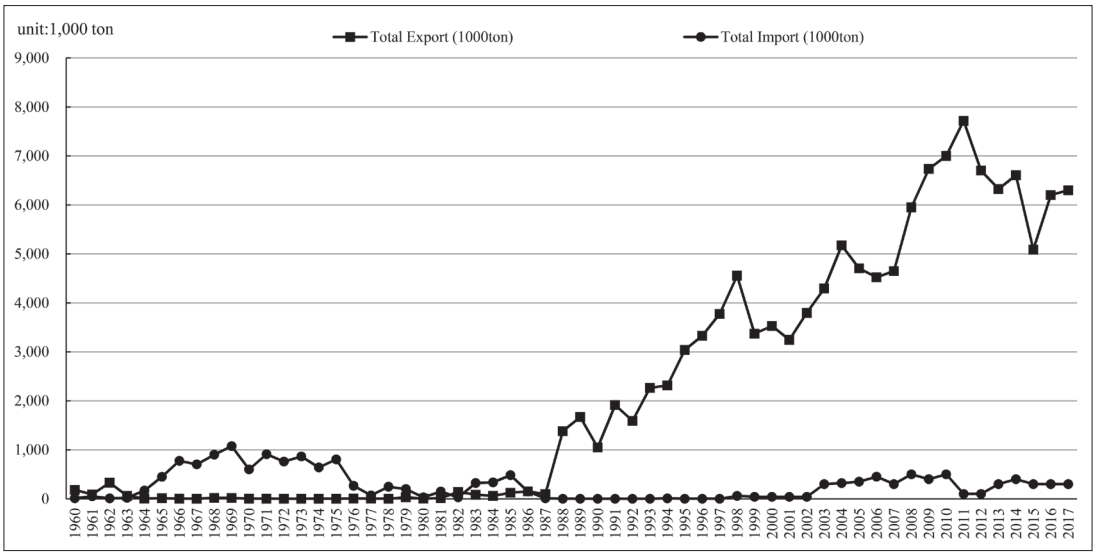

Figure. 1. Vietnamese Rice: Total Export and Total Import (Milled basis)
Data Sources: USDA: PS&D Online December 2017; USBC: International Data Base, August 2006

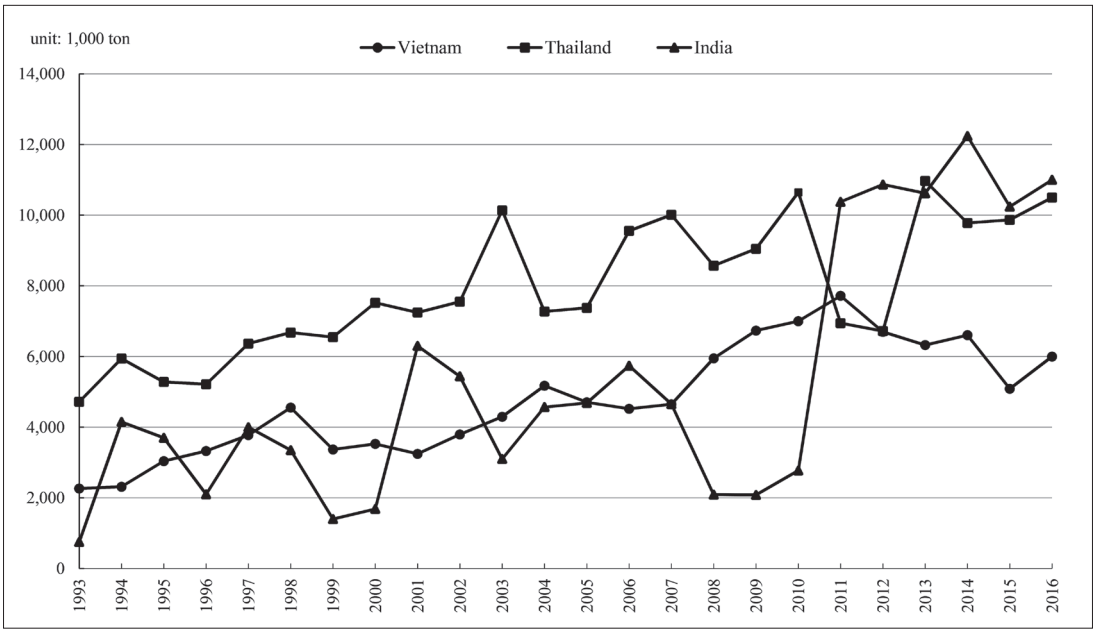

Figure. 2. Total rice exports of Vietnam, Thailand, and India (1993–2016)
Data sources: USDA, 2017.

