

Analysis of Competitiveness between U. S. and Thai Rice Exports

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This research attempts to investigate the competitiveness of the two largest rice exporters, Thailand and the U.S. The results show that importers are sensitive to relative prices between U.S. and Thai rice. Importers were also found to take the sources into account in determining portion of rice purchased from each supplier as expenditures for imported rice increase. These results generally suggest that it is important for individual exporters to keep rice export prices in line with prevailing competitor's prices and to actively promote own rice in the world rice market.

Key Words : rice, trade-flow, market-share, export competition, and covariance model analysis.

Introduction

The competitiveness of world agricultural commodities is currently of great concern to policy makers in most agricultural exporting countries. Competitiveness depends on several factors, of which price competitiveness is only one. The preferences of importers for commodities originating in a specific country may be influenced by trade agreements, cultural affinity between the exporting and importing countries, past commercial relations and familiarity with distribution channels in the exporting country, and many other factors. It has been argued that bilateral agreements are critical in determining trade flows (Heidhues, 1979⁶⁾; and McCalla and Josling, 1985⁹⁾). There is evidence that trade agreements can lead to rapid and dramatic changes in the behavior of trading countries (Gardner and Skully, 1987⁵⁾). Others have argued that the price of U.S. exports relative to the prices of other exporters is the critical determinant of market share. The large fall in U.S. rice and cotton prices following implementation of marketing loans appears to have resulted in substantial increases in U.S. exports of these commodities (USDA, 1986¹⁵⁾ and 1986¹⁶⁾). On the other hand, Gardiner and Dixit (1986)⁴⁾ have found a broad range of estimated price elasticities of foreign demand for U.S. commodities suggesting that the response of importers to U.S. prices is difficult to identify.

The purpose of this paper is to develop a measure of price responsiveness and importer preferences as well as market share stability for rice imports from the United States and

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Thailand. The U.S. and Thailand are the two major rice exporting countries accounting for approximately 50% of total world rice exports and have not changed much market in recent years (Table 1). /1 In the first half of the 1980's, the U.S. share of rice exports relative to the Thai share fell sharply (Table 2). Measures of importer behavior are used to explain

Table 1 Rice exports of the U. S. and Thailand relative to the world total exports. ¹
(milled, million metric tons)

	Total of U. S. & Thai.	World total	U. S. & Thai share of world total, %
1962	1.87	6.85	27
1963	1.98	7.07	28
1964	2.52	7.49	33
1965	2.87	7.33	39
1966	2.41	7.34	32
1967	2.50	6.37	39
1968	2.20	6.74	32
1969	1.94	7.20	27
1970	1.91	7.65	24
1971	1.98	7.62	26
1972	2.94	7.19	40
1973	1.35	6.57	20
1974	2.22	6.77	32
1975	2.19	7.50	29
1976	3.16	9.68	32
1977	4.74	9.05	52
1978	3.40	11.45	29
1979	4.59	12.17	37
1980	5.42	12.66	42
1981	5.87	11.45	51
1982	6.01	11.50	52
1983	5.41	12.12	44
1984	6.30	10.99	57
1985	5.41	12.18	44
1986	6.77	12.41	54

1 : Excludes U. S. government shipments.

Sources : Data for the total of U. S. and Thailand are from the *Commodity Trade Statistics* (United Nations) , and data for the world total are from the *World Grain Situation and Outlook* (U. S. Department of Agriculture) .

Table 2 U. S. and Thai rice exports and prices.

(milled basis, million metric tons)

	U. S. ¹ exports	Thai exports	Total ²	Share ³ of U. S. (%)	U. S. ⁴ export price	Thai ⁴ export price	Price ratio, U. S./Thai
1962	0.60	1.27	1.87	32	145	122	1.18
1963	0.56	1.41	1.98	28	148	115	1.28
1964	0.62	1.89	2.52	24	154	111	1.38
1965	0.98	1.89	2.87	34	157	109	1.43
1966	0.90	1.50	2.41	37	169	127	1.33
1967	1.02	1.48	2.50	40	172	150	1.14
1968	1.14	1.06	2.20	51	182	169	1.07
1969	0.92	1.02	1.94	47	181	138	1.31
1970	0.84	1.06	1.91	44	174	113	1.53
1971	0.41	1.57	1.98	20	172	88	1.94
1972	0.83	2.11	2.94	28	190	100	1.89
1973	0.51	0.84	1.35	37	330	207	1.59
1974	1.19	1.02	2.22	53	493	468	1.05
1975	1.24	0.95	2.19	56	401	301	1.32
1976	1.18	1.97	3.16	37	298	213	1.39
1977	1.80	2.94	4.74	37	311	222	1.39
1978	1.79	1.60	3.40	52	396	319	1.24
1979	1.79	2.79	4.59	39	366	272	1.34
1980	2.62	2.80	5.42	48	419	340	1.23
1981	2.84	3.03	5.87	48	477	399	1.19
1982	2.18	3.83	6.01	36	387	255	1.51
1983	1.94	3.47	5.41	35	383	252	1.52
1984	1.68	4.61	6.30	26	385	237	1.62
1985	1.35	4.06	5.41	24	338	204	1.65
1986	2.25	4.52	6.77	33	245	170	1.44

