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POSSIBILITIES OF EXPANDING INTRA-INDUSTRY TRADE IN JAPAN*

Yoko SAZANAMI

1. INTRODUCTION

After the quadrupling of crude oil prices in 1973, major industrial countries were forced to enter a period of severe adjustment. Japan who relied heavily on cude oil imports from the Middle East, was considered to be one of the countries that would be most severely hit by such price rise. However, in the past decade the Japanese economy seems to have stood up quite well to the challenge of adjusting itself to high oil price. Recent indications of Japanese economic performances such as the growth rate, balance of payments, price increase and unemployment look quite well compared to those in other industrial countries. On the other hand, there is growing resentments on the part of her trading partners toward such performances.

These resentments and frustration primarily stem from a Japanese growth rate that relies heavily on a surplus in the trade sector[1] and from a low proportion of manufactured goods in total imports which together may have sustained the Japanese employment level at the expense of her trading partners.

Some assert[2] that trade liberalization will be the key to relieve such resentments and frustration because it will increase imports and raise the proportion of manufactured goods in the total. But what is most disturbing for the author is the fact that Japanese trade liberalization in terms of tariffs as well as non-tariff barriers did take place in the past decade at substantial speed without appreciably raising proportion of manufactured goods in the total imports.

For example, after 20% across the board tariff reductions covering 1865 items in 1972, the average tariff of Japan became quite comparable to other industrial

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[1] In fact, over 70% of growth in GNP in 1980 depended on growth in trade sector. MITI [7], 1981, p. 13.

[2] The typical American view on this matter is summarized as "... It is especially frustrating when Japan—a country that realizes a tremendous advantage from free export markets—seems to have little interest in maintaining an open world trading community. This concern goes beyond examples of restricted market access in Japan and the nagging bilateral trade disputes that go unresolved year after year. Our concern rather centers on what we believe is too weak a commitment to a long-term strategy of trade liberalization." from "Report on Trade Mission to Far East" [13], p. 91.

countries.[3] And also the number of items under quantitative restriction were reduced to 27 (include only 5 manufactured goods) in 1979. At the same time there was remarkable improvement in reducing other types of non-tariff barriers. For example, about half of American businessmen interviewed in the study jointly undertaken by NIRA and Arthur D. Little [8] in 1979 stated that almost all the barriers related to bureaucracy and intentional discriminatory policy have been abolished. Despite all these changes in tariff and non-tariff barriers plus an appreciation of the yen from 308 yen to a dollar in 1971 to 219 yen in 1979, imports of manufactured goods still accounted for only one forth of total imports in Japan. This proportion is much lower than that of the United States (54.7%) and West Germany (58%).

The present small proportion of manufactured goods in the total imports may be partially attributed to the rise in price of crude oil. Increase in payment for crude oil has depressed the proportion of manufactured imports. Another reason that can be pointed out as depressing the ratio of manufactured goods in the total imports seems more fundamental. Namely, Japan has built a trade structure on inter-industry specialization rather than intra-industry type and there has been only a very modest shift to the latter even after the oil crisis.

The purpose of the present paper is to analyze why Japanese trade is characterized by inter-industry rather than intra-industry specialization and to see whether there is a possibility of expanding intra-industry trade in the future to leave some room for increasing imports of manufactured goods. In Section 1, the present state of inter-industry vs. intra-industry trade in Japan will be assessed in relation to that of in other industrial countries. The question why Japanese trade took a pattern of inter-industry specialization limiting the expansion of imports of manufactured goods will be asked. Problems of imports of manufactured goods after oil crisis will be reviewed in Section 2, to see whether there were some obstacles for their expansion. And in Section 3, recent development of intra-industry trade in Japan will be studied by calculating the proportion of intra-industry trade in the total trade by major trading partners. In concluding section we will comment on the future possibilities of expanding intra-industry trade in Japan and increasing the imports of manufactured goods.

2. INTRA-INDUSTRY VS. INTER-INDUSTRY SPECIALIZATION IN JAPAN

The importance of intra-industry trade in expanding world trade has been stressed by Balassa [2], Grubel and Lloyd [4] and others [3]. A substantial amount of world trade today consists of the mutual exchange of goods that belong to the same industrial category but differ in type, style or use. There are a number of alternative hypothesis that explain such new development in trade. One such hypothesis concerns information access and market size. The formation of

[3] MITI [7], 1979, p. 354.

common market and progress in trade liberalization in the post-war period expanded market size and facilitated access to market information across the border. Hence, firms could choose suitable location for production not necessarily within their national border but within their neighbors and specialize in particular type of products or processes. Another hypothesis of intra-industry trade is related to product differentiation in manufactured goods. Since high income countries will hold a comparative advantage in high quality products, they will export these products and exchange them for low quality products within the same product categories. Thus there may be more intra-industry trade observed in countries that produce differentiated products.

Loertscher and Wolter [6] tested the statistical significance of these alternative hypothesis. Among the variables that proved to be statistically significant were; (1) difference in income level of two countries, (2) distance between the centers of economic activities in the countries, (3) existence of custom union and (4) similarities in culture. The degree of product differentiation which is most frequently mentioned as the cause of intra-industry trade did not show statistical significance. (However, this was probably due to the inadequacy in the measure used for product differentiation.)

From the above theoretical as well as statistical studies on intra-industry trade, it is quite evident that one cannot expect a large amount of intra-industry trade in the case of Japan which has not formed a custom union nor share national border with any industrial countries that have similar culture and income level.

