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INCOME AND PRICE ELASTICITIES IN U.S.-JAPAN BILATERAL TRADE

Yoko SAZANAMI and Atsuko MATSUMURA

INTRODUCTION

When Houthakker and Maggee (1969) found Japanese income elasticity of exports nearly three times the income elasticity of imports for 1951–1966, they commented,

> "In fact Japan has enjoyed an exceptional rate of growth (though perhaps not three times as fast as the rest of the world), and in addition it has had considerable inflation, yet it has not had any chronic balance of payments problems. Our findings on income elasticities are one possible explanation of this remarkable phenomenon, which has attracted little attention precisely because it has not led to a crisis."

Now, her rate of growth been halved from the rates in 1951–1966 and her price level stabilized, Japan faces "a crisis" caused by huge trade surplus and the subsequent trade frictions, particularly with the United States.

Indeed, Japan faced severe trade frictions with the United States for the periods 1969–1972, 1976–1978 and 1981 to present. All these periods are characterized by huge Japanese trade surplus against the U.S. The trade barriers including NTBs and strong export drive to compensate for the slow domestic demand expansion in part of Japan are frequently mentioned as being responsible for such imbalances. Also, recent yen-dollar misalliance is accused of depriving the competitiveness of American products in the Japanese market.

The purpose of the present paper is to estimate income and price elasticities in U.S.-Japan bilateral trade for major manufactured goods that are traded between the two. We found that big difference in income elasticity of imports between U.S. and Japan tended to create huge bilateral trade imbalance, especially in 1969–1972 and 1976–1978 frictions. Although this difference in income elasticity of imports between the two countries still persists, the gap tends to become narrow in recent years, (1975:1Q to 1984:3Q) for commodities such as chemicals and precision machinery. Such tendency suggests the possibility of reducing the imbalance in the future.

1. U.S.-JAPAN TRADE INTERDEPENDENCE IN MANUFACTURED GOODS

According to the recent estimates of income elasticities in U.S.-Japan bilateral trade, difference in income elasticities between the two countries seems to have

decreased slightly from Houthakker & Maggee's estimates, 3.52 for U.S. imports and 1.10 for Japanese imports. The 1982 Whitepaper on Trade[1] estimated 3.42 for U.S. imports against 1.46 for Japanese imports for the period 1975:2Q to 1981:4Q.

Part of the difference in income elasticities of imports between the two countries may well reflect the difference in commodity composition of bilateral trade. While Japanese imports from the U.S. in 1984 consisted of foods (21.4%), raw material & fuels (26.6%) and manufactured goods the rest, the U.S. imports from Japan primarily consisted of manufactured goods (99%). As Goldstein & Khan (1985) shows, manufactured imports have higher activity elasticities than foods and raw materials. Thus, difference in commodity composition of trade between U.S. and Japan can well lead to the difference in income elasticities between the two countries.

The difference in commodity composition of trade between U.S. and Japan, may also cause the difference in import price elasticities in bilateral trade. Goldstein & Khan (1985) also shows that price elasticities are larger for manufactured goods than non-manufactured goods. The present difference in import price elasticities between U.S. and Japan seems even larger than the difference in import income elasticities, as 1982 Whitepaper on Trade estimated -1.86 for U.S. imports and -0.21 for Japanese imports.

The commodity composition of U.S.-Japan trade basically reflects the factor endowment conditions in both countries. The U.S. endowed with rich natural resources and land holds strong competitive strength in agricultural commodities as well as in highly sophisticated manufactured goods. On the other hand, resource poor Japan can only export manufactured goods. Thus, some differences in income and price elasticities between U.S. and Japan are inevitable. However, if some part of the difference is due to the difference in trade barriers, institutional systems or people's responsiveness to trade, there is a possibility of narrowing such differences by changing these factors.