1 : Excludes the government shipments such as PL 480, Foreign donations (Section 416) , and AID Mutual Security shipments.

2 : Total of U. S. and Thai rice exports. Due to rounding, total numbers may not be exactly the same as numbers adding U. S. and Thai exports.

3 : Share of the U. S. rice exports relative to the total of U. S. and Thai rice exports.

4 : Average prices of Thai and U. S. rice exports to the fifteen importing regions.

Source : *Commodity Trade Statistics*, the United Nations.

these changes in market share. The results of the analysis are useful in identifying the key factors underlying the competitiveness of an exporting country in the world rice market.

Fifteen major rice importing regions in the world were included in this analysis. They are Brazil, Belgium-Luxembourg, France, West Germany, Iran, Iraq, Italy, South Korea, Netherlands, Nigeria, Saudi Arabia, Senegal, Singapore, United Kingdom, and the rest of the world. The first fourteen countries account for approximately half of the total rice imports from the U.S. and Thailand, while the rest of the world region accounts for the rest during the study period, 1962 through 1986 (Table 3).

Table 3 Annual average rice exports from U. S. and Thailand, and U. S. shares in individual importing regions during 1962 and 1986.

	Total ¹ exports (1000 MT)	Share of U. S. (%)
Brazil	183	23
Belgium-Luxembourg	54	89
France	20	66
W. Germany	50	89
Iran	229	48
Iraq	170	70
Italy	103	58
S. Korea	217	76
Netherlands	67	61
Nigeria	207	63
Saudi Arabia	203	57
Senegal	143	28
Singapore	178	2
United Kingdom	45	85
Rest of the world	2,014	29

1 : Total of U. S. and Thai rice exports excludes the U. S. government shipments.

Source : *Commodity Trade Statistics*, the United Nations.

U.S. Rice market shares

The U.S. share of rice export markets relative to the Thai share fluctuated during the period studied. The U.S. accounted for about 30% of the total exports from the two countries during the first half of the 1960's (Table 2). The proportion accounted for by the U.S. increased sharply in the second half of the 1960's reaching 51% in 1968, and decreased in the early 1970's. In 1971, in particular, Thailand exported four times the quantity exported from the U.S. Since 1971, U.S. share has increased reaching 56% in 1975. Although the U.S. share continued to fluctuate in the last half of the 1970's, U.S.

rice exports increased steadily and reached 2.84 million MT in 1981, 48% of the total exports from the U.S. and Thailand. /2 Since then, however, both the volume and the share of U.S. rice exports decreased, until the marketing loan was implemented in 1986.

These fluctuations of the U.S. share can be indirectly explained by the availability of Thai rice for exports. Weather in Thailand occasionally causes a crop failure which reduces the volume of Thai exports. The ratio of U.S. prices to Thai prices also fluctuates overtime. Although U.S. rice prices were higher than Thai prices throughout the period, the differences were greater in 1971 and 1972, while prices were almost the same in 1968 and 1974 (Table 2). Between 1975 and 1981, U.S. prices fell from 40% higher than Thai prices to 20% higher. Between 1982 and 1985, however, U.S. prices were 50% higher than Thai prices, because high loan rates were locked in by U.S. farm policy and the U.S. dollar was appreciating.