Indeed in such studies as Grubel and Loyd or Aquino [1] which conducted an international comparison of intra-industry trade, the proportion of intra-industry trade in Japanese trade was appreciably lower than in other industrial countries. Grubel and Lloyd's estimates for 1964 show that the proportion of intra-industry trade in Japanese trade was only 21% when average for ten industrial countries including Japan was 48%.

Even when Aquino included such countries as Hong-Kong, India, Korea, Brazil and Mexico besides major industrial countries in his international comparison of intra-industry trade in manufactures, Japan ranked 23rd in a total of 26 countries in respect to proportion of intra-industry in total trade. (See Table 1, colume 1.[4])

As is pointed out by Grubel and Lloyd,[5] their index for intra-industry trade B_{ij} is strongly influenced by the total trade imbalance. Since

$$B_{ij}=\frac{\sum_{i}^{n}(X_{ij}+M_{ij})-\sum_{i}^{n}|X_{ij}-M_{ij}|}{\sum_{i}^{n}(X_{ij}+M_{ij})}\times 100$$

[4] Table 1 was based on Aquino [1] but the ranks by countries were added to the initial table.

[5] Grubel and Lloyd [4]. "The mean is a biased downward measure of intra-industry trade if the country's total commodity trade is imbalanced or if the mean is an average of some subset of all industries for which exports are not equal to imports..." p. 22.

(when X_{ij}, M_{ij} is exports and imports of i commodity of country j). B_{ij} will get smaller when there is large difference between $\sum_i^n X_{ij}$ and $\sum_i^n M_{ij}$. Thus Grubel–Lloyd suggested their index be adjusted (for inbalanced trade) as

$$C_{ij}=B_{ij}/1-k$$

where

$$k=\left|\sum_i^n X_{ij}-\sum_i^n M_{ij}\right| \Big/ \sum_i^n X_{ij}+\sum_i^n M_{ij}$$

TABLE 1. INTERNATIONAL COMPARISON OF INTRA-INDUSTRY AND INTER-INDUSTRY TRADE IN MANUFACTURE (1972)

Country	Intra-industry trade						Inter-industry trade	
	Rank	B_{ij}	Rank	C_{ij}	Rank	Q_{ij}	Rank	S_{ij}(1)
France	1	86.5	4	93.1	1	87.4	26	26
Netherlands	2	78.6	16	80.6	3	78.7	21	60
Sweden	3	75.6	18	77.4	4	76.3	23	51
United Kingdom	4	76.0	2	96.8	2	81.9	25	29
Austria	5	73.4	12	85.7	6	75.0	20	64
Denmark	6	70.7	14	84.3	11	70.3	18	68
Belgium	7	70.1	17	79.3	12	70.1	19	66
Norway	8	69.2	1	97.2	8	72.5	3	187
Italy	9	66.6	6	91.7	9	72.3	22	53
Canada	10	66.3	11	87.6	7	73.5	8	107
West Germany	11	62.5	5	92.4	5	76.0	24	31
Switzerland	12	60.5	20	61.4	14	60.9	7	120
United States	13	57.4	21	58.1	16	57.3	17	69
Ireland	14	55.2	3	94.8	13	64.5	12	93
Singapore	15	53.6	8	88.7	10	71.4	11	96
Yugoslavia	16	53.3	19	68.0	17	55.3	14	87
Spain	17	43.8	22	56.3	21	49.1	13	89
Australia	18	40.8	13	85.3	15	58.5	10	97
Hong kong	19	39.5	24	42.6	23	39.2	2	199
Portugal	20	39.1	23	56.2	22	40.9	6	138
Korea Republic	21	37.5	25	41.9	23	39.2	4	154
Mexico	22	36.6	7	89.1	18	54.8	9	98
Japan	23	30.0	9	88.5	18	54.8	16	70
Greece	24	26.5	10	88.3	25	35.7	5	139
Brazil	25	25.5	15	80.8	20	49.8	15	74
India	26	21.7	26	24.3	26	22.9	1	241

Source: Aquino [1], Table 1 and Table 6.

Note: (1) Standard deviation of S_{ij} (specialization index).

(2) Speaman's rank correlation coefficient between B_{ij} and C_{ij} was 0.362, C_{ij} and Q_{ij} was 0.606 and B_{ij} and S_{ij} was -0.685.

k is the proportion of trade imbalance in total trade. Aquino proposed another type of adjustment by estimating theoretical exports and imports, X^e_{ij} and M^e_{ij}. X^e_{ij} and M^e_{ij} are exports and imports when there is no imbalance in total trade.

$$Q_{ij}=\frac{\sum_i^n (X_{ij}+M_{ij})-\sum_i^n |X^e_{ij}-M^e_{ij}|}{\sum_i^n (X_{ij}+M_{ij})} \times 100$$

when

$$X^e_{ij}=X_{ij}\frac{\frac{1}{2}\sum_i^n (X_{ij}+M_{ij})}{\sum_i^n X_{ij}}, \qquad M^e_{ij}=M_{ij}\frac{\frac{1}{2}\sum_i^n (X_{ij}+M_{ij})}{\sum_i^n X_{ij}}.$$