One may not overlook that U.S. holds a predominant share in Japanese imports of manufactured goods such as chemicals and precision machinery. Also, the importance of Japanese market in U.S. exports for such commodities are increasing in recent years (see Table 1). The proportion of manufactured goods in Japanese total imports from the U.S. have increased from 40.7% in 1973 to 53.0% in 1983. The expansion of Japanese imports of manufactured goods from the U.S. will tend to reduce the difference in both income and price elasticities of U.S.-Japan bilateral trade, if income and price elasticities of Japanese manufactured imports are similar to those of the U.S. imports. In order to assess the possibility of reducing the income and price elasticity difference in U.S.-Japan trade by expanding mutual trade in manufactured goods, we have tried to estimate the import demand function of major items traded between the two in the following Section.

[1] Published by Ministry of International Trade and Industry, Japan.

TABLE 1. U.S.-JAPAN MUTUAL INTERDEPENDENCE IN TRADE* (%)

	U.S. Trade							
	Exports to Japan				Imports from Japan			
Year	1970	1975	1980	1983	1970	1975	1980	1983
Total trade	10.7	11.8	9.6	10.9	14.7	8.8	13.1	16.2
Total manufacture	6.6	4.5	6.0	7.6	21.6	21.2	24.4	25.0
Apparel & Textiles	3.2	2.5	3.1	4.2	26.6	22.0	15.5	18.6
Chemicals	8.4	6.8	8.9	13.2	12.1	10.8	8.3	10.3
(Medical & Pharmaceuticals)	9.3	14.2	16.3	20.4	6.1	9.9	12.2	11.7
Machinery	6.6	3.9	5.0	6.1	20.7	23.7	35.0	35.5
(General & Electric)	7.6	4.3	4.5	6.8	26.7	22.3	34.9	31.4
(Precision)	9.4	8.6	9.5	9.9	31.3	34.4	37.1	28.3
(Motor vehicle)	1.3	1.2	1.2	0.9	10.2	28.4	45.0	40.4
	Japanese Trade							
	Exports to U.S.				Imports from U.S.			
Year	1970	1975	1980	1983	1970	1975	1980	1983
Total trade	31.1	20.2	24.4	29.5	29.5	20.1	17.5	19.8
Total manufacture	31.8	20.2	24.9	29.8	41.0	34.9	20.4	28.9
Apparel & Textiles	17.9	9.0	7.5	11.1	8.8	6.1	7.5	7.4
Chemicals	13.0	8.9	11.6	16.6	40.5	38.3	42.8	46.6
(Medical & Pharmaceutical)	10.5	16.1	24.4	29.5	30.9	28.3	30.3	43.3
Machinery	30.9	23.0	28.7	33.8	61.7	43.9	51.7	61.7
(General & Electric)	32.7	20.9	29.0	27.1	59.3	49.8	50.7	63.1
(Precision)	30.7	27.1	24.7	27.1	57.3	46.2	56.8	74.9
(Motor vehicle)	40.4	39.3	43.0	47.2	52.9	44.2	29.0	19.9
(Toys)	—	33.8	35.6	40.1	—	50.4	42.8	18.8

* % in total exports and imports of respective commodities in U.S. and Japan.
Source: OECD, "Statistics of Foreign Trade Series B."
Nihon Kanzei Kyokai, "Gaikoku Boeki Gaikyo."

2. MODEL OF ESTIMATION AND DATA USED

As a model of estimation, we used conventional import demand function, assuming imperfect substitution between imports and domestic products, no money illusion and price elastic export supply.

The import of commodity i of country j from trading partner k is determined as,

$$M^i_{jk}=f(Y_j, P^i_{m_{jk}}, P^i_{D_j}, P^i_{m_{jw}})$$

where Y_j: real income of country j
$P^i_{m_{jk}}$: price of i imports in j from k
$P^i_{D_j}$: price of i products in j

$P^i_{m_{jw}}$: price of i imports of j from rest of the world[2]