The U.S. share relative to Thai shares in the individual importing regions vary (Table 3). It is, on average, high in Europe with Belgium-Luxembourg, W. Germany, and the U.K. at almost 90%. In France and the Netherlands, U.S. rice makes up over 60% of the total imported from the both countries. The U.S. share in Italy, the major rice importing country in Europe, averaged 58%. U.S. shares in S. Korea and Iraq are 76% and 70%, respectively. Consumers in S. Korea prefer Japonica type rice, which is not produced in Thailand. In Nigeria, Iran, and Saudi Arabia, U.S. shares are 63%, 58%, and 57%, respectively. In Senegal, Brazil, and the rest of the world, U.S. rice exports account for less than 30%. The lowest U.S. share is found in Singapore, which is located close to Thailand.

Modeling Approach

A method of multi-step budgeting process is employed in this study. This type of procedure has been used in previous trade studies by Resnick and Truman (1973¹¹) and 1974¹²), wells and Johnson (1979¹⁷), Arnade and Davison (1987)¹, and Davison and Arnade (1987)². /3 The number of steps to be processed varies among studies. Arnade and Davison (1987)¹ and Davison and Arnade (1987)² took two steps, while Resnick and Truman (1973)¹¹ took more steps. It is assumed that goods can be grouped into smaller categories as demand is determined step by step. The first step of the budget allocation process is to distribute the total budget among the various groups of products according to substitutability or complementarity. Once a portion of the budget is allocated to each group, demand for products within a particular group is assumed to be independent of demand for products in other groups. In the final step, products are grouped according. Demand at each step is assumed to depend on price levels of the products in the group and on the budget allocated to the group. Thus, demand for product, q_{ij} (j -th product in the i -th group), at the final step, is specified as :

$$(1) \quad q_{ij} = f (P_{i1}, P_{i2} \dots\dots\dots P_{im}, Y_i),$$

where, P_{im} is the price level of product q_{im} , and Y_i is the budget allocated to group i .

In this study, the budgeting process is assumed to be conducted in successive steps by each rice importing country. First, the budget is divided among commodity groups, one of which is rice and its substitutes and complements. Subsequent allocations separate rice from other products leaving a group that includes domestic and imported rice. Once the total demand for rice is determined, a category of imported rice including the amounts imported from various rice exporters is separated from domestic rice. Finally, imported rice is separated into rice from the U.S. and Thailand and rice from other exporters. /4 A portion of the total budget of the importer is assumed to be allocated to the group of rice imported from the U.S. and Thailand at this final step. The amount of rice imported from a specific exporting country is dependent on own price and price levels of rice exported from the other country and the budgetary amount allocated to this imported rice category.

Equation (1) is regarded as a basic specification for a demand analysis. However, when applied for a trade analysis, this specification often causes multicollinearity problems, and it is difficult to evaluate the estimated coefficients. In trade models, this type of problem is frequently encountered (Wells and Johnson, 1979¹⁷⁾; Arnade and Davison, 1987¹⁾; and Davison and Arnade, 1987²⁾). /5 Another problem with this type of specification is that agricultural imports are affected by changes in domestic production in the importing country. While the dependent variable q_{ij} in Equation (1) is affected by change in domestic production, the specification does not account for the effects of domestic production on imports. /6

To avoid multicollinearity and to incorporate the characteristics of agricultural imports mentioned above, the basic import demand equation can be specified as follows :

$$(2) \quad q_{ij} / Q_i = f (P_{ij} / P_i, Y_i^*, ZD_{ij}),$$

where, q_{ij} / Q_i is the share of product q_{ij} in the i -th group (or market) Q_i ; P_{ij} is the price of q_{ij} ; P_i is a weighted average price of all products in the i -th group excluding q_{ij} ; Y_i^* is the portion of the budget allocated to the i -th group; and ZD_{ij} is a demand shifter for the exporter in question. Because the equation is specified with market share as the dependent variable, the problem of variations in the volume imported due to fluctuating domestic production is avoided. This functional form is useful in analyzing an exporter's competitiveness in agricultural trade. Changes in market share reflect an exporter's ability to compete with other suppliers of products in the same market.

Price variables P_{ij} and P_i are both expressed in U.S. dollars. The price ratio variable, therefore, is assumed to have already accounted for the effects of changes in exchange rates of currencies among exporters, because a change in exchange rate is reflected in the export prices.