MODEL

To estimate world import demand for rice effectively, we use Deaton and Muellbauer's (1980) linear approximate almost ideal demand system (LA/AIDS) model in this study. The LA/AIDS model is expressed as follows.

$$w_{it} = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_{jt} + \beta_i \ln\left(\frac{X_t}{P_t}\right) + \upsilon_{it}, \qquad (1)$$

where w_{it} is the expenditure share of country i; p_{jt} is the price of country j; X_t is the world expenditure for rice; υ_{it} is the error term; t represents period t; and α_i, γ_{ij} and β_i are the parameters. For the price index P_t, we use the log–linear analogue of the Laspeyres price index as Moschini (1995) suggests, as follows.

$$\ln P_t = \sum_{i=1}^{n} \overline{w}_{it} \ln p_{it}, \qquad (2)$$

where $\overline{w}_{it}$ is the sample mean of the expenditure share of county i.

Parameter restrictions are imposed as follows:

Adding–up restriction

$$\sum_{i=1}^{n} \alpha_i = 1, \sum_{i=1}^{n} \gamma_{ij} = 0, \sum_{i=1}^{n} \beta_i = 0 \qquad (3)$$

Homogeneity restriction $$\sum_{j=1}^{n} \gamma_{ij} = 0 \qquad (4)$$

Symmetry restriction $$\gamma_{ij} = \gamma_{ji} \qquad (5)$$

The formulas to calculate the price elasticity of demand and expenditure elasticity of demand are as follows.

$$\text{Price elasticity} \qquad \eta_{ij} = \frac{\gamma_{ij} - \beta_i w_j}{w_i} - \delta_{ij} \qquad (6)$$

$$\text{Expenditure elasticity} \qquad e_i = 1 + \frac{\beta_i}{w_i}, \qquad (7)$$

where δ_{ij} is the Kronecker delta, if $i = j$, $\delta_{ij} = 1$ and zero otherwise. Additionally, η_{ij} indicates the elasticity of demand for county i to the price of county j. We evaluate the above elasticity by the sample mean of expenditure share.

DATA AND PROCEDURES

The target rice exporting countries in this study are Vietnam, Thailand, India (the three largest rice exporters globally), and we group all other exporting countries into Rest of the world (ROW).

In this study, we use annual rice import data from the UN Comtrade database for the period from 1993 to 2015, and aggregate the import data for 69 countries as world imports. We make this choice because we can obtain import data in 1993 for only the 69 countries, and the percentage of total of rice imported quantity for the 69 countries to rice imported quantity for world in 2015 is more than 50[1]. Accordingly, we can assume that these 69 countries are world's main importers.

We also use data for paddy (HS code 100610), husked (HS code 100620), milled (HS code 100630), and broken rice (HS code 100640), all of which we convert to their milled equivalents. We convert paddy and husked rice using conversion ratios of 0.65 and 0.80, respectively, while broken rice and milled rice are equivalent (Barreiro–Hurle, 2012).

We obtain the nominal price by dividing the import value by import quantity (milled equivalent), and following Konandreas *et al.* (1978) and Honma (1983), we obtain the effective price as follows.

$$\text{Effective Price}_{t\ year} = \frac{\text{Nominal price}_{t\ year}}{\left(\frac{CPI_{t\ year}}{100} \cdot \frac{ER_{base\ year}}{ER_{t\ year}}\right)}, \qquad (8)$$

where $ER_{base\ year}$ is the exhange rate (national currency per US dollar) of the base year, $ER_{t\ year}$ is the exhange rate (national currency per US dollar) for year t[2].

In this study, we set the base year for the consumer price index and exchange rate as 2010. We obtain the consumer price index and exchange rate data from the IMF's International Financial Statistics[3].

Table 1 provides the sample means and sample standard deviations for the data.

ESTIMATION RESULTS

We estimate the LA/AIDS model using the iterated seemingly unrelated regression method. In addition, because the previous estimation implies serial correlation in the error terms, we assume a first–order serial correlation in the error term ($\upsilon_{it} = \rho \upsilon_{it-1} + \varepsilon_{it}$) and conduct the estimation following Yen and Chern's (1992) method below.