From Table 1, one can see that Japan is the only country whose index values as well as the ranking in countries listed are influenced substantially by such adjustments. For example, when the Grubel–Lloyd adjustment is made on B_{ij} in colume 1, the Japanese intra-industry trade index C_{ij} ranks to the 9th among 26 countries. Also when ranked according to Q_{ij} (Aquino's index), Japan rank to the 18th. It is quite clear that since Table 1 includes only manufactured commodities, the large trade imbalance in manufactured goods in 1972 altered the ranking of Japan according to C_{ij} and Q_{ij} from B_{ij}

In 1972 Japanese exports of manufactured goods totaled 27,090 million dollars while imports of manufactured goods were only 6,789 million dollars leaving an imbalance of more than 20,000 million dollars. Such an imbalance in manufactures is not limited to 1972 but rather it exists for every year. One may claim that intra-industry trade in Japan is underestimated when the unadjusted index is used. On the other hand one may also argue that such adjustment will conceal the major characteristics of Japanese trade, namely, a high percentage of manufactured goods in exports and an extremely low proportion of manufactured goods in imports. For example, the proportion of manufactured goods into total exports was 94.8% in 1972 while that in total imports was only 28.9% in the same year.

This characteristic may in itself show that Japanese trade centers on inter-industry specialization rather than intra-industry specialization. Instead of exchanging the manufactured goods that belong to the same industrial categories, Japan tends to concentrate her exports in particular industries (mostly manufactured good) and exchange them for products of other industries (mostly raw materials and foods). In other words, the large trade imblance in trade of manufactures and small proportion of intra-industry trade in manufactures may be two sides of the same coin.[6] Therefore if Japanese imports of manufactures are to increase, it will be when Japanese trade is transformed from its present inter-industry specialization to intra-industry trade.

[6] This is the reason why we used the unadjusted Grubel–Lloyd index of intra-industry trade in the following sections.

If standard diviation of Specialization index defined as,

$$S_{ij}=\frac{E_{ij}\Big/\sum_{i}^{n}E_{ij}}{\sum_{j}^{n}E_{ij}\Big/\sum_{i}^{n}\sum_{j}^{k}E_{ij}}\times 100$$

(when E_{ij} stands for country j's exports of commodity i) is used as a measure for inter-industry specialization, one can see that trade in Japan tended to be more inter-industry oriented compared to other industrial countries.

In the 1970s various forces at work in the international economic sphere induced structural changes in the domestic Japanese economy as well as in Japanese trade. OPEC's raising the crude oil price in 1973 and again in 1979 has increased Japanese oil payment and raised energy prices. Industries that use energy intensively were forced to introduce energy saving devices or lost comparative advantages.

Also the appreciation of the yen together with liberalization of trade increased the imports from Newly Industrializing countries. And as Japanese firms were faced with severe competition from imports, they tried to move into more technologically intensive lines of products. There was a stronger drive for exports to oil-rich countries or elsewhere because Japanese domestic market failed to expand after oil crisis. In the next section we will review how all these forces at work after the oil crisis have affected the commodity composition of Japanese imports, and how the proportion of manufactured goods in total imports changed. And then we will see whether Japanese trade is progressing toward an expansion of intra-industry trade or an intensification of traditional inter-industry specialization.

3. JAPANESE TRADE AFTER THE OIL CRISIS

Japanese trade in the postwar period has been characterized by a heavy reliance on imported raw materials and a low proportion of manufactured goods in total imports. Although there was some increase in imports of manufactured goods towards the end of 1960s causing the ratio of manufactures in total imports to rise from 22% in the mid-1960s to 30% in 1970, the sharp increase in the price of crude oil in 1973 depressed the ratio again to 20% in the following years.

The increase in oil payment affected the imports of other industrial countries as well but probably not as much as in the case of Japan where the proportion of crude oil in total imports amounted to 16% in 1972, almost twice the ratio of 7.4% the OECD average.

The soaring of Japanese oil payment after 1973 reflected almost entirely this price rise effect, as the volume of crude oil imports decreased in 1974, 1975, 1978 and 1980.[7] The leveling off and decline in the volume of imports after 1973 was

[7] MITI [7], 1981, p. 239.

caused by the introduction of energy saving devices, changes in the industrial structure and the shift from oil to other energy resources. Rise in output per unit of energy in aluminum, iron and steel and cement that started in the late 1960s accelerated in the 1970s. Since output per unit of energy is much greater in precision machinery, electric machinery and general machinery industries than in iron and steel or basic chemical industries, changes in the industrial structure during the 1970s that increased the share of machinery industry in total industrial production enabled Japan to produce more output with less energy at an aggregate level. This was also true in the exporting sector where the share of machinery in total exports rose from 58.4% in 1973 to 63.8% in 1979.

Indeed, oil saving was particularly pronounced in exports and in capital formation sectors, both characterized as using energy intensive technology. For example Yoshioka [14] estimates that imports of crude oil generated per unit of output (million yen in 1970 constant price) was reduced from 11.9 thousand yen in 1973 to 10.3 thousand yen in 1977. According to his study, the largest factors that contributed to such reduction of crude oil imports were the changes in commodity composition of final demand, followed by changes in input coefficients. But such crude oil savings introduced in the Japanese economy after the oil crisis could not make up for the steep rise in prices. The proportion of the oil bill in total import payments more than doubled from 15.7% in 1973 to 35.1% in 1977. This soaring of the oil bill had overshadowed all the changes that took place in other commodities. Therefore it may be more preferable if we subtract oil from total imports when examining the changes in the commodity composition of Japanese trade after the oil crisis, imports of manufactured goods in particular.

