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2 Market Structure, Comparative Advantage, and Japanese Trade under the Strong Yen

Peter A. Petri

2.1 Introduction

Between February 1985 and December 1988 the yen appreciated 33 percent in real and 57 percent in nominal terms against a trade-weighted currency basket, and 93 percent against the U.S. dollar. This round of appreciation—called *endaka*, the rampaging yen—was roughly twice as large as that in 1970–73, when the yen first emerged as a major international currency, and also larger than that in 1975–78, when the yen recovered from the first oil crisis. Visible signs of the economic impact of this change abound in Tokyo's streets, shops, and factories—from BMWs and Benetton clothes to Samsung TVs and Taiwanese electronic components. Real Japanese exports are flat, and Japanese firms are aggressively shifting manufacturing operations nearer to markets and to countries with lower production costs.

Recent popular discussions of these developments—for example, most major business journals have recently featured articles on the internationalization of the Japanese economy—have focused on three theses regarding the impact of *endaka* on Japanese trade. The first is that Japan has begun to undergo structural changes that will eventually make it as open to imports as are other advanced economies. *Fortune*, for example, reported that the "retailing revolution the West has been waiting for is here. . . . That's good news for American goods" (as quoted in Rapoport 1989). In a similar, if less sensational,

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vein the Ministry of International Trade and Industry's new *White Paper on International Trade* (MITI 1989) also argued that Japanese import patterns have shifted and presented evidence that imports in recent years have exceeded expectations based on pre-1985 experience.

A second thesis receiving considerable attention is that currency realignments and other recent changes have accelerated the integration of East and Southeast Asian economies, including especially Japan, South Korea, Taiwan, and some ASEAN countries. *The Economist* speaks of "a swirl of forces—not all emanating from Japan—that is re-shaping East and South-East Asia by bringing their economies closer together" (Rapoport 1989, p. 159). Dornbusch (1988) noted that the "recent strength of the yen, relative to the dollar, has surely helped develop this new division of labor. But it is certain that, once established, it will now develop much further." These changes could be extremely significant, since an integrated "yen bloc," combining large markets, advanced technology, and low-cost labor and raw materials, would be a formidable competitor in the world economy (Maidment 1989).

A third thesis, however, is challenging the view that Japan has become more open with *endaka*. It emphasizes the relatively slow adjustment of the Japanese trade surplus in general and of the Japanese bilateral trade surplus with the United States in particular, notwithstanding sharp improvements in U.S. price competitiveness. The proponents of this view have argued that *endaka* shows that exchange rate adjustments, no matter how large, cannot satisfactorily open Japan. In their view, the "best" Japanese markets continue to be closed by invisible structural impediments such as the domestic bias of the Japanese distribution system and the stable, inward-looking pattern of Japanese business-group relationships.[1]

These theses have been buttressed by bits of economic data, but have not been, for the most part, subject to rigorous analysis. This paper examines the recent evolution of Japanese trade under three headings: aggregate trade, partner composition, and product structure. Under the first two headings, the paper provides a detailed empirical review of ongoing developments. Under the last heading, it presents a model with new evidence on the effects of Japanese market structure on the pattern of Japanese trade. The model shows that variables reflecting product distribution, market concentration, and other potential market barriers, in combination with conventional determinants of comparative advantage, play important roles in explaining the structure of Japanese imports.

2.2 Aggregate Trade

At first glance, aggregate measures of Japanese trade paint a pessimistic picture of the effectiveness of exchange rate changes. The dollar value of Jap-

1. These arguments are stressed, for example, by the Advisory Committee for Trade Policy and Negotiations (1989).

anese exports increased 49 percent between 1985 and 1988, from $174 to $260 billion, while the value of imports increased only 40 percent, from $118 to $165 billion. As a result, Japan's overall trade surplus nearly doubled, from $56 to $95 billion, and its bilateral surplus with the United States increased from $50 to $55 billion. To what extent, if at all, did appreciation affect aggregate trade? Was the effect of exchange rate changes consistent with historical experience, or is there evidence of structural change that either retarded or accelerated trade adjustment?

Figures 2.1–2.3 display the evolution of Japanese trade since 1980. Figure 2.1 shows movements in the effective exchange rate of the yen. Figure 2.2 shows movements in the dollar value of Japanese trade. Dollar exports entered a period of sustained growth in 1983, while dollar imports were relatively flat until 1987 when imports also began to grow rapidly. This figure shows modest and delayed response in the dollar value of Japanese trade to the appreciation of the yen since 1985—export value growth was essentially unchanged, while the break in import value growth appeared only six quarters after the yen began to appreciate. Figure 2.3 shows movements in trade volumes, which reacted more rapidly. Export volume growth essentially stopped with the break in the yen and import volume growth accelerated by early 1986. One important difference between the value and volume data is that the collapse in oil prices in 1986 effectively lowered the value of imports by roughly 20 percent.