In actual estimation log-linear form as,

$$\ln M^i_{j_k} = a^i_{j_k} + b^i_{j_k} \ln (P^i_{m_{jk}}/P^i_{D_j}) + c^i_{j_k} \ln Y_j$$

$$b^i_{jk} < 0, \quad c^i_{jk} > 0$$

was used. The import demand functions were estimated for periods 1965–1979 and 1975 : 1 Q–1984 : 3 Q. As for 1965–1979, 17 manufactured goods and foods traded between U.S. and Japan were chosen for the analysis. The U.S. imports from Japan were based on Japanese exports to the U.S. in Input-Output table of Japan. The Japanese imports from the U.S. were based on "U.S. Export FT 610" published by U.S. Department of Commerce. The relative prices are the producer's price in respective countries adjusted by exchange rates. The real GDP in importing country was used as an activity variable.

As for 1975 : 1 Q–1984 : 3 Q, we chose 7 items that had relatively high weights in U.S.-Japan bilateral tade. The value of trades were obtained from "Gaikoku Boeki Gaikyo" published by Nohon Kanzei Kyokai taking Japanese exports to and imports from the U.S. As for price, wholesale price index of U.S. Department of Labor, "Wholesale Prices and Price Indexes" and of Bank of Japan, "Bukka Shisu Nenpo" adjusted by exchange rate were used. In order to estimate short-run and long-run price elasticities, Almon type distributed lag was introduced.

3. PRICE AND INCOME ELASTICITIES OF MANUFACTURED GOODS TRADED BETWEEN U.S.-JAPAN

The results of estimation for 1965–1979 are summarized in Table 2. Both income and price elasticities of 15 out of 18 items were statistically significant at 5% level in case of U.S. imports. Although the price elasticities of U.S. imports were statistically significant at 5% level in textiles and leather & leather products, income elasticities were not for both of these items. And in wood and wood products, income elasticities of U.S. imports were minus.

The results of Japanese import elasticities were generally poor. Only five items—apparels, chemicals, paper & pulp, leather & leather products and precision machinery—had income and price elasticities that were statistically significant at 5% level. Besides these five items, only income elasticities of textiles, furniture, rubber & rubber products, motor vehicle, wood & wood products and electrical machinery were statistically significant at 5% level.

The price elasticities of Japanese imports in most of these items were not only smaller than those of U.S. imports but became statistically significant only at 10–20% level.

[2] In actual estimation, we did not include the price effect of the imports from the third countries. Such assumption may be permissible in case of Japan where U.S. imports of manufactured good hold the predominant share but not in the U.S. We will try to include them in the future study.

TABLE 2. INCOME AND PRICE ELASTICITIES IN U.S.-JAPAN TRADE
(1965–1979)