Table 1. Sample means and sample standard deviations for quantity, effective price and expenditure share

(Unit: thousand tons, US$/kg)

	Vietnam	Thailand	India	Rest of the world
Quantity	1,408.542 (980.761)	2,681.759 (663.837)	1,612.825 (812.614)	5,329.351 (807.939)
Effective price	0.555 (0.408)	0.788 (0.274)	0.926 (0.478)	3.614 (5.204)
Expenditure share	0.064 (0.051)	0.180 (0.088)	0.136 (0.079)	0.620 (0.193)

Note: The upper row shows the sample mean and the lower row in parentheses shows the sample standard deviation.

[1] The 69 rice import countries are: Algeria, Argentina, Australia, Bangladesh, Belize, Bhutan, Bolivia (Plurinational State of), Brazil, Brunei Darussalam, Burundi, Canada, Central African Rep., Chile, China, China Hong Kong SAR, China Macao SAR, Colombia, Congo, Croatia, Cyprus, Czechia, Denmark, Dominica, Ecuador, Finland, Gabon, Germany, Greece, Grenada, Guatemala, Hungary, Iceland, India, Indonesia, Ireland, Jamaica, Japan, Madagascar, Malawi, Malaysia, Mauritius, Mexico, Morocco, the Netherlands, New Zealand, Nicaragua, Norway, Oman, Paraguay, Peru, Portugal, Rep. of Korea, Romania, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Saudi Arabia, Singapore, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Trinidad and Tobago, Tunisia, Turkey, United Kingdom, USA, and Vanuatu.

[2] Our deflation works as follow. First, we deflate the import values of each import country by exporter (Vietnam, Thailand, India, and world total) using the CPI and exchange rates of each import country as in equation 8. Second, we summed the deflated import values for the 69 countries by exporter. Third, we calculate the import value for the rest of the world by subtracting the import values for Vietnam, Thailand, and India from the import value of the world total.

[3] We supplemented missing consumer price index and exchange rate data from the United Nations Statistical Yearbook series.

$$w_{it} = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_{jt} + \beta_i \ln \left(\frac{X_t}{P_t} \right) - \rho \left[\alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_{jt-1} + \beta_i \ln \left(\frac{X_{t-1}}{P_{t-1}} \right) \right] + \rho w_{it-1} + \varepsilon_{it}, \quad (9)$$

where ε_{it} is the stochastic variable.

In addition, we carried out the estimation excluding the expenditure share equation for the ROW to avoid the singularity problem.

Table 2 provides the estimation results. The coefficient of determination is from 0.807 to 0.858, which indicates that we can obtain good estimation results generally.

In addition, Table 3 shows the estimation results for price elasticity and expenditure elasticity of demand.

WORLD DEMAND FOR VIETNAMESE RICE

We consider the demand for Vietnamese rice in the world market using the price and expenditure elasticities shown in Table 3 in this section.

First, we focus on own price elasticities, which for Vietnam is –1.453, Thailand is –0.850, India is –0.744, ROW is –0.465, and all values are significant at the 1% level. The absolute values of own price elasticity of demand for Thai, Indian, and ROW's rice are less than 1, but the absolute value of own price elasticity of

Table 2. Parameter estimation results

Parameter	W_V	W_T	W_I	W_R
α_i	–4.134*** (–5.155)	0.945 (0.866)	–1.591 (–1.433)	5.779*** (4.651)
β_i	0.182*** (5.266)	–0.030 (–0.638)	0.076 (1.598)	–0.228*** (–4.255)
γ_{iV}	–0.017 (–1.292)			
γ_{iT}	0.044*** (3.144)	0.022 (1.018)		
γ_{iI}	0.012 (1.205)	0.014 (1.136)	0.045*** (3.351)	
γ_{iR}	–0.038*** (–6.070)	–0.080*** (–8.502)	–0.071*** (–8.079)	0.190*** (17.529)
ρ		0.250** (2.106)		
R^2	0.807	0.858	0.823	
D.W.	1.929	2.007	1.307	

Notes: 1) In column 1, row 1: V = Vietnam, T = Thailand, I = India, R = Rest of the world.
2) The upper row shows the estimated value and the lower row in parentheses shows the t value.
3) The critical value of the t distribution in the degrees of freedom for the demand system of 53 is 1.674 at the 10% level, 2.006 at the 5% level, and 2.672 at the 1% level. Additionally, **, and *** indicate that the estimated value is statistically significant at the 5% and 1% levels, respectively.
4) R^2: the coefficient of determination; D.W. : Durbin–Watson statistic.
5) α_R, β_R, γ_{iR} were analyzed after estimation using the delta method.

