

ECONOMIC ANALYSIS OF THE ASIAN RICE TRADE

HIDEKI IMAOKA

INTRODUCTION

THERE ARE plenty of studies on the rice economy of each Asian country in relation to the international market, but few studies on the total Asian rice market.¹

The aim of this study is to put piecemeal information and hypotheses together and to test the hypothesis which will describe the basic, structural characteristics of the Asian rice market. The first hypothesis is that the Asian rice market is independent from the rest of the world market. Second is the hypothesis that the Asian rice market is in perfect competition. When fluctuation in domestic production is given as exogenous, each country will try to soften the impact of these fluctuations on the national economy. The third objective is to describe national rice policy in relation to international trade and analyze the impact of fluctuation in domestic production in relation to its transmission to the Asian rice market.

I. ASIAN RICE MARKET IN THE WORLD MARKET

About 3 per cent of the world rice production (1968–70 average, milled basis) is traded internationally. This share is much less than the corresponding share for other cereals, such as wheat (16 per cent), maize (11 per cent), and barley (16 per cent), and much less than the corresponding share with regard to major international commodities: coffee (83 per cent), cocoa (77 per cent), tea (55 per cent), and sugar (30 per cent).

Rice is traded either milled, or husked, or as husk (paddy), broken, or parboiled rice. Traditionally, however, more than 95 per cent of the international rice trade consists of milled rice.²

Rice is sometimes classified on the international market in terms of outside appearance, such as round, medium, and long grain. Round grain is quite dif-

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¹ In this study, Asia means the following countries: Pakistan, India, Bangladesh, Sri Lanka, Burma, Singapore, West Malaysia, Thailand, Vietnam, Cambodia, Indonesia, China, Taiwan, Philippines, North Korea, South Korea, Laos, and Japan.

² Consequently, all amounts in this study are presented on a milled rice basis although very large volume of paddy (rice in the husk) is sometimes traded between Japan and South Korea.

TABLE I
EXPORT PRICE INDICES (ANNUAL AVERAGE) AND CORRELATION COEFFICIENTS

A. Price Indices (1957-59=100)					
Year	Private Trade Index	Bilateral Contracts Index	Long/Medium Grain Index	Round Grain Index	Total Rice Index
1960	83	95	88	91	88
1961	93	97	96	88	95
1962	108	98	104	104	103
1963	103	104	102	110	103
1964	100	109	101	117	103
1965	99	112	102	120	105
1966	119	118	116	130	119
1967	150	132	145	126	142
1968	142	153	151	129	147
1969	121	140	132	116	129
1970	96	114	103	109	104
1971	83	90	86	87	86
1972	105	93	98	109	99
1973	251	216	228	273	235
1974	357	402	380	364	377
1975	280	336	297	344	305

B. Correlation Coefficients					
	Private Trade Index	Bilateral Contracts Index	Long/Medium Grain Index	Round Grain Index	
Private trade index					
Bilateral contracts index	0.89				
Long/medium index				0.90	
Round grain index					

Source: [5].

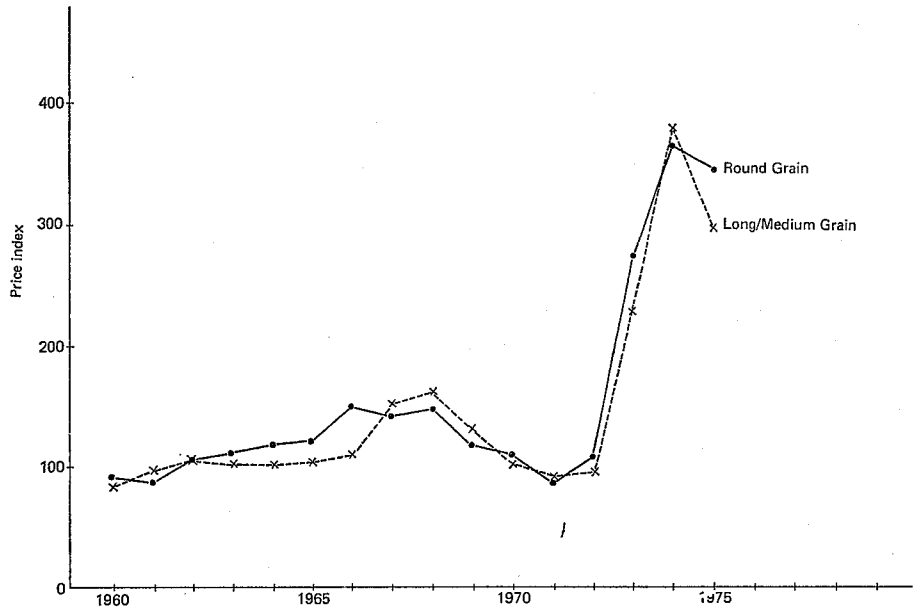
Note: With regard to the formation of these indices, refer to [2].

ferent from medium and long grain in taste and in geographical distribution of consumption and production. However, export price movements of round grain on the international market very closely parallels that of medium/long grain (Table I and Figure 1). Although the correlation coefficient is not accurate enough to numerically measure the degree of parallel movements of two variables in the flow of time, the high rate of correlation coefficient between round grain and medium/long grain (Table I) leads us to expect that, at least on the average, both grains are almost perfectly substitutable on the international market and therefore can be treated as if they are the same product.

It is, therefore, expected that the exact same factors operate, to the same extent, on the international demand-supply relationship of round grain and medium/long grain.³

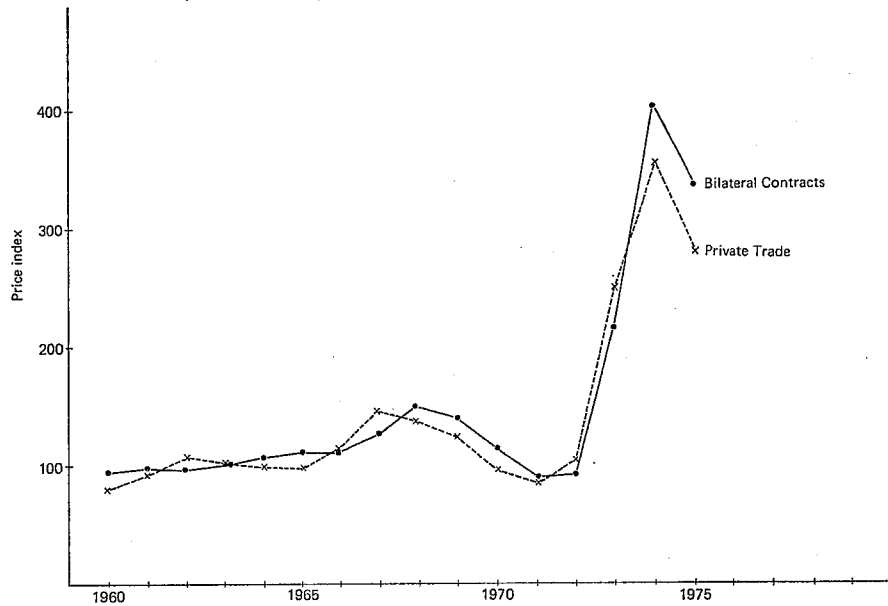
³ In this study we can assume, without empirical reasoning, that there is no significant difference in price movement between f.o.b. price (export price) and c.i.f. price (import price).

Fig. 1. Price Indices of Round and Long/Medium Rice (1957-59=100)



Source: [5].

Fig. 2. Price Indices in Bilateral Contract Trade and Private Trade (1957-59=100)



Source: [5].

There is a closely parallel export price movement between private trade and bilateral contract trade too (Table I and Figure 2). Based on the same reasoning, therefore, it can be hypothesized that both trade types can be treated as if they are in the same category in the sense that the same factors operate to the same extent on the international demand-supply relationships of private transaction and bilateral contract transaction.⁴

Asia is the largest rice exporting and importing region in the world. About 4 million metric tons of milled rice, about 50 per cent of the world total is annually imported by the Asian countries. On the other hand, the Asian exporting countries annually supply about 4.3 million metric tons in milled basis to the world market (Table II). Seventy to eighty per cent of Asian import demand was supplied in the seventies by Asian exporting countries themselves: mainly Thailand, China, Burma, Pakistan, and Japan (Table II). Therefore, the Asian exporting countries annually supply about 70 per cent of their export to the Asian market. The United States is the only outside supplier of major importance to the Asian market, whose export amounts to more than 90 per cent of Asian import from the outside market and supplies about 25 per cent (1965-74 average) of total Asian imports (Table II). Through both export to the outside market and imports from the United States, therefore, the Asian rice market is linked with the rest of the world market.