(1) U.S. Imports from Japan

$$\ln(MV_U/P_J \cdot ERI) = \alpha^U + \beta^U \ln P_{JU} + \gamma^U \ln GDPU$$

	α^U	β_1^U	β_2^U	γ^U	Dummy	DW	$\bar{R}^2$
Foods	−34.8894		−3.3039	2.7475		2.4636	0.9011
	(−4.6597)		(−8.5624)	(5.1677)			
Textile products	−5.9507		−2.2872	0.7268		2.6320	0.9351
	(−0.7101)		(−6.7337)	(1.2268)			
Apparel	−37.6638		−3.2552	2.9781		1.5738	0.8097
	(−2.6523)		(−5.5399)	(2.9568)			
Paper & Pulp	−53.1840		−3.9572	3.9103		1.2625	0.7223
	(−3.3182)		(−5.5024)	(3.4409)			
Publishing &	−76.6240		−3.0744	5.5548		1.1668	0.8755
Printing	(−7.5252)		(−9.5242)	(7.6753)			
Wood & Wood	41.9271		−2.8333	−2.7348		1.4015	0.9047
products	(6.8831)		(−4.7529)	(−6.3583)			
Furniture	−34.0569		−3.2078	2.5314		0.6503	0.7423
	(−2.1504)		(−4.8814)	(2.2535)			
Chemical products	−30.5909		−2.6840	2.4513	0.8084*	1.0006	0.5925
	(−3.4782)		(−3.4214)	(3.9248)	(3.5287)		
Rubber & Rubber	−30.7037		−2.3532	2.4216		1.1059	0.6946
products	(−2.7683)		(−5.3689)	(3.0894)			
Leather & Leather	−16.5640		−3.2393	1.3355		0.7410	0.8444
products	(−0.8484)		(−4.6430)	(0.9649)			
Ceramics & Clay	−17.5932		−1.4398	1.5235		0.5898	0.9593
	(−2.9404)		(−4.6581)	(3.5847)			
Metal products	−51.9680		−2.3223	4.0086	0.5855*	1.4630	0.8550
	(−6.6224)		(−4.2270)	(7.1978)	(4.0595)		
Primary metal	−23.3801	−1.8716		2.0659	0.5009**	2.9068	0.9105
	(−8.7349)	(−8.1030)		(10.8947)	(6.5511)		
General machinery	−78.3396		−1.6401	5.8900		1.3228	0.9665
	(−16.1794)		(−4.7069)	(17.1349)			
Electric machinery	−65.2349		−3.0222	5.0401		1.6279	0.9653
	(−17.9264)		(−6.7465)	(19.5808)			
Precision machinery	−62.3308		−0.7385	4.7060		2.3268	0.9921
	(−23.8477)		(−5.0345)	(25.3684)			
Motor vehicle	−161.7110		−4.0116	11.8166		1.1452	0.9469
	(−13.7161)		(−4.1811)	(14.1288)			
Other Transportation	−67.0937		−2.5844	5.1003		0.9165	0.7129
machinery	(−5.6617)		(−3.4582)	(6.0562)			

(1) U, J are U.S. & Japan: MV_U, MV_J, are value of Imports: P_U, P_J are Producer's Price: P_{JU}, P_{UJ} are $P_J \cdot ERI/P_U$, $P_U \cdot ERI/P_J$: ERI is exchange rate: $GDPU$, $GDPJ$ are real GDP.
(2) β_1^U, β_1^J are price elasticities for average of current and previous years. β_2^U, β_2^J are price elasticities for current year only.
(3) t value in ( ).
(4) * dummy for 1973. ** dummy for 1974.

TABLE 2. (CONTINUED).

(2) Japanese Imports from U.S.

$$\ln(MV_J/P_U \cdot ERI) = \alpha^J + \beta^J \ln P_{UJ} + \gamma^J \ln GDPJ$$

	α^J	β_1^J	β_2^J	γ^J	Dummy	DW	$\bar{R}^2$
Foods	10.5739		−2.7822	0.1390		2.1718	0.9282
	(4.5816)		(−7.5453)	(0.6891)			
Textile products	−9.7487		−0.7403	1.6665	1.1990**	1.3372	0.7750
	(−1.1963)		(−0.7898)	(2.3743)	(2.7576)		
Apparel	−2.5316		−3.3903	0.9449		1.9117	0.9546
	(−0.6554)		(−6.8034)	(2.8051)			
Paper & Pulp	7.3608	−1.6111		0.3293		2.4158	0.9153
	(3.6555)	(−5.9868)		(1.8754)			
Publishing &	0.7078	0.9021		0.8029		0.8488	0.1133
Printing	(0.1431)	(1.9278)		(1.8489)			
Wood & Wood	−9.6197	−0.7407		1.9047		1.0076	0.9275
products	(−5.0444)	(−1.5957)		(11.6004)			
Furniture	1.3353	−3.0445		0.4076		1.7777	0.9185
	(0.3500)	(−6.5374)		(1.2240)			
Chemical products	−2.6642	−0.9039		1.3019		2.5081	0.9197
	(−1.6412)	(−2.3061)		(9.1961)			
Rubber & Rubber	5.5168		−0.8682	0.4848		1.9986	0.6621
products	(1.7461)		(−2.2161)	(1.7764)			
Leather & Leather	−1.0565		−1.7064	0.7608		1.4284	0.9190
products	(−0.3524)		(−5.1051)	(2.9137)			
Ceramics & Clay	−4.8852	0.5460		1.2775		1.4474	0.6876
	(−1.5994)	(1.1932)		(4.7803)			
Metal products	−0.1720		0.9451	0.9538	0.6596**	1.5914	0.7147
	(−0.0526)		(1.5111)	(3.3547)	(4.2064)		
Primary metal	11.9890	−2.3455		0.0217		1.5719	0.2223
	(2.6956)	(−2.1096)		(0.0564)			
General machinery	2.0986	−0.1379		0.9304		1.3828	0.8125
	(1.2900)	(−0.4276)		(6.5644)			
Electric machinery	−11.2701	−0.3644		2.0044		1.8003	0.9573
	(−8.2425)	(−0.8281)		(16.9886)			
Precision machinery	−8.6385		−0.7721	1.7458		1.4465	0.9820
	(−6.8259)		(−3.4555)	(15.7933)			
Motor vehicle	−11.3365		−1.1737	1.8572		1.0372	0.9056
	(−4.7484)		(−1.9321)	(8.9339)			
Other Transportation	−2.6167	0.4826		1.2991		1.8166	0.5165
machinery	(−0.6445)	(0.6466)		(3.7059)			