Equation (2) is further modified in order to reflect the final budgeting step, where division of rice imports between Thailand and the U.S. is determined. Incorporating cross-sectional and time-series data, a covariance model (Pindyck and Rubinfeld, 1981¹⁰⁾; and

Judge *et al*, 1985⁸⁾) was used employing intercept and slope dummies. Trade-flow data for all individual importing regions are pooled and analyzed in a single equation specified as follows :

$$(3) \quad (q_U / Q_{UT})_{kt} = a_k + b_k (P_U / P_T)_{kt} + c_k (Y^*) + \sum_{s=1} d_{sk} (ZD)_{skt} + e_{kt}$$

where,

q_U = volume of rice imported from the U.S. in metric tons,

Q_{UT} = total volume of rice imported from the the U.S. and Thailand in metric tons,

k = 1, 2, 15 (rice importing regions),

t = 1962, 1963, 1986 (time period),

s = 1, 2, s (the number of ZD's in individual importing regions),

P_U = import price of rice from the U.S., US\$ / MT,

P_T = import price of rice from Thailand, US\$ / MT,

Y^* = budget allocated to rice imported from the U.S. and Thailand, US\$ in million, deflated by the U.S. consumer price index,

ZD = other demand shifters,

e = error term,

$a, b, c, d,$ = estimated coefficients.

This specification allows us to examine the differences in magnitude of responses to changes in relative prices and budget expenditures in individual rice importing regions. A negative sign is expected for the coefficients of the price ratio variables, b , while the sign for c can be either positive or negative. If c is positive for an importing region, the region tends to favor U.S. rice as the budget allocated for rice imports from the U.S. and Thailand increases. If, on the other hand, the sign is negative, it means that the importing region favors Thai rice. Furthermore, a negative budget coefficient can be also interpreted to mean that the importing region increases the volume of imported rice by purchasing cheaper rice from Thailand instead of improving quality by importing U.S. rice. Estimates of the intercepts for the individual regions in Equation (3) may reflect other factors such as the stability of U.S. market shares after accounting for reactions to changes in relative prices and budget allocation in the region.

The model was estimated with the general linear model (GLM) procedure in SAS software package (Freund and Littell, 1991),³⁾ The package has been programmed to calculate variances of estimated coefficients for variables which are treated with slope dummies.

Data

Annual trade-flow data between exporters and importers were collected from *Commodity Trade Statistics* published by the United Nations.¹⁴⁾ The time period for the research is twenty-five years from 1962 through 1986. Exchange rates are from *International Financial Statistics* published by the International Monetary Fund (1987).⁷⁾

Some U.S. rice is exported under government programs such as PL480, Foreign donations (Section 416), and AID (Agency for International Development) mutual security. Because the actual prices of these government financed rice exports deviate from the market prices substantially, the amounts and values of U.S. rice exports under these programs are excluded from the analysis. /7 Also, countries that are major rice importers but are heavily dependent on the U.S. government shipments such as Bangladesh and Indonesia are deleted from this analysis.

The regions analyzed here are major rice importers. In some years, however, a particular region may import only a small amount of rice. This may occur because domestic production is larger than anticipated or as a result of other economic factors. In any case, it is unlikely that the same procedures for purchasing rice are followed in these exceptional years. During the total sample period there are fifty observations where total imports were less than 500 MT : 1962 through 1971, 1973 through 1976, and 1982 in Brazil ; 1963, 1966, 1967, 1969, 1970, and 1973 in Iran ; 1965 through 1970 in Iraq ; 1962 through 1966, 1968 through 1970, 1973, and 1974 in Italy ; 1962, 1963 through 1966, 1973, 1985, and 1986 in S. Korea ; and 1968 through 1970, 1972, and 1973 in Nigeria. These observations are excluded from the analysis because the quantities are so small that it cannot be assumed that importer behavior will be the same as for the rest of the sample. There are no data for budget allocated to imported rice. Therefore, the budget in each country was approximated from the total value of imports and deflated by the consumer price index in the U.S. Import prices at individual importing countries are also unavailable. Prices of imported rice from Thailand and the U.S. were estimated from total value of imports divided by the quantity in each importing country. Data for ZD specified in Equation (3) for individual importing countries were unavailable. Accordingly, the model was estimated without them.

Results

The statistical results are significant with F-value of 11.17, R-square of 0.637, and 280 degrees of freedom (Table 4). The price ratio coefficients have the expected negative sign for all the importing regions except for S. Korea, Saudi Arabia, and Singapore. None of these three price coefficients with the unexpected sign are statistically significant, however. Among the price coefficients with the expected sign, those for Italy, the Netherlands, Nigeria, and Senegal are significant at 5% level and Iraq at 20% level.