Table III and Figure 3, however, show how independent the Asian rice market is from the rest of the world market. Movements in price for the major Asian exporting countries, Thailand, China, and Burma, are quite different from those in the export price of the United States and Italy, except during the tight market in 1972-74, while export price movement of the three Asian countries is generally in parallel. The correlation coefficient in Table IV would confirm the above findings.

Fifty-five per cent of Asian imports (1966-71 average) is supplied by these three Asian exporters, and most of their export is concentrated on the Asian market. Thai export share toward Asia is 80.4 per cent, as is 79.7 per cent for Burma, and 64.8 per cent for China (1966-71 average respectively).

It is, therefore, quite reasonable to expect that these countries' export prices mainly reflect the market situation in Asia. On the other hand, Italian exports go almost completely to Western Europe and Africa. Italy's export price can be expected to reflect the market situation in the world market although its export prices may be to some extent connected to the Asian export price through competition in the entire market. U.S. exports go all over the world although a very

⁴ Bilateral contract trade includes various types of contract trade. But it can be broadly divided into two categories: commercial contracts and contracts on special terms. The latter refers to, for example, U.S. concessional export under P.L.480 and AID programs in the form of donation and long-term credit on special terms. Since this contract trade is expected to operate on the international market quite differently from the usual commercial contract trade, the U.S. concessional export is separately traded in this study. Since donation of rice under the UN food aid program is still minor in volume, it is neglected completely in this study.

TABLE
A. TRADE FLOW IN VOLUME,

Exporting Countries	Importing Countries					
	Japan	South Korea	Hong Kong	Philippines	Indonesia	West Malaysia
Japan		3,334 (17.1)				
Taiwan	85,509 (24.0)	8,494 (43.5)				
China	45,016 (12.6)		117,988 (29.7)		48,768 (5.7)	41,905 (11.1)
South Korea	7,890 (2.2)					
North Korea						
Hong Kong		7 (0)		67 (0)		
Philippines			189 (0)			
Thailand	86,083 (24.1)	1,684 (8.6)	196,739 (49.6)	65,083 (36.5)	284,506 (33.2)	239,960 (63.6)
West Malaysia			1,991 (0.5)		391 (0)	
Cambodia	10,839 (3.8)		42,902 (10.8)	11,560 (6.5)	6,345 (0.7)	12,031 (3.2)
Singapore	316 (0.1)		1,097 (0.3)		33,014 (3.9)	17,761 (4.7)
South Vietnam	4,616 (1.3)	1,667 (8.5)	22,314 (5.6)		25,071 (2.9)	7,923 (2.1)
North Vietnam			4,647 (1.2)		1,691 (0.2)	17 (0)
Nepal						
Pakistan			3,623 (0.9)			2,313 (0.6)
Burma	40,089 (11.2)	4,180 (21.3)	2,854 (0.7)	70,487 (39.6)	326,614 (38.1)	40,178 (10.6)
India						2 (0)
Subtotal of import from Asia	280,358 (78.6)	19,366 (99.1)	394,344 (99.3)	147,197 (82.7)	726,400 (84.8)	362,090 (96.0)
Australia			2,540 (0.6)			459 (0.1)
Egypt					5,004 (0.6)	25 (0)
United States	66,045 (18.5)			26,424 (14.8)	116,745 (13.6)	14,774 (3.9)
Italy					8,803 (1.0)	
Others	10,355 (2.9)	167 (0.5)	138 (0)	4,464 (2.5)		
Subtotal of import from non-Asia	76,400 (21.4)	167 (0.9)	2,678 (0.7)	30,888 (17.3)	130,552 (15.3)	15,258 (4.0)
Grand total	356,758 (100)	19,533 (100)	397,022 (100)	178,085 (100)	856,952 (100)	377,348 (100)

II
1960-65 AVERAGE

(% and metric tons)

Laos	Singapore	South Vietnam	Sri Lanka	India	Bangladesh	Cambodia	Subtotal of Export to Asia	Total Export
							3,334 (0.1)	3,334
							94,003 (2.4)	94,003
	57,218 (17.8)		141,173 (28.1)		16,633 (5.2)		468,701 (11.8)	728,833
							7,890 (0.2)	20,498
								15,883
							74 (0)	38,851
		2					191 (0)	316
32,550 (100)	162,425 (50.4)	8,447 (16.7)	45,918 (9.1)	41,626 (7.4)	10,899 (3.4)		1,175,950 (29.6)	1,540,185
	13,303 (4.1)		412 (0)				15,297 (0.4)	19,268
	19,631 (6.1)	581 (1.2)	1,668 (0.3)	10,707 (1.9)			116,264 (2.9)	328,208
							52,188 (1.3)	156,082
	14,880 (4.6)		8,586 (1.7)	1,650 (0.3)			86,707 (2.2)	158,263
	3,634 (1.1)						9,989 (0.3)	25,472
				7,880 (1.4)			7,880 (0.2)	7,880
	4,183 (1.3)		3,525 (0.7)	1,327 (0.2)	141,167 (44.1)		156,138 (3.9)	162,880
	44,338 (13.8)		281,511 (56.0)	202,457 (36.0)	128,468 (40.0)		1,141,176 (28.7)	1,571,089
	38 (0)						40 (0)	40
32,550 (100)	319,652 (99.2)	9,028 (17.9)	482,793 (96.1)	265,647 (47.2)	297,167 (92.7)	0	3,335,822 (83.9)	(4,871,085)
	273 (0.1)		196 (0)	18,505 (3.3)	1,167 (0.4)		3,272 (0.1)	62,933
							24,897 (0.6)	321,983
2 (0)	2,360 (0.7)	41,456 (82.0)	13,023 (2.6)	268,447 (47.7)	19,971 (6.2)		569,247 (14.3)	1,162,026
							902 (0.3)	132,517
			6,539 (1.3)	9,855 (1.8)	1,198 (0.4)		32,716 (0.8)	—
2 (0)	2,633 (0.8)	41,456 (82.0)	19,758 (3.9)	296,807 (52.8)	23,238 (7.3)	0	639,837 (16.1)	—
32,552 (100)	322,285 (100)	50,484 (100)	502,551 (100)	562,457 (100)	320,405 (100)	0	3,975,659 (100)	—

B. TRADE FLOW IN VOLUME,

Exporting Countries	Importing Countries					
	Japan	South Korea	Hong Kong	Philippines	Indonesia	West Malaysia
Japan		189,516 (40.4)		3,333 (2.8)	46,957 (9.4)	
Taiwan	45,861 (16.4)	15,083 (3.2)	48 (0)		3,422 (0.7)	
China	103,617 (37.0)	4,017 (0.9)	99,727 (23.9)	2,967 (2.5)	5,779 (1.2)	81,233 (30.5)
South Korea			146		1,659 (0.3)	136
North Korea					1,542 (0.3)	
Hong Kong		67 (0)			3,246 (0.6)	66
Philippines			75 (0)		4,209 (0.8)	98
Thailand	64,119 (22.9)	1,368 (0.3)	188,374 (45.1)	60,845 (50.9)	114,397 (22.8)	142,803 (53.7)
West Malaysia			23 (0)	4 (0)	555 (0.1)	
Cambodia	10,002 (3.6)		20,098 (4.8)	2,508 (2.1)	618 (0.1)	2,026
Singapore		167 (0)	5,714 (1.4)		2,020 (0.4)	5,568
South Vietnam					336 (0.1)	322
North Vietnam			1,761 (0.4)			4,848
Nepal						
Pakistan			106 (0)			138
Burma	7,459 (2.7)		69,007 (16.5)	23,794 (19.9)	67,114 (13.4)	20,203
India					1,792 (0.4)	17
Subtotal of import from Asia	231,059 (82.5)	210,218 (44.9)	385,079 (92.3)	93,451 (78.1)	253,646 (50.5)	257,600 (96.9)
Australia	66 (0)		8,636 (2.1)		828 (0.2)	1,569 (0.6)
Egypt				11,714 (9.8)	14,075 (2.8)	1,188 (0.4)
United States	43,415 (15.5)	254,478 (54.3)	22,074 (5.3)	9,256 (7.7)	206,016 (41.0)	3,552 (1.3)
Italy					10,737 (2.1)	
Others	5,503 (2.0)	3,982 (0.8)	1,638 (0.4)	5,199 (4.3)	16,579 (3.3)	2,042 (0.8)
Subtotal of import from non-Asia	48,984 (17.5)	258,460 (55.1)	32,348 (7.7)	26,169 (21.9)	248,235 (49.5)	8,351 (3.1)
Grand total	280,043 (100)	468,678 (100)	417,427 (100)	119,620 (100)	501,881 (100)	265,951 (100)