Corker (1989) has recently simulated Japanese trade in the absence of yen appreciation. He found that by 1987 Japanese real exports would have been 19 percent higher, and real imports 10 percent lower, than actually observed, and the real trade balance would have been 6 percent instead of 4 percent of Japanese GNP. In effect, yen appreciation "corrected" the Japanese surplus by approximately 2 percent of GNP. Although the dollar surplus would have been only slightly higher without appreciation than it now is (due to the much higher value of the dollar in the absence of yen appreciation), the real imbalances left to be corrected by subsequent adjustments would have been much greater.

While the effect of yen appreciation was large, it was so because the appreciation itself was large; Corker's estimated price elasticities are low (see table 2.1). The long-run relative price elasticity of exports is -1 (explaining the smooth growth of exports valued in dollars in fig. 2.2), while the long-run relative price elasticity of imports is only -0.55. Furthermore, Corker found little evidence of change in these elasticities; his one export and four import equations all passed statistical tests for coefficient stability across pre- and post-1985 data. Corker's post-1985 forecasts did somewhat underpredict both exports and imports, but in neither case were the errors large relative to estimating error.

Corker's results suggest that, if there was structural change, it affected Japanese exports and imports in opposite ways—that is, the adjustment of exports was smaller, and that of imports larger, than historical experience would

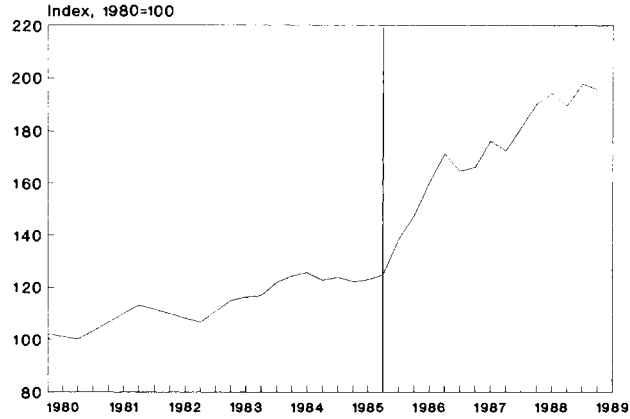

Fig. 2.1 Effective yen exchange rate (IMF Multilateral Model)

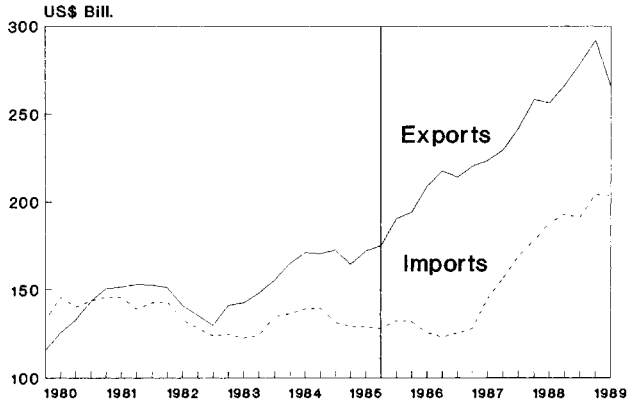

Fig. 2.2 Export and import values ($ U.S.)

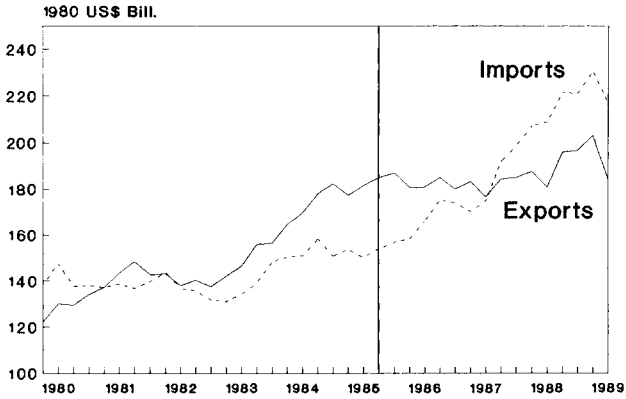

Fig. 2.3 Real exports and imports

Table 2.1 **Long-Run Trade Elasticities**

Trade Category	Relative Prices	Demand	Production
Exports	−1.09	2.04	
Imports	−.55	.88	.89
Manufactures	−.91	1.84	.99
Raw Materials	−.27		1.24
Minerals	−.11		1.04
Food and feed	−.55	.45	

Source: Corker (1989).

have suggested. On the export side, there has been much interest in the hypothesis that the pass-through coefficient has declined, or that Japanese export prices have increased less since 1985 than expected given the size of yen appreciation. Several researchers (Baldwin 1988; Marston 1989; Ohno 1988) have found evidence of low pass through, especially with respect to manufactured exports to the United States, but others (Hooper and Mann 1989) have argued that the pass-through relationships have been stable given a proper choice of the input price index. These issues are also addressed by Marston's contribution to this volume.