Figure 1 shows the changes in composition of Japanese imports in the 1970s when crude oil and natural gas are excluded from the total. The import share of raw materials excluding crude oil and natural gas declined gradually in the 1970s. There was an increase in the proportion of consumer goods while the proportion of intermediate processed goods and capital goods declined immediately following the oil crisis and then remained unchanged in the late 1970s.

Changes in the commodity composition of imports during this period were caused either by (1) changes in the import ratio, (2) substitution between imported commodities, (3) increase in output per unit of imported inputs and (4) growth in final demand for respective commodities.

The primary factor that caused the decline in the proportion of crude material[8] was the fall of raw material inputs per unit of output as is shown in Fig. 2. The fall was caused by stagnant demand in industries such as chemicals, paper and pulp and non-ferrous metal that use crude materials intensively. Also from Fig. 2, one can see that the fall of imported raw materials per unit of output was even greater. The difference between the two ratios became wider towards the end of the 1970s. Since most of the raw material imports are non-competitive imports whose domestic production is either nil or neglibibly small, the difference between the

[8] Excluding crude oil.

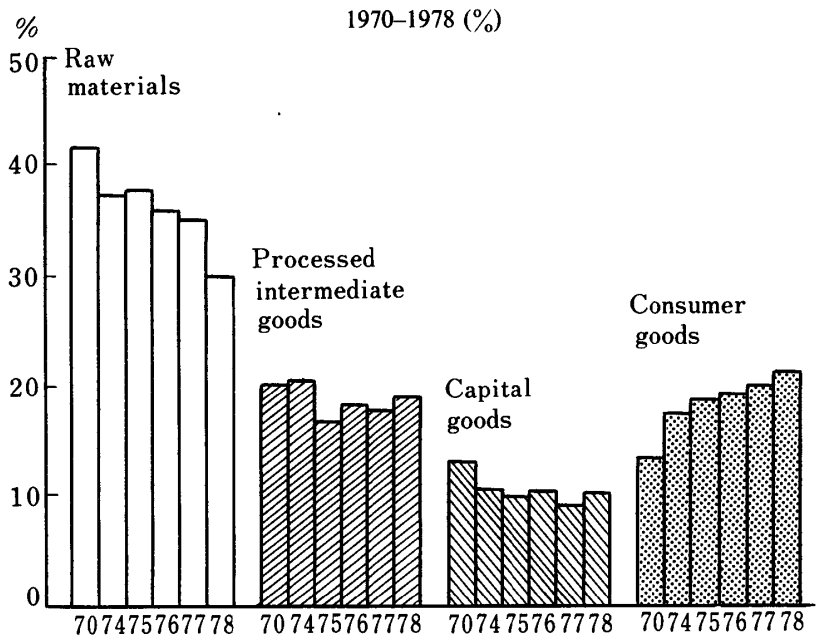

Fig. 1. Changes in commodity composition of Japanese imports: raw material, processed intermediate goods, capital goods and consumer goods.

Note: (1) Crude oil and natural gas are excluded from total imports.

(2) Raw material: edible field crops, stock raising, forestry, fishery, coal, iron ore, non-ferrous metal ore, others.

Processed intermediate goods: chemical fiber and material, pulp and papers, chemical basic materials, other chemical products, petroleum products, coal products, ceramics and clay products, iron and steel, crude steel, iron and steel primary products, non-ferrous metal primary products, metal products.

Capital goods: general, electric, transport, precision and other machineries.

Consumer goods: meat and dairy products, marine products, beverage and tabacco, fabrics and apparels, furniture, leather products, rubber products.

Source: JETRO [5], Fig. 3.

two ratios meant not the substitution between imports vs. domestic products but rather between raw material imports vs. processed intermediate imports.

There was an apparent shift towards more uses of imported textiles and fibres and away from raw cotton, as well as a shift towards imported metals and alloys and away from ores as is indicated in Fig. 3.

The import ratio of processed intermediate goods such as non-ferrous metals and alloys, woolen yarn and silk reeling rose sharply in the 1970s. In spite of this rise of the import ratio of non-ferrous metals and textiles, increase in imports of intermediate processed goods was almost proportional to the increase in total imports as is shown in Fig. 1. That imports of intermediate processed goods did