1966-71 AVERAGE

(% and metric tons)

Laos	Singapore	South Vietnam	Sri Lanka	India	Bangladesh	Cambodia	Subtotal of Export to Asia	Total Export
				3,185 (0.6)	48,404 (15.7)		291,395 (7.2)	328,745
	659 (0.2)			17 (0)			65,090 (1.6)	65,090
	58,208 (21.8)		225,525 (53.0)		79,583 (25.8)		660,656 (16.3)	1,018,367
							1,941 (0)	5,136
							1,542 (0)	90,849
							3,379 (0.1)	14,850
				3,132 (0.6)	254 (0.1)		7,768 (0.2)	7,768
45,095 (99.3)	141,802 (53.0)	39,588 (8.8)	62,800 (14.8)	145,773 (29.5)	4,141 (1.4)	2,312 (100)	1,013,417 (25.0)	1,260,350
	3,239		365 (0.1)				4,186 (0.1)	9,630
	8,952 (1.2)	935 (0.2)	3,672 (0.9)	3,726 (0.8)			52,537 (1.3)	143,442
			373 (0.1)	683 (0.1)			14,525 (0.4)	67,046
	1,293 (0.5)						1,962 (0)	1,962
	5,807 (2.2)		1,232 (0.3)				13,648 (0.3)	13,648
				47,062 (9.5)			47,062 (1.2)	47,062
	1,533 (0.6)		6,947 (1.6)		159,000 (51.5)		167,724 (4.1)	335,043
	26,508 (9.9)		124,479 (29.3)	177,212 (35.8)	17,059 (5.5)		532,835 (13.2)	668,450
	57 (0)						1,866 (0)	11,313
45,095 (99.3)	248,058 (92.8)	40,523 (9.0)	425,393 (100)	380,790 (77.0)	308,441 (100)	2,312 (100)	2,811,533 (69.4)	(4,077,438)
	3,208 (1.2)			1,602 (0.3)			15,909 (0.4)	150,000
	6,054 (2.3)			57,912 (11.7)			90,943 (2.2)	301,000
65 (0.1)	2,232 (0.8)	411,267 (91.0)		44,670 (9.0)	8 (0)		997,033 (24.6)	1,652,830
	80 (0)			3,983 (0.8)			14,800 (0.4)	429,000
247 (0.6)	7,659 (2.9)			5,750 (1.2)			48,599 (1.2)	—
312 (0.7)	19,233 (7.2)	411,267 (91.0)	0 (0)	113,917 (23.0)	8 (0)	0 (0)	1,167,284 (28.8)	—
45,407 (100)	267,291 (100)	451,790 (100)	425,393 (100)	494,707 (100)	308,449 (100)	2,312 (100)	4,048,817 (100)	—

C. TRADE FLOW IN

Exporting Countries	Importing Countries					
	Japan	South Korea	Hong Kong	Philippines	Indonesia	West Malaysia
Japan		82,954 (17.8)		69,765 (21.8)	180,184 (15.0)	2
Taiwan			2,108	6,707 (2.1)	14,234 (1.2)	
China	12,072 (40.0)		185,518 (46.7)	95,477 (29.9)	345,189 (28.8)	155,657 (56.2)
South Korea						
North Korea					41,832 (3.5)	
Hong Kong					2,435 (0.2)	
Philippines		1			4	858 (0.3)
Thailand	14,659 (48.6)	6,681 (1.4)	155,488 (39.1)	111,369 (34.9)	214,564 (17.9)	108,326 (39.0)
West Malaysia					5,843 (0.5)	
Cambodia			49			32 (0)
Singapore			3,642		2,136 (0.2)	117 (0)
South Vietnam						7 (0)
North Vietnam						306 (0.1)
Nepal						
Pakistan			1,934	4,701 (1.5)	148,685 (12.4)	4,626 (1.7)
Burma			3,688	8,740 (2.7)	27,291 (2.3)	2,254 (0.8)
India			27			31 (0)
Subtotal of import from Asia	26,731 (88.6)	89,636 (19.2)	352,454	296,759 (92.9)	982,397 (81.9)	272,216 (98.2)
Australia	109 (0.4)		19,407 (4.9)		10,926 (0.9)	1,442 (0.5)
Egypt	3,317 (11.0)					
United States		369,207 (79.0)	25,465 (6.4)	16,309 (5.1)	196,045 (16.3)	378 (0.1)
Italy			133 (0)	6,442 (2.0)	3,319 (0.3)	
Others		8,333 (1.8)	169 (0)		7,031 (0.6)	3,148 (1.1)
Subtotal of import from non-Asia	3,436 (11.4)	377,540 (88.8)	45,174 (11.4)	22,751 (7.1)	217,321 (18.1)	4,968 (1.8)
Grand total	30,167 (100)	467,176 (100)	397,628 (100)	319,510 (100)	1,199,718 (100)	277,184 (100)

Sources: [5] [6].

Note: All figures, except total export, are based on data reported by importing countries. For Indonesia, South Vietnam, and Laos, data reported by exporting countries was used over several years because of incomplete data from the importer side. Total export is based on data from the exporting countries. The

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(% and metric tons)

Laos	Singapore	South Vietnam	Sri Lanka	India	Bangladesh	Cambodia	Subtotal of Export to Asia	Total Export
	2 (0)		2,362 (0.8)	1,216 (1.3)	53,090 (37.9)	729 (0.5)	390,304 (9.8)	400,351
	6,620 (2.4)						29,669 (0.7)	29,680
	32,221 (11.9)		131,944 (42.1)		9,500 (6.8)		967,578 (24.2)	1,573,100
								9,280
							41,832 (1.0)	150,666
	67 (0)						2,502 (0.1)	58,900
							863 (0)	3,813
54,112 (100)	184,088 (67.9)	35 (0)		35,527 (38.4)	1,560 (1.1)	32,948 (21.2)	919,357 (23.0)	1,090,358
	58 (0)				12,307 (8.8)		18,208 (0.5)	20,915
	83 (0)						164 (0)	9,280
					5,838 (4.2)		11,733 (0.3)	47,832
							7 (0)	7
	768 (0.3)						1,074 (0)	20,000
				29,787 (32.2)			29,787 (0.7)	29,787
	8,984 (3.3)		65,685 (21.0)				234,615 (5.9)	499,521
	14,493 (5.3)		111,946 (35.7)	7,291 (7.9)	31,676 (22.6)		207,379 (5.2)	290,583
	729 (0.3)						787 (0)	24,891
54,112 (100)	248,113 (91.6)	35 (0)	311,937 (99.6)	73,821 (79.8)	113,971 (81.3)	33,677 (21.6)	2,855,859 (71.4)	(4,258,957)
	1,413 (0.5)		1,304 (0.4)				34,611 (0.9)	115,000
				14,233 (15.4)			14,233 (0.4)	541,000
	20,237 (7.5)	281,182 (100)		4,468 (4.8)	26,176 (18.7)	122,049 (78.4)	1,064,842 (26.6)	1,797,900
							9,894 (0.2)	232,000
	1,160 (0.4)			31 (0)			19,872 (0.5)	—
0 (0)	22,810 (8.4)	281,182 (100)	1,304 (0.4)	18,732 (20.2)	26,176 (18.7)	122,049 (78.4)	1,143,452 (28.6)	—
54,112 (100)	270,923 (100)	281,217 (100)	313,241 (100)	92,553	140,147	155,726 (100)	3,999,311 (100)	—