Elasticities of U.S. market share with respect to the price ratio were calculated for individual importing regions based on the estimated results of Equation (3). They are reported in Table 5. The calculated price elasticities for European countries generally are inelastic as observed in Belgium-Luxembourg, France, W. Germany, and U.K. However, the major rice importers in Europe such as Italy and the Netherlands had elastic price elasticities at -2.469 and -1.283, respectively. A large price elasticity indicates that the exporters in a country are sensitive to relative prices, changing from one supplier to another in line with relative price changes. In Africa, Senegal had the largest price elasticity at -2.993 followed by Nigeria at -1.485. The estimate for Brazil at -2.697 was also very elastic. The elasticity for the rest of the world was -1.305, suggesting that the majority of rice importers included in this region are also considerably price responsive.

The results also show that the budget expenditure coefficients, for which both positive and negative signs are possible, vary greatly among the importing regions (Table 4). A positive sign indicates that U.S. share increases as the budget allocated to rice increases, and a negative sign suggests an increase in Thai share as the budget increases. Most of the regions studied had positive budget expenditure coefficients, but the Netherlands, Senegal, and the rest of the world had negative coefficients. The negative coefficients for Nigeria and Senegal were statistically significant. This can be interpreted to mean that when they import more rice by expanding their budget for rice imported, they put more emphasis on increases in quantity than quality by importing Thai rice, which is cheaper and considered to be inferior to U.S. rice. These results are consistent with those reported by Ross (1979)¹³ in his study of grain demand in Senegal. The budget coefficients for Iran, Iraq, S. Korea, and Saudi Arabia were positive and significant. Consumers in S. Korea, in particular, prefer Japonica type of rice, which is not produced in Thailand giving the U.S. a distinct advantage over Thailand. The coefficient in S. Korea may reflect this consumer preference for U.S. rice over Thai rice.

Elasticities of budget expenditures for U.S. shares are relatively large in Iran, Saudi Arabia, Senegal, and the rest of the world at 0.303, 0.518, -0.884, and -0.316, respectively (Table 5). The large positive and negative elasticities for Saudi Arabia and Senegal, respectively, indicate that they react differently from each other, Saudi Arabia favorably and Senegal unfavorably, for U.S. rice as their budgets increase. An extremely large elasticity for Singapore at 7.327 may reflect the small U.S. share in that country. In other importing countries, changes in U.S. market shares in response to changes in budget expenditures are very inelastic ranging from -0.256 for the Netherlands to 0.224 for France.

Finally, the estimated intercepts may indicate the overall stability of the shares in individual importing regions. Statistically significant intercepts may indicate that the market share is generally stable after accounting for responses to variations of prices and budget expenditures. The estimated intercepts were significant for the regions except for Brazil, S. Korea, Saudi Arabia, Singapore, and the rest of the world (Table 4).

Table 4 Results of empirical analysis for U. S. and Thai rice export competition in individual importing regions.

	Intercept	Price ratio, P_U/P_T	Budget, Y^*
Brazil	0.843* (0.604)	-0.444 (0.391)	0.00111 (0.00175)
Belgium-Luxembourg	1.051*** (0.309)	-0.113 (0.216)	0.00005 (0.00283)
France	0.862*** (0.324)	-0.249 (0.216)	0.01844* (0.01249)
W. Germany	0.855*** (0.358)	-0.072 (0.227)	0.00556* (0.00360)
Iran	0.816*** (0.375)	-0.373* (0.244)	0.00224 (0.00076)
Iraq	1.053*** (0.372)	-0.357* (0.243)	0.00250 (0.00112)
Italy	1.984*** (0.450)	-1.025*** (0.285)	0.00256* (0.00184)
S. Korea	0.385 (0.374)	-0.174 (0.250)	0.00135*** (0.00049)
Netherlands	1.548*** (0.352)	-0.557*** (0.218)	-0.00670 (0.00537)
Nigeria	1.683*** (0.383)	-0.668*** (0.269)	-0.00184*** (0.00058)
Saudi Arabia	0.043 (0.348)	0.165 (0.220)	0.00391*** (0.00140)
Senegal	1.350*** (0.307)	-0.591*** (0.220)	-0.00601*** (0.00187)
Singapore	-0.251 (0.424)	0.080 (0.225)	0.00306 (0.00381)
United Kingdom	0.873*** (0.341)	-0.030 (0.218)	0.00098 (0.00537)
Rest of the world	0.751 (0.479)	-0.266 (0.248)	-0.00014 (0.00030)

F-value	11.17		
R-square	0.637		
Number of obs.	325		
Number of d. f.	280		

Standard errors are in parentheses.