Table 3. Price elasticity and expenditure elasticity of demand

		World demand for rice			
		Vietnam	Thailand	India	Rest of the world
Price	Vietnam	–1.453*** (–6.458)	0.255*** (3.042)	0.050 (0.618)	–0.038*** (–3.053)
	Thailand	0.177 (0.816)	–0.850*** (–7.196)	0.005 (0.046)	–0.063*** (–3.298)
	India	–0.205 (–1.391)	0.103 (1.411)	–0.744*** (–7.867)	–0.065*** (–4.155)
	Rest of the world	–2.364*** (–6.369)	–0.342* (–1.856)	–0.873*** (–3.542)	–0.465*** (–7.570)
Expenditure		3.846*** (7.117)	0.833*** (3.191)	1.562*** (4.441)	0.632*** (7.299)

Notes: 1) The upper row shows the estimated value and the lower row in parentheses shows the t value.
2) The critical value of the t distribution in the degrees of freedom for the demand system of 53 is 1.674 at the 10% level, 2.006 at the 5% level, and 2.672 at the 1% level. Additionally, * and *** indicate that the estimated value is statistically significant at the 10% and 1% levels, respectively.

demand for Vietnamese rice is more than 1. When the absolute value of own price elasticity of demand is more than 1, if the import price decreases by 1%, the import quantity increases by more than 1%; thus, the import value increases. We can therefore say that lowering the price is not so effective strategy for Thailand, India, and ROW. On the other hand, it is an effective strategy for Vietnam.

Second, we focus on expenditure elasticity of demand, and estimated values for all countries are significantly positive. Most interestingly, the value of expenditure elasticity of demand for Vietnam is the highest at 3.846, followed by India (1.562), Thailand (0.833), and ROW (0.632). This result indicates that when the world spends more on rice, Vietnamese rice will be in the most dominant position with the sharpest increase in world demand for its rice. Actually, world expenditure for rice has been increasing annually; therefore, Vietnam can get the greatest advantage to expand exporting rice.

Third, we target cross price elasticity of demand. The elasticity of demand for Thai rice to the price of Vietnamese rice is 0.255 and significant, but the other cross price elasticities among the three major exporting countries are not significant[4]. From this result, we can say that Vietnamese rice has an international competitiveness from the viewpoint of product differentiation because it differs from Thai and Indian rice, and their prices do not significantly affect the demand for Vietnamese rice. Additionally, the price of Vietnamese rice significantly affects the demand for Thai rice. On the other hand, the price of Vietnamese and Thai rice do not significantly affect the demand for Indian rice. We can thus say that Vietnam and India have established a unique position in the world market. Based on our results above, we can say that Vietnam should plot their strategy for expanding rice exports based on the product differentiation of Vietnamese rice from Thai and Indian rice.

SUMMARY AND CONCLUSIONS

This study investigates the international competitiveness of the Vietnamese rice sector from the viewpoint of product differentiation. We used the LA/AIDS model to estimate world demand for rice imported from major rice exporters (Vietnam, Thailand, India, and ROW). The major results are as follows.

First, the absolute value of own price elasticity of demand for Vietnamese rice is more than 1; therefore, lowering the price is an effective strategy for Vietnam.

Second, the expenditure elasticity of demand for Vietnamese rice is 3.846, the highest value among the major rice exporters, so Vietnam can gain the greatest advantage to expand exporting rice because we can expect that the world will spend more on rice.

Third, based on the cross price elasticity results, Vietnamese rice has an international competitiveness from the viewpoint of product differentiation because it differs from Thai and Indian rice, and their prices do not significantly affect the demand for Vietnamese rice.

However, this study implies a future issue. As Figure 2 shows, in recent years, Thailand and India increased their export quantities, while that for Vietnamese rice decreased. Surprisingly, the results of this study indicate that the recent observed fall–off in Vietnamese rice exports is not a result of the change in Thai and Indian rice prices. Further studies are therefore needed to investigate the reasons for the decline in the export quantity of Vietnamese rice.

AUTHOR CONTRIBUTIONS

Nu Thi LE and Kohya TAKAHASHI designed the study, analyzed the data, and wrote the paper, and Koshi MAEDA designed and supervised the whole of study.

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[4] The cross price elasticities between major export countries (Vietnam, Thailand, and India) and the ROW, the significant complementary relationships are estimated. We need to do further research in the future on this point.