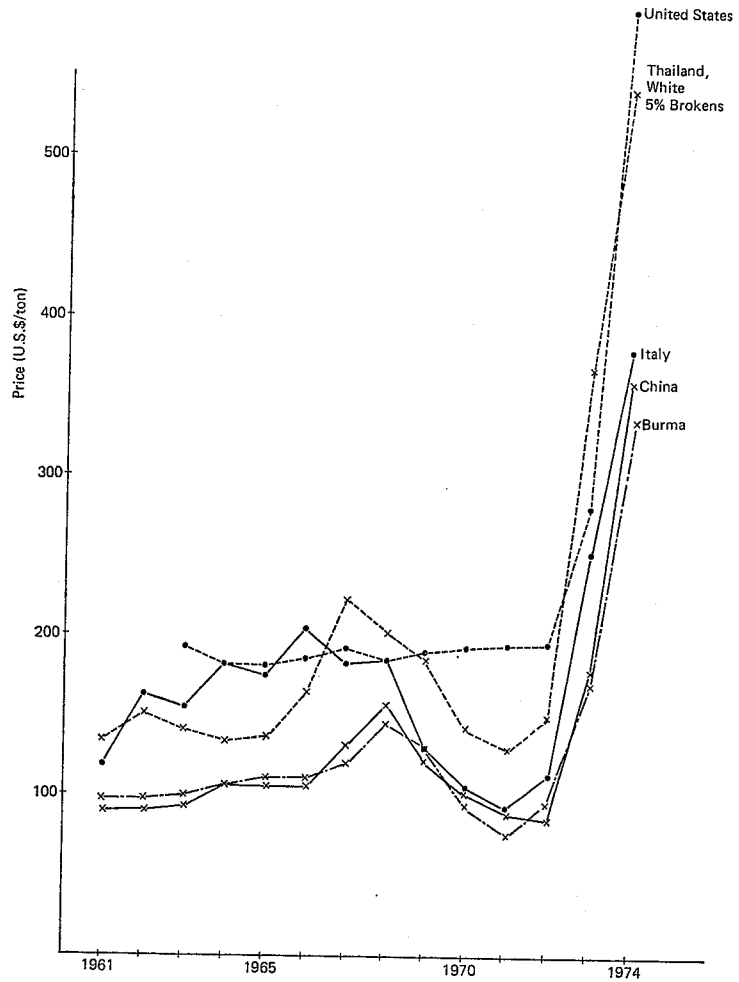
only exception is China, figures for which were estimated on the basis of data reported by importing countries. Figures in parenthesis are percentages of share in each column total.

TABLE
EXPORT PRICES OF MAJOR EXPORTING

	1961	1962	1963	1964	1965
Italy, originario, 3% broken	121.0	164.1	155.7	184.2	175.0
United States, milled, nato No. 2			192.6	182.8	180.6
Burma, Nag' seim SMS, 42% broken	97.0	97.0	100.0	105.8	108.9
China, 42% broken	91.0	91.0	93.8	100.8	100.8
Thailand:					
White, 5% broken	136.6	151.5	142.8	136.6	137.5
Husked, 100%	126.0	141.7	134.4	124.0	125.4
Broken, A1 super	99.4	113.1	106.7	91.0	96.0

Sources: [4] [5].

Fig. 3. Export Price



Sources: [4] [5].

III
COUNTRIES (ANNUAL AVERAGE)

									(U.S. \$/Ton)
1966	1967	1968	1969	1970	1971	1972	1973	1974	
205.2	182.3	186.6	129.9	106.5	94.0	114.5	253.7	380.6	
186.1	192.3	184.8	188.3	191.9	196.0	279.7	591.8		
108.9	120.4	146.1	139.2	96.9	76.7	94.7	169.9	334.5	
100.8	133.0	158.2	122.4	103.8	83.4	79.3	178.5	361.5	
165.8	223.7	203.3	185.5	143.0	129.1	150.7	368.1	542.1	
155.6	220.6	207.1	180.9	144.0	130.4	151.2	382.9	556.1	
126.1	158.5	151.5	104.7	85.4	67.4	94.5	245.7	363.0	

TABLE IV
CORRELATION COEFFICIENT OF EXPORT PRICES

	Thailand	Burma	China	U.S.	Italy
Thailand	*	*	*	*	*
Burma	0.89	*	*	*	*
China	0.87	0.89	*	*	*
U.S.	-0.40	-0.38	-0.37	*	*
Italy	0.48	0.45	0.45	-0.35	*

large portion (60.3 per cent of the 1966-71 average) is concentrated in the Asian market. U.S. rice trade is in exports on concessional terms, which were begun in 1955 and have accounted, since then, for over 50 per cent of the total. Concessional exports, made under P.L.480 and AID programs, are either donations or long-term credit sales, with repayment in dollars or in the currency of the recipient country. This latter type of sale accounts for the bulk of concessional exports [3, p. 47]; and most U.S. rice export (to India and Indonesia in the early sixties, to South Vietnam and South Korea in the latter half of the sixties, and to South Korea, South Vietnam, and Cambodia in the seventies) was sold through this special concessional program. Therefore, although the share in the Asian market is large enough, the U.S. export price does not necessarily reflect the price situation in that market, and U.S. export does not fully reflect the market situation in Asia in the sense that it has impact on the market through increase in export availability, and the Asian market situation does not necessarily provide an impact on U.S. export. In this sense, U.S. export is a very important exogenous factor for the Asian market, but does not act as a medium connecting the Asian with the rest of the world market.

On the basis of this reasoning and empirical evidence, it can be concluded that the Asian rice market is independent and U.S. export is an exogenous factor.

II. THE BASIC CHARACTERISTICS AND STRUCTURE OF THE ASIAN RICE MARKET

A. *Liquidity*

Total volume traded is such that the Asian market seems to be very stagnant. Total volume is almost around 4 million metric tons in import basis (Table II). Although exports from Asian countries fluctuated between 4.8 million metric tons for the 1960-65 average and 4.1 million metric tons for the 1966-71 average, about 70 per cent of exports went into the Asian market.

Changing the perspective shows the Asian market to be very liquid. Japan, a major importer in the early sixties, almost stopped importing in the late sixties and emerged as a major exporter, while South Korea, a minor importer, became a major importer in the late sixties. South Vietnam, a middle level net exporter in the early sixties, became a major importer in the latter half of the sixties. Cambodia also changed from a net exporter to a net importer in the seventies. Philippine imports zigzagged between zero and 0.3 million metric tons and finally reached a constant level of 0.3 million metric tons in the early seventies. India, a major importer in the sixties, drastically reduced its imports in the 1972-74 period. Indonesia's imports went down from the 0.8 million metric ton level in the early sixties to 0.5 million metric tons in the late sixties, but climbed to reach more than 1 million metric tons in the seventies.

Burma, the largest dealer in exports in the Asian market during the early sixties, gradually decreased exports from the latter half of the sixties and drastically reduced them in 1970. China, on the other hand, gradually increased its exports to the Asian market beginning in the early sixties. Even Thailand, the traditional and largest exporter in Asia, decreased both absolute volume and share in the Asian market. The United State's major customers were India and Indonesia in early sixties but became South Korea, South Vietnam, and Cambodia in the seventies (Table II).

In Table II, change is indicated in the pattern of trade flow in the Asian market, reflecting the above-mentioned changes. With the drastic decrease in Burmese exports, traditional Burmese customers (Sri Lanka, India, Bangladesh, and Indonesia) completely changed their sources of import. Indonesia's import source was changed to China and Japan. Sri Lanka changed to China. India first transferred its import source to Thailand, but finally total imports were drastically reduced probably because wheat was substituted for rice. With Japan's emergence as a major exporter, South Korea, Philippines, Indonesia, and Bangladesh relied very much on Japanese export. Furthermore, China's gradual concentration on the Asian market resulted in a decrease of Thailand's share even in traditional net-importer import areas (Hong Kong, Indonesia, West Malaysia, and Singapore).

These findings suggest that the Asian rice market is quite liquid in the sense that elasticity of substitution between different export destinations is very high, though not infinite, on the exporters' side. In other words, there seems to be

no special relationship between sellers and buyers in the Asian rice market, such as monopolistic competition through product differentiation.