(1) U, J are U.S. & Japan: MV_U, MV_J, are value of Imports: P_U, P_J are producer's Price: P_{JU}, P_{UJ} are $P_J \cdot ERI/P_U$, $P_J \cdot ERI/P_U$: ERI is exchange rate: $GD\text{-}U$, $GDPJ$ are real GDP.

(2) β_1^U, β_2^J are price elasticities for average of current and previous years. β_2^U, β_2^J are price elasticities for current year only.

(3) t value in ( ).

(4) * dummy for 1973. ** dummy for 1974.

The income elasticities of Japanese imports were smaller than those of the U.S. imports, the only exception being textile. The items that had large U.S.-Japan income elasticity differentials in 1965–1979 were motor vehicles (6.3 times), general machinery (6.5 times), metal products (4 times) and electrical machinery (2.5 times).

In Table 3, results for 1975:1Q–1984:3Q are summarized. We introduced Almon distributed lag to obtain long-run and short-run price elasticities. As for price elasticities of imports, all items except toys were statistically significant at 5% level in case of U.S. imports. But, their long-run elasticities were generally smaller than the elasticities in Table 2. Income elasticities of U.S. imports in Table 3 were also smaller than the estimates in Table 2 for major U.S. imports. The items that showed large reduction in income elasticities were general & electrical machinery and motor vehicles. This probably reflects the Japanese voluntary export restraint introduced in the late 1970s.

The price elasticities of Japanese imports continued to show poor results except for apparels & textiles. The income elasticities of Japanese imports were statistically significant at 5% level except for motor vehicles and toys. In fact, compared to the estimates in Table 2, income elasticities increased from 1.30 to 2.30 in chemicals and 1.85 to 2.42 in precision machinery. Since both items together accounts for almost one third of Japanese manufactured imports from the U.S., the increase in income elasticities of these items will lead to an increase in income elasticity of total imports.

CONCLUDING REMARKS

Since income elasticities of most of the items in Table 2 were larger in U.S. than in Japan, it is quite evident that even if the commodity composition of trade between the two were identical in 1965–1979 and income grew at the same rate in both countries, trade surplus would have emerged in part of Japan. In fact, when U.S. demand were strong in major items traded between the two, huge trade surplus led to severe trade friction in 1969–1972 and 1976–1978.

The possibilities of correcting such trade imbalance by exchange rate mechanism were limited as price elasticities of Japanese imports were small or not even statistically significant for 1965–1979. Also, the import demand of motor vehicles in U.S. showed extremely high income elasticities and results of the estimation improved only when dummy variables for voluntary restrictions were introduced. This implies that income and quantity restriction affected import volume than price changes.