A *** indicates the 5% statistical significance level, and ** and * indicate the 10% and 20% significance levels, respectively.

Table 5 Estimated elasticities of U. S. market share with respect to price ratio and budget expenditure.

	Price ratio, P_U/P_T	Budget, Y^*
Brazil	-2.697	0.067
Belgium-Luxembourg	-0.177	0.001
France	-0.530	0.224
W. Germany	-0.115	0.151
Iran	-1.090	0.303
Iraq	-0.720	0.170
Italy	-2.469	0.097
S. Korea	.	0.124
Netherlands	-1.283	-0.256
Nigeria	-1.485	-0.162
Saudi Arabia	.	0.518
Senegal	-2.993	-0.884
Singapore	.	7.327
United Kingdom	-0.051	0.023
Rest of the world	-1.305	-0.316

Conclusion and Implications for Rice Exporters

Trade in agricultural products originating different suppliers is highly competitive. It is of interest, therefore, to identify the factors determining the competitiveness of an exporting country. The results of the market-share and trade-flow analysis for competition between U.S. and Thai rice exports in world markets strongly indicate that prices of individual exports relative to competitor's prices are critical. Import shares in countries such as Italy, the Netherlands, Nigeria, and Senegal were found to be significantly price elastic. The estimated elasticities for Italy and Senegal, in particular, were -2.469 and -2.993, respectively. The estimates for the other countries studied in this research were also price elastic.

Responses of U.S. market share to changes in budget expenditures varied depending upon regions. While most of the regions tended to favor U.S. rice as they increased their budget for imported rice, the Netherlands, Nigeria, Senegal, and the rest of the world appeared to favor Thai rice. In particular, the market-share elasticity with respect to budget for Senegal was fairly large in absolute value at -0.884. The negative budget coefficients estimated in these rice importing countries suggest that increases in expenditures on rice imported do not necessarily increase the U.S. share in these regions.

In recognition of these results in global and individual rice importing regions, it appears

that rice exporters need to keep prices in line with those prevailing among their competitors in order to maintain competitiveness in world rice markets. In this context, a policy, such as the marketing loan introduced with the U.S. 1985 Farm Bill aimed at decreasing export prices and insulating U.S. prices from changes in exchange rates or other domestic economic variables, is an effective tool to recover the U.S. share in the world markets. For importing regions that appear to prefer rice from a specific country, a different strategy focusing on improving the image of the country's own rice is needed. Finally, it would be effective if programs such as the export enhancement program in the U.S. be targeted at importers who are sensitive to relative prices and to changes in their budget expenditures.

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Footnotes :

- /1. There are other rice exporters such as Pakistan, the P.R.C. (People's Republic of China), Italy, Burma, Australia, Argentina, and Uruguay. However, individual shares in these countries are less than 10% of world rice exports. If reexports by original importers (such as Italy, Belgium-Luxembourg, the Netherlands, etc.) are excluded from the rice trade statistics, the total share of Thailand and the U.S. would be much higher than 50% of the world rice markets.
- /2. The figures of U.S. rice exports in this research exclude the government shipments. See the footnote 2 in Table 2.
- /3. The number of steps to be processed varies among studies. Arnade and Davison (1987) and Davison and Arnade (1987) took two steps, while Resnick and Truman (1973) took more steps.
- /4. This may not be inappropriate since the other rice exporters are minor regarding with volumes of their exports. Accordingly, it is assumed that effects of other rice exporters on Thai and U.S. rice exports are negligible.
- /5. Some of these researchers had to delete some of price variables from their models because of multicollinearity problems.
- /6. To incorporate the influence of domestic production, some previous studies have included importer's domestic production as an exogenous variable in their import demand equations.
- /7. Because the dependent variable is specified as market share of U.S. commercial exports over total of U.S. commercial and Thai exports, these U.S. government shipments should not affect the results considerably.
- /8. Elasticities with respect to price ratio for S. Korea, Saudi Arabia, and Singapore were not calculated, because the price coefficients for these countries were not only with the wrong sign but also insignificant. Consequently, price elasticities for these countries can be considered to be close to zero.