Thai rice has a reputation for high quality, and it is sometimes said that this quality gives Thai rice a position of monopolistic competition through product differentiation. This hypothesis may be rejected by considering the effects Chinese exports had on the Asian market. There is empirical evidence to confirm this reasoning. The following is the import function for Thai rice in the Hong Kong market,⁵ estimated by using monthly import data.

$$\begin{aligned} \log T = & -38.43 + 1.60 \log PT - 2.77 \log PT_{-1} + 1.47 \log PC \\ & (0.55) \quad (-1.12) \quad (0.86) \\ & + 2.71 \log PC_{-1} - 1.09 \log PB - 2.15 \log PB_{-1} \\ & (1.91) \quad (-1.59) \quad (-2.83) \\ & + 0.69 \log PA + 0.73 \log PA_{-1} + 0.63 Z_1 + 0.25 Z_2 \\ & (0.64) \quad (0.85) \quad (1.34) \quad (0.49) \\ & - 0.10 Z_3 . \\ & (-0.20) \\ R^2 = & 0.8598, \quad DW = 2.311. \end{aligned}$$

Notation and explanation:

T = monthly volume of Hong Kong's import of Thai rice, c.w.t.

PT = import price of Thai white rice (Thai white rice, 100 per cent whole), HK\$/c.w.t., c.i.f., at month end.

PC = import price in Chinese white rice (Chinese See Mew and South China Jien, average with equal weight), HK\$/c.w.t., c.i.f., at month end.

PB = import price of Burmese white rice (unit value), HK\$/c.w.t., monthly average (no import duty in Hong Kong).

PA = import price in U.S. white rice (U.S. white rice, 15 per cent broken), HK\$/c.w.t., c.i.f., at month end.

$W_j(i)$ = Lagrange extrapolation polynomial.

$Z_j = \sum_i W_j(i) \log I(-i)$.

$I(-i)$ = monthly volume of Hong Kong imports of white rice in the $t-i$ period.

Figures in parentheses = t value.

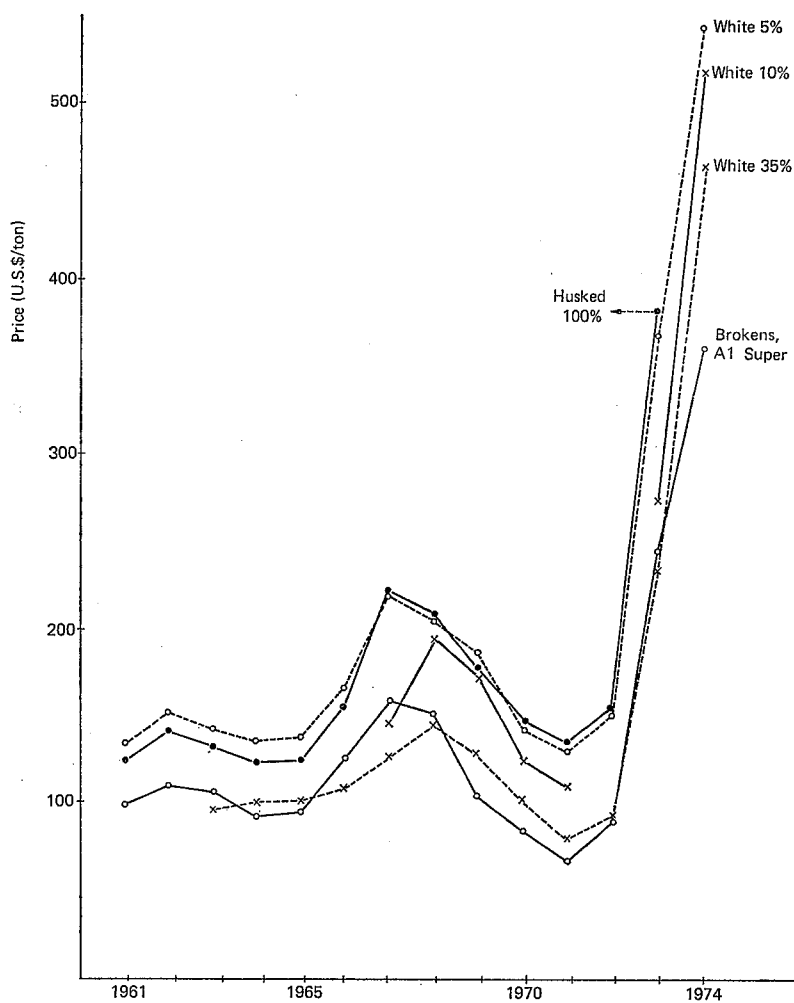
Period of observation = January 1970–June 1972. Sample size is therefore thirty.

Method of estimation = simple least square method.

According to this evidence, since cross-price elasticity of imports of Thai rice (with respect to China's price) is much larger, with positive sign, than its own price elasticity of import, Thai rice is faced with tough price competition from Chinese rice in the Hong Kong import market. This implies that Thai rice is

⁵ Import regulations in Hong Kong are the quota system of quarterly volume in import and the designation system of import sources. Effects of the former system on price competition among countries were excluded by inserting Z_1 , Z_2 , and Z_3 into the equation. Since the volume of import from each source is usually not specified under the latter system, it was considered that there is no serious effect on price competition between countries.

Fig. 4. Export Price of Thai Rice, Classified by Quality Standard



Source: [5].

TABLE V
CORRELATION COEFFICIENT OF EXPORT PRICES

	White 35%	White 10%	White 5%	Husked	Broken, A1 Super
White rice, 35%	*	*	*	*	*
White, 10%	0.90	*	*	*	*
White, 5%	0.86	0.93	*	*	*
Husked	0.87	0.76	0.89	*	*
Broken, A1 super	0.94	0.90	0.89	0.96	*

not necessarily in a position of monopolistic competition through high quality product differentiation. Since Hong Kong has traditionally imported both Thai and Chinese rice and is a typical mid-level importer in the Asian market, these results may apply to the entire Asian market.

Figure 4 shows the export price movement of Thai rice classified by quality. Export prices run in parallel. Table V shows the correlation coefficient of some export prices. The elasticity of substitution between rice of different quality is almost infinite as if they were one single good.

These findings further confirm the assertion that the Asian rice market is highly liquid, and reject as by-products statements that Thai rice is in monopolistic competition through high quality product differentiation. All findings suggest that quality differentiation is not taken into consideration in Asian rice market transactions.

B. *Less Trade-Oriented Market and More Domestic-Oriented Trade Policy*

As mentioned earlier, about 2 per cent of the world's rice production is traded internationally. The ratio in the Asian rice market is slightly higher than the world average (Table VI). All net-exporting countries, except for Pakistan, reduced their ratio over the 1961-71 period, and consequently the average ratio over all net-exporting countries was reduced from 5.5 per cent in 1961-65 to 3.6 per cent in 1966-71. On the other hand, the average ratio for all net-importing countries was kept at the 5 per cent level throughout the 1961-71 period, in spite of the entry of South Korea and South Vietnam in the group of net-importing countries. This is because the traditional net-importers (Bangladesh, Indonesia, West Malaysia, Sri Lanka, and India) reduced the ratio. It was found

TABLE VI
RATIO OF NET EXPORT OR IMPORT TO DOMESTIC
PRODUCTION (IN VOLUME)

	Net-Exporting Countries		Net-Importing Countries	
	1961-65 Average	1966-71 Average	1961-65 Average	1966-71 Average
Burma	26.5	11.0	Bangladesh	3.2
China	1.0	1.6	Hong Kong	*
Cambodia	18.3	5.6	Indonesia	10.7
Pakistan	14.5	16.2	Japan	3.3
South Vietnam	2.1	—	Laos	9.0
Thailand	21.6	14.7	Malaysia	59.4
Japan	—	0.4	Philippines	7.0
			Sri Lanka	76.4
			Singapore	*
United States	54.9	68.9	India	1.6
			South Korea	0
			South Vietnam	—
Asian net-exporting countries	5.5	3.6	Asian net-importing countries	5.5
				5.1

Sources: Production: [4]; trade: national trade statistics of each country.

that a less trade-oriented trend is in progress in the Asian rice market.

Many factors must be used to explain this downward ratio trend. Here, however, it is enough to point out that the trend should be, to a large extent, attributed to the more domestic-oriented rice trade policy of the Asian countries. With regard to policies of the importing countries, it is very rare for them to use tariff measures to affect import in rice (Table VII).

Instead of indirect measures, such as tariffs, the government in most countries directly controls and regulates import under general trade policy, which in essence means higher self-sufficiency and maintaining large enough buffer stocks.⁶ Under policies of self-sufficiency, the domestic price system is almost completely separated from the international price system through either direct or indirect government intervention. However, since the buffer stock on hand is not large enough to cushion fluctuation in domestic production (Table VIII), most importing countries have to rely upon the international market in order to soften the impact of this fluctuation on domestic consumers. Therefore, importing countries have relied on the international market as if it were their own warehouse for buffer stock. This is the reason why most importing countries want to expand government-to-government contract trade.⁷ Import availability is a kind of buffer stock for many of them. U.S. and Japanese exports on concessional terms are in particular almost perfect substitutes for buffer stock.