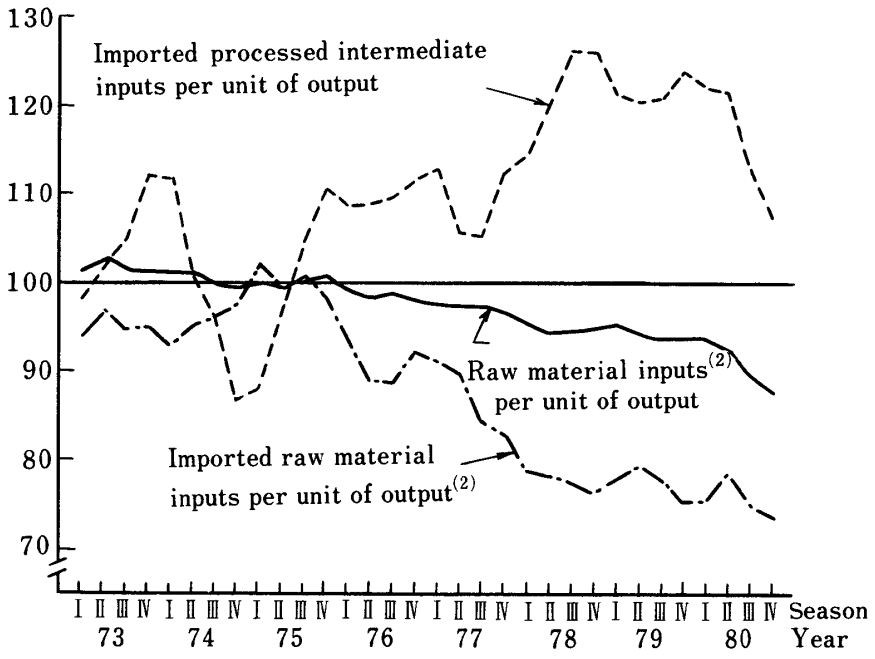

Fig. 2. Changes in raw materials input per unit of output and imported raw material inputs per unit of output. (Manufacturing Industry)
Note: (1) seasonally adjusted index 1975=100; (2) excluding crude oil.
Source: MITI [6], 1981, p. 249, Fig. 3-3-19.

not rise more was primarily due to the stagnant demand for textiles and non-ferrous metals. This stagnant demand offset the increase in imports that was caused by rise in import ratios. In other words, in industries that experienced the rise in import ratio, the growth in demand after the oil crisis was relatively small and depressed the possibility of large increase of imports.

The experience of the capital goods industry was quite different from that in processed intermediate goods. The proportion of capital goods in total imports fell in 1974 from 1970 but it remained almost unchanged through the late 1970s. From Table 2, one can see that import ratios of capital goods such as office-machinery, industrial machinery and electronic computers in 1975 were relatively high. However, compared to import ratios in 1970, they were substantially lower reflecting the import substitution that proceeded during this period.[9] Because the increase in final demand both in domestic as well as in foreign markets was large compared to other industries, they just offseted the decline in the import ratio and caused the increase in imports in capital goods industry to be almost proportional to total imports.

The only industry that experienced a more than proportional increase in imports to the total was the consumer goods industry. Here the import ratio for

[9] For example, the import ratio of office machinery was 18.41%, while that of electronic computer and accessary equipment was 45.86% in 1970. These ratios were much higher than in 1975. See Sazanami and Kikuchi [10].

Textile, Zinc, Nickel, Aluminum and Lead
1970–1979

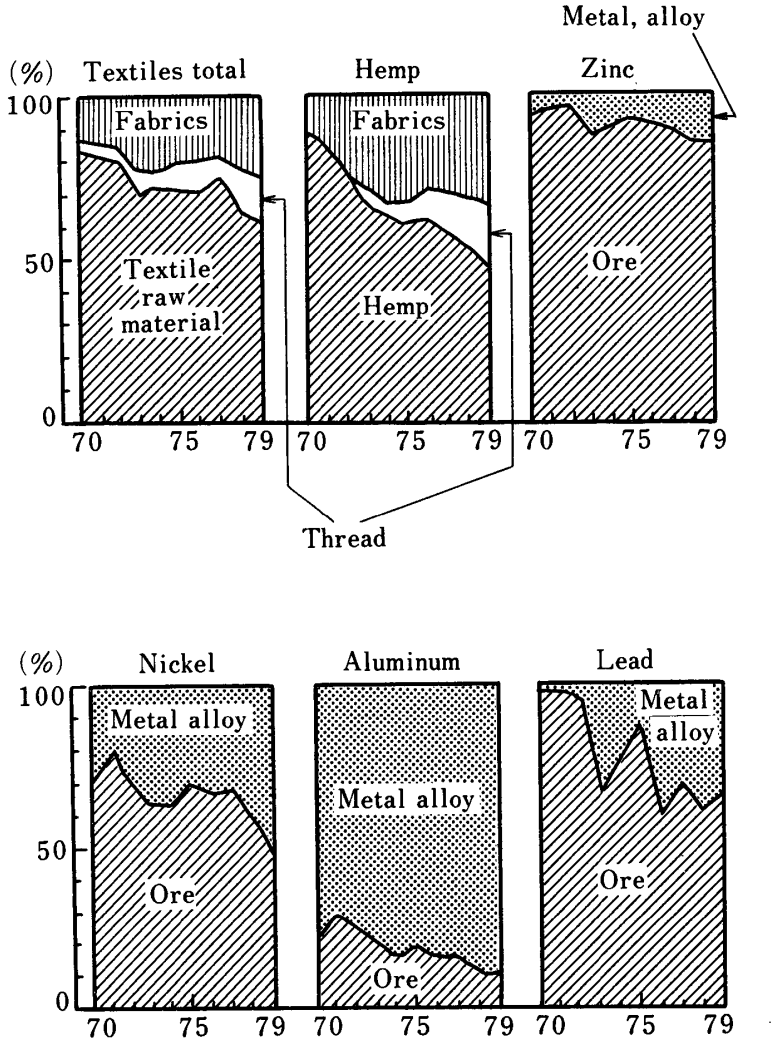

Fig. 3. Changes in import share of raw materials and processed intermediate goods.
Source: JETRO [5], p. 24, Fig. 7.

both foods and apparels rose sharply reflecting the gain in competitive strength of neighboring Newly Industrializing countries, the liberalization of trade and appreciation of yen.[10]

When crude oils and fuels are excluded from total imports, the proportion of manufactured goods in Japan did increase in the 1970s. There was a shift from raw material imports to intermediate processed imports in textiles and non-ferrous metals. However, these industries were particularly hard hit by a slow recovery in

[10] According to Sazanami and Kikuchi [9] price elasticities for food items are quite large, suggesting a large responsiveness to import price changes. For the period of estimation, 1968–1978: meat, −3.16; fish and preparations, −1.62; chocolates and sweets, −1.45; dairy products, −0.42.