The estimates for later period, 1975:1Q–1984:3Q show some narrowing of income elasticity differentials between U.S. and Japan in chemicals, general & electric machinery and precision machinery. Further researches are needed to make clear why the differences were reduced. The present model merely assumes price elastic supply for exports and do not incorporate the difference that may

TABLE 3. INCOME AND PRICE
(1975 1.Q

I. U.S. Imports from Japan

(1) $\ln(MV_U/P_J, ERI)=a^U+\sum_i b^U_{-i}\ln P_{JU}+c^U\ln GDPU$

	Period	a^U	b^U_0	b^U_{-1}	b^U_{-2}	b^U_{-3}	b^U_{-4}
Apparel & Textile	1975:4–84:3	−3.4599	−0.7089	−0.3674	−0.1354	−0.0129	
		(−5.7212)	(−4.9216)	(−10.6014)	(−1.7809)	(−0.1790)	
Chemicals	1975:4–84:3	−1.4133	−0.2881	−0.3995	−0.3341	−0.0919	
		(−1.8877)	(−2.9750)	(−3.9483)	(−7.8106)	(−0.4781)	
Medical &	1975:4–84:3	−7.3325	−0.1383	−0.1907	−0.1572	−0.0379	
Pharmaceuticals		(−4.3026)	(−0.9139)	(−1.2462)	(−3.3073)	(−0.1216)	
General & electric	1976:1–84:3	−1.5622	−0.1328	−0.2357	−0.3087	−0.3519	−0.3652
machinery		(−1.8337)	(−1.9185)	(−2.6601)	(−4.9519)	(−6.2599)	(−2.0585)
Precision	1976:2–84:3	−5.3144		−0.1666	−0.1266	−0.0900	−0.0567
machinery		(−4.1466)		(−1.0744)	(−2.6543)	(−1.5751)	(−0.7038)
Motor vehicles	1975:4–84:3	−4.3759	−0.3729	−0.3541	0.0564		
		(−4.8975)	(−2.2720)	(−3.8112)	(0.2256)		
Toys	1975:2–84:3	1.5197	0.0439	0.0874			
		(0.6608)	(0.0516)	(0.1042)			

(1) U, J are U.S. & Japan: MV_U, MV_J are value of Imports: P_U, P_J are wholesale price index,
(2) Almon distributed lag, d, degree: sc, starting zero constraint: e.c., ending zero constraint.
(3) Seasonal dummy.
(4) Dummy for 1983: 1Q and 1984: 1Q for voluntary restriction on Auto.
* t-value in ( ).

TABLE 3

II. Japanese Imports from U.S.

(1) $\ln(MV_J/P_U, ERI)=a^J+\sum_i b^J_{-i}\ln P_{UJ}+c^J\ln GDPJ$

	Period	a^J	b^J_0	b^J_{-1}	b^J_{-2}	b^J_{-3}	b^J_{-4}
Apparel & Textile	1976:2–84:3	−3.0098		−0.3434	−0.5526	−0.6228	−0.5541
		(−2.8093)		(−2.6383)	(−13.1967)	(−13.0580)	(−8.3263)
Chemicals	1976:1–84:3	−9.1504	−0.0745	−0.1079	−1.0020	−0.0513	0.0387
		(−8.1379)	(−1.1002)	(−1.2196)	(−1.5046)	(−0.9219)	(0.2375)
Medical &	1976:3–84:3	−8.0338			0.4096	0.0607	−0.1547
Pharmaceuticals		(−4.9336)			(2.8620)	(1.6259)	(−3.0438)
General & electric	1976:3–84:3	−5.8612			0.0589	−0.0465	−0.1052
machinery		(−3.2519)			(0.3336)	(−0.8279)	(−1.5614)
Precision	1976:2–84:3	−11.7770		−0.2111	−0.1723	−0.1318	−0.0816
machinery		(−10.2771)		(−2.4544)	(−6.0446)	(−4.2519)	(−2.0801)
Motor vehicles	1976:2–84:3	27.7368		−0.7272	−0.6948	−0.6060	−0.4605
		(4.1621)		(−1.2323)	(−3.7107)	(−2.8534)	(−1.5389)
Toys	1975:4–84:3	4.0588	0.3083	−0.9786	−1.4589	−1.1327	
		(1.0764)	(0.5999)	(−7.6743)	(−5.5473)	(−4.5141)	

(1) U, J are U.S. & Japan: MV_U, MV_J are value of Imports: P_U, P_J are wholesale price, index
(2) Almon distributed lag, d, degree: sc, starting zero constraint: e.c., ending zero constraint.
(3) Seasonal dummy.
* t-value in ( ).