In most exporting countries, too, rice exports are under strict governmental control.⁸ Export prices are almost completely separated from the domestic price

⁶ In Indonesia, Bangladesh, India, Sri Lanka, and South Vietnam, rice imports are monopolized by the governments. In Philippines, Malaysia, South Korea, Hong Kong, and Japan, rice imports are under the direct or indirect government control although they are not monopolized by the governments. With regard to the detailed description of general rice trade policy, see [3].

⁷ In South Vietnam, rice is imported mainly from the United States on concessional terms. Philippines' imports in 1971 and 1972 were mostly on the basis of government-to-government contracts. They included substantial quantities obtained on long-term credit and some donations. In Cambodia, imports are mainly based on government-to-government contracts. In Laos, bilateral agreements are in force with France, Thailand, USSR, and South Vietnam. In South Korea, most of the imported rice is obtained on concessional terms (long-term credit). A substantial part of Indonesian imports is made under government-to-government contracts. Preference is given to imports on concessional terms and to aids and grants. In Bangladesh, the bulk of rice imports are under government-to-government contracts, and are partly obtained on concessional payment terms. In Sri Lanka, rice is largely imported under government-to-government contracts with the traditional suppliers, namely, Burma, China, Pakistan, and Thailand. In India, however, imports on concessional payment terms (long-term credit) have not been made since 1969. See [3].

⁸ In Pakistan, since 1972, private exporters have been allowed to participate only in the export of coarse rice together with the Trading Corporation of Pakistan, which retains the monopoly of superior varieties. In Thailand, the government maintains strict but limited control over rice exports through the Ministry of Economic Affairs, with which all commercial rice exporters are required to register. In China, foreign trade in rice is a monopoly of the government agency, China National Cereals, Oils, and Foodstuffs Import-Export Cooperation. In Burma, too, the government is the sole agent of rice exports. Japanese rice exports are made under direct governmental control. See [3].

TABLE VII
TARIFF MEASURES AFFECTING RICE TRADE

Rice Exporting Countries	Types of Rice	Duty and/or Tax	Levy and/or Cess	Others	
Burma	Exports	—	—	—	
	Imports	—	—	—	
China	Exports	—	—	—	
	Imports	—	—	—	
Japan	Exports	All types	Free	Free	Free
	Imports	All types	Free	Free	Free
Pakistan	Exports	Superior rice	U.S.\$ 60.8/ton	—	—
		Coarse/medium rice	U.S.\$ 12.5/ton	—	—
	Imports		—	—	—
Thailand	Exports	All types	abt. 3%	Variable	—
	Imports	All types	U.S.\$ 105.8/ton	—	—
United States	Exports	All types	Free	Free	Free
	Imports	Paddy	U.S.\$ 27.6/ton	—	—
		Husked rice	U.S.\$ 33.1/ton	—	—
		Milled rice	U.S.\$ 55.2/ton	—	—
		Brokens	U.S.\$ 6.9/ton	—	—
India	Exports	All types	Free	Free	Free
	Imports	All types	Free	Free	Free
Indonesia	Exports		Export is prohibited		
	Imports	All types	Free	Free	Free
Cambodia	Exports	Husked and milled rice	10%	—	—
		Brokens	8%	—	—
	Imports	All types	Free	—	—
South Korea	Exports		Exports suspended		
	Imports	All types	16%	—	—
Bangladesh	Exports		—	—	—
	Imports	All types	Free	Free	Free
Malaysia	Exports		—	—	—
	Imports	All types	Free	Free	Free
South Vietnam	Exports		—	—	—
	Imports	All types	—	—	—
Singapore	Exports		—	—	—
	Imports	All types	Free	Free	Free
Sri Lanka	Exports		—	—	—
	Imports	All types	Free	Free	Free
Hong Kong	Exports		—	—	—
	Imports		—	—	—

Source: [3].

TABLE VIII
STOCK/DOMESTIC PRODUCTION RATIO

	(%)
Bangladesh	1.3
Burma	7.0
Hong Kong	636.0
India	3.0
Indonesia	3.2
Japan	42.5
South Korea	11.6
West Malaysia	19.6
Pakistan	16.6
Philippines	22.1
Sri Lanka	16.0
Thailand	19.5

Sources : [4] [5].

system. This is made possible by either direct or indirect control of export volume⁹ and export tax/levy (Table VII). With regard to the exporting countries, the existing level of buffer stock is much less than the volume of domestic production and is not, therefore, efficient enough to moderate the impact of fluctuation in domestic production on the international market.

As analyzed above, both importing countries and exporting countries are inclined to pour the impact of fluctuation in domestic production, to a greater extent, into the international market through their international rice trade policy. On the other hand, since the ratio of trade volume to domestic production is very small and declining, and brought on by their own trade policy, the impact on the market is very serious.

III. ECONOMETRIC MODEL OF THE ASIAN RICE MARKET AND EMPIRICAL RESULTS

In Sections I and II, various piecemeal hypotheses were made and tested. In this section, an econometric model is set up to put these hypotheses together, and test the assertion synthetically and empirically.

The first assumption is that the Asian rice market is an independent market separated from the rest of the world market, and U.S. export is an exogenous

⁹ In Thailand, the export permit is granted on certain conditions which vary according to the domestic and/or world market situation. One such condition is the variable export tax (premium) raised or lowered, or even abolished, in order to achieve the objectives of the governmental rice policy. Another condition, introduced in 1972, is the obligation on private exporters to sell a quantity of rice proportional to their exports to the government at the fixed prices. The proportion is changed according to the situations. In Burma, although there is no systematic control system, exports seem to be controlled under a monopoly of the government in terms of both volume and price. In Pakistan, as mentioned above, private exports of coarse rice are subject to the governmental control on quality and prices. Since 1969, all Japanese rice exports have been made on noncommercial terms at the prices which were supported by the government. See [3].

factor. In the model, the assumption is:

(1) The unique Asian rice price is determined through the equilibrium condition between Asian import demand and Asian export supply, that is to say, the condition of total Asian import demand for the Asian exporter = total Asian export supply to the Asian importer.

(2) The U.S. export affects the demand-supply equilibrium only indirectly as a substitute for buffer stock in importing countries. It is not affected by the demand-supply condition in the Asian market. Therefore, U.S. export is simply added to the carry-over stock in the importing countries.

The second assumption is that there is a unique commodity bundle, which is rice, and within which the elasticity of substitution between round grain and medium/long grain, between private trade and bilateral contract trade, and between different qualities of rice is infinite.

The third assumption is that the Asian rice market is in perfect competition in the sense that each exporter and each importer is too small to affect the international price through his own export and import. Furthermore, transportation cost and insurance cost are not very significant so there is no significant difference in movements of f.o.b. and c.i.f. price. Consequently, a unique rice price movement in the Asian rice market can be assumed.

The fourth assumption is that elasticity of substitution is infinite between different export destinations on the exporters' side and elasticity of substitution between different import origins on the importers' side. Therefore, a unique export supply function can be applied to each exporting country and a unique import demand function to each importing country. The fourth assumption is related to the mechanism of adjustment for fluctuation in domestic production in relation to import demand and export supply. Following J. R. Behrman and F. G. Adams [1], domestic production and domestic consumption are assumed to be almost perfectly inelastic with regard to the international price. Since domestic consumption is also income inelastic, total domestic consumption is assumed as constant. Furthermore, stock adjustment is assumed to be independent of international price movement in both importing and exporting countries, because most stock seems to be held by government and manipulated only in relation to the domestic market situation, completely separate from the international market. Therefore, stock adjustment is solely related to fluctuation in domestic production, which is given according to several factors including natural conditions.

A. *Model and Empirical Results*

With regard to net-importing countries, there is identity such that

$$I(t) \equiv [S(t) - S(t-1)] - D(t) + C, \quad (1)$$

where

$I(t)$ = yearly volume of import in period t ,

$D(t)$ = yearly volume of domestic production in period t ,

$S(t)$ = carry-over stock at the end of period t ,

C = domestic consumption, which is assumed as constant.