TABLE 2. IMPORT RATIO BY COMMODITIES IN JAPAN
1975

(Unit; %)

I. Intermediate goods*				II. Capital goods**		IV. Consumer goods***	
A. Raw materials		Chemical manures, agricultural chemicals	10.09	Air craft	34.48	Hempen fabric	37.86
Iron ore mining	99.52	Lumber, plywood, chip	8.78	Electronic computer and accessory device	17.45	Leather and fur products	16.47
Other non-metal ores	91.83	Petroleum refinery products	8.29	Precision instrument	16.32	Printing and publishing	16.47
Non-ferrous metal ores	85.03	Medical preparation	8.10	Ship and its repair	12.57	Processed fish meat	12.47
Inedible crops	63.48	Hempen yarn	6.03	Office machinery	10.46	Knitted fabric	10.07
Iron scrap	48.00	Ferrous alloy	5.02	Tool, metal working machinery	6.94	Silk fabric	9.84
Wood and log	46.37	Cotton yarn	4.58	Industrial machinery	5.95	Meat	8.12
Materials for ceramics	13.36	Other basic non-ferrous metal	4.23	Prime mover and boiler	5.10	Cotton-rayon fabric	7.78
Brown rice barley	10.75	Plastic	2.96	General industrial machinery and equipments	4.70	Leather products	7.32
Sea-shore water fishing	7.05	Rolled aluminum	2.48	Other General machinery	3.78	Wollen fabrics	7.04
Sericulture	5.86	Other wooden products	2.31	Strong electrial machinery	3.34	Apparel accessories	4.52
Stock-raising	5.81	Pottery, china and earthenware	2.25	Other weak electrical appliances	3.06	Rubber products	3.28
Gravel and building stone	0.99	Other metal products	2.07	Electric equipment for home use	2.68	Tabacco products	2.72
B. Processed intermediate goods		Glass products	1.68	Motor vehicle	1.80	Furniture	1.04
Non-ferrous metals	31.86	Rolled, drawn and extruded copper	1.07	III. Fuels		Beverages	0.48
Paint, vanishes and lacquers	19.34	Prepared feeds for animal and poultry	1.00	Crude petroleum production	99.77		
Silk-realing	19.31	Electric wire and cable	0.97	Coal mining	85.65		
Pulp	13.64	Paper articles	0.88	Natural gas	72.85		
Wollen yarn	12.12	Petroleum organic basic chemicals	0.85				
Non-petroleum organic basic chemicals	11.85	Synthetic fiber yarns	0.83				
Other basic industrial chemicals	10.52						

Note: * $\frac{\text{Imported intermediate goods}}{\text{Intermediate demand}} \times 100.$ ** $\frac{\text{Imported capital goods}}{\text{Capital demand}} \times 100.$ *** $\frac{\text{Imported consumer goods}}{\text{Domestic consumer demand}} \times 100.$

Source: Sazanami and Kikuchi [9], Table 1.

TABLE 3. STANDARD DEVIATION OF "INDEX OF SPECIALIZATION" IN MANUFACTURE JAPAN, U.S. AND WEST GERMANY 1970–1980

	Imports			Exports		
	Japan	U.S.	W. Germany	Japan	U.S.	W. Germany
SITC	5–8	5–8	5–8	5–8	5–8	5–8
1970	38.2	55.5	30.7	60.7	30.8	41.1
1971	38.7	51.2	28.9	62.4	35.7	38.7
1972	37.9	48.4	31.5	62.2	35.8	40.2
1973	37.7	39.2	30.3	62.8	31.0	37.6
1974	30.6	46.2	34.3	60.3	30.8	35.6
1975	32.8	44.8	33.3	62.9	33.0	36.6
1976	28.5	45.0	26.6	64.4	33.3	34.9
1977	33.0	41.8	36.2	60.6	35.5	33.6
1978	29.5	42.5	27.2	61.1	44.9	33.4
1979	27.7	40.2	26.7	66.7	41.5	32.6
1980	25.2	59.1	28.5	69.2	45.7	33.2

Note: (1) Manufacture include SITC 5–8.
(2) Specialization index was defined as

$$S_{ij}=\frac{E_{ij}\Big/\sum_{i}^{n}E_{ij}}{\sum_{j}^{k}E_{ij}\Big/\sum_{i}^{n}\sum_{j}^{k}E_{ij}}\times 100$$

when $\sum_{j}^{k}E_{ij}$ equals OECD total and E_{ij} stands for country j's exports (or imports) of i commodity.

Source: OECD Trade Statistics.

final demand after the oil crisis and this reduced the import demand for intermediate processed goods. On the other hand, in capital goods industries where final demand grew at a higher rate, the import ratio fell and as a result the increase in imports was somewhat less than increase in total imports. (Excluding crude oil and natural gas.) Thus the largest increase in imports of manufactured goods were in consumer goods, foods and apparels in particular.