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–1984 3.Q)

b^U_{-5}	Lag[2]	$\sum_i b^U_{-1}$	C^U	Q_1	Q_2	Q_3[3]	$\bar{R}^2$	DW
	d=2	−1.2247	3.3899				0.9828	2.3640
	e.c.		(18.1988)					
	d=2	−1.1136	2.7748				0.8742	1.8136
	s.c.		(12.0075)					
	d=2	−0.5241	3.8432				0.8026	1.5462
	s.c.		(7.2631)					
	d=2	−1.3947	3.6273				0.9318	0.7707
	s.c.		(13.7249)					
−0.0267	d=2	−0.4666	4.2327				0.8787	1.4706
(−0.4264)	s.c.		(10.7762)					
	d=2	−0.6706	4.4342		−0.4619[4]		0.9363	1.7688
	s.c.		(16.0311)		(−5.6593)			
	—		1.1218		0.4966	0.7066	0.5526	0.5813
	—		(1.5801)		(4.3019)	(6.0684)		

1980=100: P_{JU}, P_{UJ} are $P_J \cdot ERI/P_U$, $P_U \cdot ERI/P_J$: ERI is exchange rate: $GDPU$, $GDPJ$ are real GDP.

(CONTINUED).

b^J_{-5}	b^J_{-6}	Lag[2]	$\sum_i b^J_{-i}$	C^J	Q_1	Q_2	Q_3[3]	$\bar{R}^2$	DW
−0.3465		d=2	−2.4195	1.1717		0.1786	0.0890	0.9309	1.7193
(−6.7023)		e.c.		(8.4754)		(5.1276)	(2.5409)		
		d=2	−0.2952	2.2992				0.8683	2.1490
		s.c.		(15.7590)					
−0.2366	−0.1850	d=2	−0.1060	1.8847				0.8288	1.7612
(−3.1408)	(−3.1357)	e.c.		(8.9338)					
−0.1170	−0.0819	d=2	−0.2916	1.9313	−0.1829	−0.1921	−0.1687	0.7310	1.6898
(−1.2561)	(1.1371)	e.c.		(8.2707)	(−3.0142)	(−3.3004)	(−2.8507)		
−0.0457		d=2	−0.6506	2.4179	−0.1143	−0.0818	−0.1254	0.9008	1.5135
(−1.3632)		e.c.		(16.3660)	(−3.3315)	(−2.4976)	(−3.7682)		
−0.2585		d=2	−2.7470	−2.9159				0.7521	1.8791
(−1.1092)		e.c.		(−3.3874)					
		d=2	−2.9619	0.0049	−0.4278	−0.2933		0.7076	1.1760
		e.c.		(0.0101)	(−3.5512)	(−2.4099)			

P_{JU}, P_{UJ} are $P_U \cdot ERI/P_J$, $P_J \cdot ERI/P_U$: ERI is exchange rate: $GDPU$, $GDPJ$ are real GDP.

exist in supply behavior of two countries. The Japanese supply may be more price elastic than the U.S. counterpart that they responded more swiftly to strong demand for colored TV in early 1970s and demand for small cars after the oil price rise in the mid-1970s. Alternative explanations may simply be that the opening up of Japanese markets for the late 1970s to present had increased both price and income elasticities, namely there was some structural changes in Japanese import demand.

At any event, there seems to be some changes observed in respect to the income elasticity differentials between U.S. and Japan in major commodities traded between the two. And if such trend continues in the future, there is a possibility of having smaller bilateral trade imbalance between U.S. and Japan.

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