Therefore, in addition to the independent variable (international price), the import demand function can relate to domestic production and carry-over stock at the end of period, depending on the relationship between domestic production and carry-over stock.

Under the assumption that desired stock existing at the end of a production period $S(t)^*$ is proportional to production occurring during the period $D(t)$,

$$S(t)^* = a + bD(t). \quad (2)$$

Assuming that government adjusts actual stock in a certain period $S(t)$, only a fraction of the distance required by the desired stocks,

$$S(t) - S(t-1) = m[S(t)^* - S(t-1)]. \quad (3)$$

$(1 > m \geq 0)$

From equations (2) and (3), the relationship is such that

$$S(t-1) = \frac{1}{1-m} S(t) - \frac{mb}{1-m} D(t) - \frac{ma}{1-m}. \quad (4)$$

By inserting this equation into equation (1) and adding the price variable $P(t)$, the import demand function is such that

$$I(t) = \frac{-m}{1-m} S(t) + \frac{ma-1+m}{1-m} D(t) + cP(t) + d, \quad (5)$$

where

$$\frac{-m}{1-m} < 0, \quad \frac{ma-1+m}{1-m} \geq 0.$$

The equation (5) was applied to several net-importing countries: Hong Kong, Bangladesh, India, and Indonesia.

Hong Kong:

$$HI = 44,252.92 + 1.16ME - 1.22HST_{-1} - 34.19P. \\ \quad \quad \quad (3.87) \quad (-1.93) \quad (-0.45)$$

$R^2 = 0.83, \quad DW = 2.27.$

Bangladesh:

$$BI = 675,759.43 - 0.68BISTA - 0.006BID - 924.49P. \\ \quad \quad \quad (-1.13) \quad (-0.20) \quad (-2.42)$$

$R^2 = 0.62, \quad DW = 2.06.$

India:

$$IDI = 793,229.56 - 0.55IDSTA - 0.005IDD - 765.09P/PW. \\ \quad \quad \quad (-4.18) \quad (-0.61) \quad (-2.47)$$

$R^2 = 0.87, \quad DW = 2.05.$

Indonesia:

$$II = -16,296.79 + 0.88ISTA - 0.03ID + 2,809.88P. \\ \quad \quad \quad (1.72) \quad (-0.72) \quad (2.22)$$

$R^2 = 0.65, \quad DW = 1.87.$

HI = yearly import volume from Asian rice exporters (milled basis) in Hong Kong in period t .

HE = yearly volume of export to the Asian importers in rice (milled basis) in Hong Kong in period t .

HST_{-1} = carry-over stock at the end of period $t-1$, in rice (milled basis) in Hong Kong.

BI = yearly volume of import from the Asian rice exporter (milled basis) in Bangladesh in period t .

$BISTA$ = carry-over stock at the end of period t , plus yearly volume of import from United States in period t , in Bangladesh.

BID = yearly volume of rice (paddy) production in period t , in Bangladesh.

II = yearly import volume from Asian rice exporters (milled basis), in period t , in Indonesia.

$ISTA$ = carry-over stock at the end of period t , plus yearly volume of U.S. import in period t , in Indonesia.

ID = yearly volume of production in rice (paddy), in period t , in Indonesia.

P = the international rice price (Thai, white rice, 5 per cent brokens, f.o.b., U.S.\$ / metric ton, on commercial trade).

PW = f.o.b. price of Canadian wheat, U.S.\$ / metric ton. The period of observation = 1960-74. Method of estimation = simple least square method.

With Sri Lanka, the following function was applied, derived from equations (1), (2), and (3).

$$I(t) = -mS(t-1) - (1+m)aD(t) + cP(t). \quad (6)$$

The estimated equation is as follows.

Sri Lanka:

$$CI = 721,729.61 - 0.638CST_{-1} - 1.41CD - 340.55P.$$

(-0.92) (-0.99) (-0.81)

$$R^2 = 0.57, \quad DW = 1.99.$$

CI = yearly volume of rice (milled basis) import from the Asian exporting countries in period t , in Sri Lanka.

CST_{-1} = carry-over stock at the end of the period $t-1$, in Sri Lanka.

Observation period and the method of estimation are same as above.

Stock data is not available for Singapore and West Malaysia. Therefore, the stock effect was completely neglected with Singapore, the following relationship is first assumed for West Malaysia, that is,

$$S(t) - S(t-1) = m[D(t-1) - D(t-2)], \quad (7)$$

($1 > m > 0$),

where S is the desired and actual level of stock, and D is the actual level of domestic production.

From equations (1) and (7) the following import demand function is obtained by adding price variable P :

$$I(t) = mD(t-1) - mD(t-2) - D(t-1) + cP(t). \quad (8)$$

Empirical results are:

Singapore:

$$SI = 280,976.87 + 0.58SE - 233.90P .$$

(2.02) (-1.60)

$$R^2 = 0.73, \quad DW = 2.21.$$

West Malaysia:

$$MI = 415,370.19 - 0.35MD + 0.61MD_{-1} - 0.41MD_{-2} + 277.16P .$$

(-1.36) (1.88) (-1.39) (1.23)

$$R^2 = 0.67, \quad DW = 1.25.$$

SI = yearly import volume from Asian exporters in period *t*, for milled rice, to Singapore.

SE = yearly export volume to Asian importing countries in rice (milled), in period *t*, in Singapore.

MI = yearly rice import volume from Asian exporting countries in period *t*, in West Malaysia.

MD = yearly volume of domestic rice production, in period *t*, in West Malaysia.

MD₋₁, *MD*₋₂ = lagged domestic production volume.

Observation period and method of estimation are same as above.

With other Asian importing countries (including Japan, South Korea, the Philippines, South Vietnam, and Cambodia), Japan has an overwhelming proportion of the group, where the stock to domestic production ratio is extremely high. Therefore, it is assumed that there is an ever-present intention to keep the desired ratio of carry-over stock to domestic production stay in this group. It is also assumed that deviation of the actual from the desired ratio through unexpected fluctuation in domestic production will affect the volume of imports. The following is the estimated equation.

Other Asian importing countries:

$$RI = 574,786.00 + 236,683.12RISTA/RID - 532.33P .$$

(0.20) (-0.70)

$$R^2 = 0.22, \quad DW = 2.21.$$

Since net-exporting countries, first Thailand and Burma, have enough surplus (Table VI), it is assumed that they are always seeking to maintain certain levels in carry-over stock-domestic production ratio, the desired ratio, although no official statement has been given about domestic buffer stock policy. Estimated equations are:

Thailand:

$$TEA = 1,375,860.42 + 1,158,685.65TST_{-1}/TD - 625.69TPR - 1,183.21P .$$

(1.03) (-0.60) (-0.98)

$$R^2 = 0.70, \quad DW = 1.01.$$

$$TEN = 511,667.03 + 2,084,652.17TST_{-1}/TD - 291.86TPR$$

$$(3.98) \quad (-0.85)$$

$$- 188,932.52P/PI .$$

$$(-1.52)$$

$$R^2 = 0.82, \quad DW = 1.92.$$

Burma:

$$BEA = 1,176,664.66 - 2,902,863.88BEST_{-1}BD - 2,377.78P .$$

$$(-1.35) \quad (-3.02)$$

$$R^2 = 0.68, \quad DW = 0.45.$$

$$BEN = 554,579.58 + 297,165.81BEST_{-1}BD - 271,790.49P/PI .$$

$$(0.23) \quad (-1.92)$$

$$R^2 = 0.52, \quad DW = 1.57.$$

BEA = yearly volume of Burmese exports to Asian importing countries.
BEN = yearly volume of Burmese exports to other countries.
BD = yearly volume of Burmese domestic rice production.
TEA = yearly volume of Thai rice exports to the Asian importing countries.
TEN = yearly volume of Thai rice exports to other countries.
TD = yearly volume of Thai domestic rice production.
TPR = rice premium rate in Thailand, 1965 = 100 (white 100 per cent and 5 per cent broken).
PI = Italy's export price (Originario, 15 per cent broken), U.S.\$/ton, f.o.b.

In the case of China, rice export is used to earn enough foreign currency to buy wheat to balance the domestic deficit. Therefore, it is assumed that the Chinese import and export agency is very sensitive to price movement in wheat when they determine the volume of rice for export. With this assumption, the following equations are estimated.