In regards to exports, Japan intensified the specialization toward the end of 1970s. As pointed out in the previous section, in 1972 the standard deviation of specialization index of Japan was higher than in most of the industrial countries reflecting the predominance of inter-industry specialization. Such tendency to specialize in particular industries did not seem to have changed in Japan after the oil crisis or even to have became more evident in machinery and transportation equipment where an increase might have been expected.

The divergent movement of exports vs. imports resulted in rather modest

TABLE 4. INTRA-INDUSTRY TRADE IN JAPAN, U.S. AND WEST GERMANY
1970 and 1979

	Japan		U.S.		West Germany	
	1970	1979	1970	1979	1970	1979
Textiles	32.6	57.4	70.9	74.7	72.6	72.9
Chemicals	60.7	55.8	56.4	67.8	55.6	62.5
Ceramics and clay	33.2	42.2	60.0	60.5	70.5	82.2
Iron and steel	5.2	11.1	51.3	50.8	67.9	59.8
Non-ferrous metals	39.8	49.3	49.6	45.6	51.6	78.3
Metal products	16.6	21.3	56.4	57.6	58.5	69.1
General machinery	74.1	34.4	56.4	67.7	49.3	47.9
Electric machinery	38.6	31.6	71.6	76.6	61.1	70.0
Transport machinery	17.0	11.8	52.6	68.8	54.4	59.0
Precision machinery	40.5	30.0	39.5	62.5	60.0	87.0
Manufactured total(1)	44.7	47.0	55.2	64.6	62.9	69.8

Note: (1) Excluding food.
(2) Intra-industry trade index was defined as follows:

$$\frac{1}{n}\sum_{i}^{n}\frac{(E_i+M_i)-|E_i-M_i|}{(E_i+M_i)}\times 100$$

where E_i=export of i commodity; M_i=import of i commodity.
Source: MITI [6], 1981, Table 4-1-7, p. 297.

increase in intra-industry trade in manufacture. In 1979, the Japanese index of intra-industry trade for manufacturing industry as a whole was still substantially below the level in the U.S. and West Germany (see Table 4). The industries that experienced an expansion of intra-industry trade in the 1970s were textiles, non-ferrous metals and metal products. In machinery industries—general, electric, transportation and precision machineries, the index of intra-industry trade fell as they intensified export expansion which was not matched by an increase in imports. Such a fall in the intra-industry trade index for machinery did not take place in the U.S. or West Germany who both continued to expand intra-industry trade. Thus the difference between these countries and Japan in regards to the proportion of intra-industry trade became even wider in the late 1970s. In 1979, the proportion of intra-industry trade in the U.S. and West Germany exceeded 60% while in Japan it was 47%, only a gain of 3% from 1970.

4. RECENT REGIONAL DEVELOPMENT OF INTRA-INDUSTRY TRADE IN JAPAN—A CONCLUDING REMARKS

Japanese trade after the oil crisis, continued to depend heavily on exports of a limited number of manufactured goods and on imports of raw materials. As a

TABLE 5. REGIONAL DEVELOPMENT OF INTRA-INDUSTRY TRADE IN JAPAN
(1970, 1975 and 1980)

	World total			U.S.			EC			NICS(1)			Centrally planned countries			Others		
	1970	1975	1980	1970	1975	1980	1970	1975	1980	1970	1975	1980	1970	1975	1980	1970	1975	1980
Textiles	23.1	51.1	67.1	7.6	25.0	15.0	83.0	70.0	75.0	30.9	83.0	94.8	32.6	74.2	83.2	16.3	13.6	53,8
Chemicals	89.5	69.2	95.6	57.1	61.7	46.5	64.3	65.5	59.9	8.9	16.1	39.1	32.7	24.1	43.8	70.6	46.9	69.8
Ceramics and clay	48.0	78.0	75.8	24.1	55.9	50.0	98.0	94.2	77.0	34.4	69.4	54.7	51.9	72.5	88.0	55.0	83.1	75.4
Iron and steel	17.7	3.6	10.9	5.9	2.4	4.5	17.0	5.4	11.2	3.7	4.8	20.9	36.4	4.0	5.5	23.3	3.6	11.4
Non-ferrous metals	41.6	59.2	59.9	87.5	86.3	77.6	77.6	94.4	80.1	22.9	9.9	6.1	50.0	48.2	42.0	17.1	32.1	24.3
Metal products	18.1	19.2	19.4	17.4	23.2	29.0	73.3	62.7	51.1	7.2	29.0	22.8	3.6	2.2	4.6	13.0	7.4	8.1
General machinery	77.3	46.9	34.6	74.4	98.3	75.3	71.0	98.0	70.6	1.8	9.7	6.6	20.8	4.0	2.4	37.3	16.9	13.1
Electric machinery	28.6	26.1	21.9	40.9	43.4	45.0	47.2	30.0	19.9	15.2	40.0	26.5	10.2	11.6	1.5	9.1	5.1	5.3
Transport machinery	21.1	10.0	12.3	49.7	26.7	15.7	71.6	23.4	30.9	0.2	1.6	4.0	6.0	0.8	12.7	4.9	1.9	4.4
Precision machinery	38.8	37.6	28.0	58.4	49.5	38.5	42.7	37.7	28.0	7.3	27.4	50.0	14.4	4.6	8.8	29.6	33.1	14.4

Note: (1) NICS includes Korea, Taiwan, Hong Kong and Singapore.
(2) SITC: 3 digit classification was aggregated into 2 digit classification corresponding to the industrial classification as listed in the table.
(3) Intra-industry trade index was defined as

$$\frac{\sum_{i}^{n}(X_ijk+M_ijk)-\sum_{i}^{n}|X_ijk-M_ijk|}{\sum_{i}^{n}(X_ijk+M_ijk)}\times 100$$

$X_ijk=j$'s exports of i commodity to k; $M_ijk=j$'s imports of i commodity from k.