China:

$$CEA = 118,522.10 + 4,469.99P/PW + 2,471.45P/PW_{-1} .$$

$$(1.64) \quad (1.85)$$

$$R^2 = 0.77, \quad DW = 2.05 .$$

$$CEN = 0.02P/PI + 345,689.47 .$$

$$(0.03)$$

$$R^2 = 0.01, \quad DW = 1.04.$$

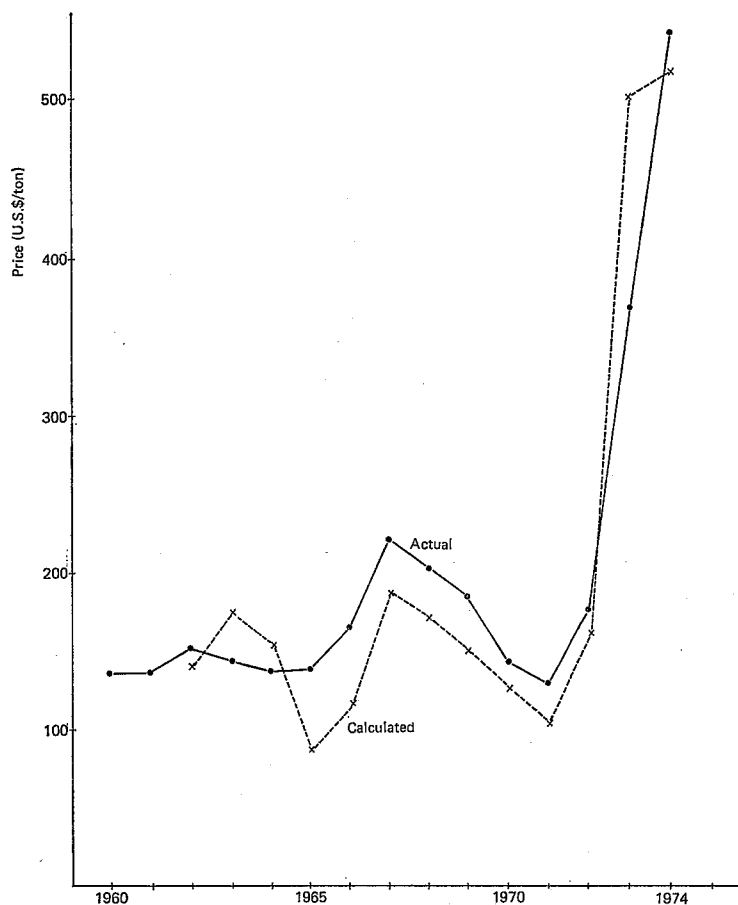
CEA = yearly volume of Chinese exports to Asian exporting countries.
CEN = yearly volume of Chinese exports to non-Asian countries.

For Pakistan and the other exporting countries, assumption (7) was applied. Since,

$$D(t) = E(t) + S(t) - S(t-1) + D . \tag{9}$$

By adding another independent variable *P*, *E(t)* is expressed as

Fig. 5. Actual and Estimated Price Movement



$$E(t) = aD(t) - mD(t-1) + mD(t-2) + cP + d,$$

where $a > 0$, $m > 0$.

Estimated results are:

Pakistan:

$$PEA = -53,060.85 + 0.007PED - 0.03PED_{-2} + 458.38P.$$

(0.26) (-0.44) (1.08)

$$R^2 = 0.41, \quad DW = 1.80.$$

$$PEN = 546,735.80 + 214,833.02(P/PI) - 0.03PED + 0.05PED_{-2}$$

(1.45) (-1.08) (0.90)

$$R^2 = 0.65, \quad DW = 1.25.$$

Other exporting countries:

$$RE = 45,067.93 - 0.06RED + 0.07RED_{-2} + 692.65P.$$

(-1.52) (1.92) (1.33)

$$R^2 = 0.64, \quad DW = 2.10.$$

PEA = Pakistan's yearly export to Asian importing countries.

PEN = Pakistan's annual export to the rest of countries.

PED = yearly volume of Pakistan domestic production in rice (paddy).

RE = yearly volume of export from the rest of the Asian exporting countries (Japan, Cambodia, South Vietnam, South Korea, and Taiwan) to Asian importing countries.

RED = yearly domestic production volume in other Asian exporting countries.

By setting the equilibrium condition in the Asian market such that

$$CI + HI + SI + MI + II + IDI + BI + RI = BEA + TEA + CEA + PEA + RE,$$

we get the equilibrium price of the model, the movement of which is determined by estimated parameters and exogenous variables. Figure 5 gives the estimated price contrasted with actual price. In this calculation, however, both Indonesia's import and Burma's export were treated as exogenous variables in the equilibrium condition, because the price coefficient has an opposite sign with significant *t*-value and the solved price was highly distorted by these equations.

B. Implications

The price coefficient for Indonesia and Burma has the opposite sign with significant *t*-value. This happened with Indonesia because of the very peculiar movements of domestic production in relation to import. In spite of very large fluctuation in import during 1960–74, the production data does not necessarily explain that fluctuation.

With Burma, this opposite sign occurred because the government's direct export restriction in the seventies could not be fully incorporated into the model. It would be misleading to assume that Burma is a monopolistic seller and Indonesia a monopolistic buyer simply because of the opposite movement of import and export in relation to international price. Even though export and import are exogenous variables in calculating estimated price, since estimated international price movement follows actual price very closely (Figure 5), empirical results still verify the hypothesis that the Asian market is in perfect competition and separate from the rest of the world market.

Although the United States supplies about 20 per cent of Asian import demand, its role in the Asian market is indirect in the sense that U.S. export does not affect equilibrium conditions, as verified by the model. Since *IDSTA* in the equation for India and *BISTA* in the equation for Bangladesh have significant estimated coefficients, with buffer stock in these countries, U.S. export would have softened the impact of fluctuations in domestic production on the international market.

Burma, Thailand, China, and Pakistan send a certain amount of their export to non-Asian countries. But no significant evidence could be found to show that these exports are influenced by variables other than those in the export function for Asia.

Table IX shows the price elasticity and the production elasticity of import demand of export supply. Except for China, price elasticity is low, not only in

TABLE IX
PRICE ELASTICITY/PRODUCTION ELASTICITY

	Price Elasticity	Production Elasticity
Importing countries :		
India	-0.28	-1.47
Bangladesh	-0.58	-0.35
Indonesia	+0.85	+0.71
Hong Kong	-0.02	—
Singapore	-0.13	—
Sri Lanka	-0.13	-3.76
West Malaysia	+0.16	<i>MD</i> : -1.38
		<i>MD</i> ₋₁ : -2.15
		<i>MD</i> ₋₂ : -1.28
Other importing countries	-0.20	—
Exporting countries :		
Export to Asia :		
Pakistan	0.45	<i>PED</i> : 0.10
		<i>PED</i> ₋₂ : -0.42
Burma	-0.55	—
Thailand	-0.66	—
China	1.16	—
Other exporting countries	0.26	3.96
Export to outside Asia :		
Burma	-1.10	—
Thailand	0.66	—
China	0	—

the importing but also in the exporting countries. But, production elasticity is quite high, particularly for India, Sri Lanka, West Malaysia, and the rest of the Asian exporters. These findings confirm the assertion that many Asian countries use the international market, as if it were their own warehouse for buffer stock. Since production elasticity is greater than unity in absolute terms, the impact of fluctuation on domestic production is exaggerated in the Asian rice market.

CONCLUSIONS

The Asian rice market is an independent market with U.S. export, an exogenous factor in the sense that a unique international price is determined solely by the condition that the Asian import demand for Asian export is equal to the Asian export to Asia. Furthermore, the Asian rice market is in perfect competition in the sense that every exporter and importer is too small to affect the determination of international price. Consequently there is a unique international price for the commodity bundle, rice.

The role of price adjustment is very minor in the Asian rice market. The Asian rice market is highly distorted by fluctuations in domestic production, the impact of which is exaggerated in the market by rice trade policies of both im-

porting countries and exporting countries, but of the importing countries in particular.

As far as the policy implications of this are concerned, in order to stabilize the Asian rice market, priority should be given in each country to controlling the fluctuations in domestic rice production. The existing rice stock level, which is not small, is inefficiently utilized to stabilize the Asian market because of national rice trade policies. Therefore, adjustment of national rice trade policies is first needed to create an international buffer stock policy, which is purported to be more efficient on the international scene.

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