Source: Sazanami [10], Table 2.2.

result, expansion of intra-industry trade was rather modest. According to Grubel–Lloyd,[11] machinery industry has high intra-industry trade index than the others. Machinery exports from Japan expanded very rapidly in the 1970s,[12] but this did not help to promote intra-industry trade in Japan. This was partly because a large part of the expansion was directed not to industrial countries but rather to Newly Industrializing countries that needed more general machinery for industrialization, as well as to oil producing countries that could now afford more electric machinery and transportation machinery and to centrally planned countries that were relatively immune to the oil crisis. The increase in exports to these countries could not be matched with the increase in imports from them since most of them do not export or even produce machinery. Therefore, as the Japanese exports to these countries expanded, it caused a fall in the intra-industry trade index on an aggregate level as is shown in Table 4.

In Table 5, Japanese trading partners were grouped into five regions, namely, U.S., EC, Newly Industrializing countries in Asia, Centrally Planned countries and Rest of the world. The intra-industry index was calculated by regions for the years 1970, 1975 and 1980. The index by regions shows quite diverse movement during 1970s. As for machineries, the proportion of intra-industry trade in total trade with the U.S. and EC declined between 1970 and 1980 except for electric machinery to U.S. Since the intra-industry trade index is very small in regards to trade with other regions, the index for the world total was reduced still further as exports directed to these regions increased during this period.

Industries that experienced an expansion of intra-industry trade were textiles, chemicals, ceramics and stone, non-ferrous metals and metal products. The expansion of intra-industry trade with these industries mainly reflected the increase in intra-industry trade with Newly Industrializing countries, except for the case of non-ferrous metals. The most remarkable increase was observed in the case of textiles. In textiles, a large part of the increase in imports from Newly Industrializing countries in the 1970s took the form of intra-industry trade. In 1980, 94.8% of textile trade between Japan and Newly Industrializing countries was intra-industry trade. Similar development were observed in the case of textile trade with centrally planned countries reflecting the increase in trade with China. Even in machineries, there was an increase in intra-industry trade between Newly Industrializing countries and Japan, with trade in electric machinery and precision machinery accounting for part of this increase.

Although increase in the proportion of exports directed to developing countries and centrally planned countries tended to depress the proportion of intra-industry trade in total trade, this was not necessarily true in case of Newly Industrializing countries in the 1970s. The index of intra-industry trade with Newly Industrializing countries rose in most of these industries and the levels in 1980

[11] Grubel–Lloyd [4], Tables 3 and 4, p. 42.

[12] Exports of general, electric, transportation and precision machineries taken together accounted for 39.4% of total exports in 1970 but was 62.7% in 1979.

were higher than the world total in textiles, iron and steel, metal products, electric machinery and precision machinery.

Careful study must be carried out in the future to see why Japan expanded intra-industry trade with Newly Industrializing countries in spite of the decline observed in trade with the U.S. and EC. At least one can point out that liberalization of trade and the appreciation of the yen seem to have increased the intra-industry trade of certain regions. The emergence of industrial centers in neighboring countries and closer economic ties through direct investment may have enabled Japanese firms to undertake intra-industry trade.[13] Thus the possibility of future expansion of intra-industry trade in Japan seem to rest on (1) the industrialization of neighboring developing countries and (2) building up closer business ties with other nations through exchange of capital with developing countries and industrial countries.

Presently intra-firm operation in manufacturing industry yields large net exports from Japan, particularly in electric machinery, transportation machinery and precision machinery.[14] However, though the proportion of imports in total procurement of head offices in the machinery industry is still very small—less than 5%—, purchase from their foreign affiliates accounts for 38% of imports in general machinery, 47% in precision machinery and 61% in electric machinery. Therefore if foreign affiliates increase such supply, there is a possibilities of expanding intra-industry trade through intra-firm exchanges of parts and products.

The outcome of the recent development of intra-firm operation and its effect on Japanese intra-industry trade in manufacturing industry is difficult to evaluate.[15] But at least it is quite evident from Table 5 that Japan is expanding intra-industry trade with countries with whom it has built closer economic ties. Although large oil payment have overshadowed the increase in import of manufactured goods to Japan, expansion in the future may be expected through (1) the emergence of industrial centers in the neighboring countries, (2) continuation of liberalization policy and (3) closer economic ties that promote intra-firm exchange of parts and products.

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[13] Accumulated total amount of Japanese direct foreign investment in manufacturing industry between 1951–1980 was directed to the following regions:

Asia	36.3%	North America	19.3%
Latin America	22.1%	Europe	6.7%
Middle East	8.5%	Oceania	6.3%
Africa	0.8%		
Total developing countries	67.7%	Total developed countries	32.3%

from Shimada [12], Table 1.3.

[14] In 1978, total net exports of intra-firm operation in machinery was 2701 billion yen. Shimada [12], Table 4.3.

[15] Shimada [12], Table 4.4.

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