Has Japanese import behavior changed? One structural reason that suggests such change is the strengthening of distribution channels that aggressively feature imported merchandise (see sec. 2.3 for further details). This transformation in the distribution system is more likely to be evident in recent data than in data from the quarters directly following the break in the yen. In fact, early postappreciation data on Japanese imports suggested less adjustment than implied by historical import relationships (Loopesko and Johnson 1987).[2] Corker's historical equations also suggested that there was too little actual import growth in 1986, but then shifted to increasingly *under*predicting actual imports by late 1987, at the end of Corker's dataset (see fig. 2 in Corker 1989).

We have reestimated equations for Japanese manufactures imports using the several additional data points that have recently become available. The equations used are similar to those estimated by Corker and others.[3] However, the Chow (1960) test now shows considerable evidence *against* stability across the pre- and postappreciation periods (see table 2.2), and experiments with alternative splits indicate that the break occurred in the third or fourth quarter

2. One possible hypothesis cited was that the distribution system absorbed some of the decline in yen import prices in higher profit margins.

3. As in Corker (1989), I found that a very simple specification with current activity and one-quarter price lags performs extremely well and dominates more complex specifications with polynomial lag terms. It should be noted, however, that Noland (1988) has found evidence for longer lags. Although changes in the lag specification do not necessarily affect the size of estimated elasticities and longer-run behavior, they can affect prediction in the immediate neighborhood of a change in the direction of price movements, such as occurred in 1985.

Table 2.2 **Estimated Equations for Real Imports of Manufactures**

	(1) 1975:2 –1989:2	(2) 1975:2 –1985:2	(3) Variable × Dummy	(4) = (2) + (3) 1985:3 –1989:2
Coefficients:				
Constant	−1.310**	−2.109**	−.817	−2.926
	(−4.500)	(−5.904)	(−1.011)	
Lagged imports	.685**	.507**	−.003	.504
	(12.091)	(6.476)	(−.408)	
Industrial production	.581**	.923**	.161	1.085
	(5.196)	(6.2767)	(.959)	
Change in industrial production	1.345**	.482	1.366*	1.848
	(4.649)	(1.399)	(2.407)	
Relative price lagged 1 quarter	−.229**	−.189**	−.229*	−.418
	(−5.705)	(−3.546)	(−2.485)	
Long-run properties:				
Output elasticity	1.846	1.873		2.186
Price elasticity	−.729	−.383		−.843
Statistics:				
Observations	57	57		
R^2	.995	.996		
Adjusted R^2	.995	.996		
F statistic	2568.7	1452.4		
Durbin's H	−.99	−.28		
Durbin-Watson	2.24	2.06		
Standard error	.0306	.0272		
Squared errors	.0488	.0347		
Chow F, eq. (1) vs. eq. (2)		3.75		
5% Significance, $F(5,47)$		2.42		

Note: OLS with all variables in logs. Dependent variable is import volume. Relative price is ratio of manufacturing import price index to domestic GNP deflator. T-ratios in parentheses. Col. 3 shows results for variables multiplied by a dummy which is set equal to 1 in the second subperiod.

*$P = .05$.

**$P = .01$.

of 1985. Forecasts based on the preappreciation equation at first overpredict and then substantially underpredict imports starting in 1987 (see fig. 2.4).

The differences between pre- and post-1985 equations are captured in "coefficient change" variables, constructed by multiplying each independent variable with a dummy set to one in the third quarter of 1985 and thereafter (table 2.2, col. 2–4). Column 2 shows the coefficients appropriate to the period prior to appreciation, column 3 presents changes between the periods, and column 4 calculates coefficients appropriate in the postappreciation period. Evidently, the sensitivity of imports increased significantly after 1985 with respect to changes in both industrial production and the relative price of imported goods.[4]

4. The price variable used to represent Japanese domestic costs in these equations was the GDP deflator. Since the import price/GDP deflator ratio is somewhat more sensitive to exchange rate

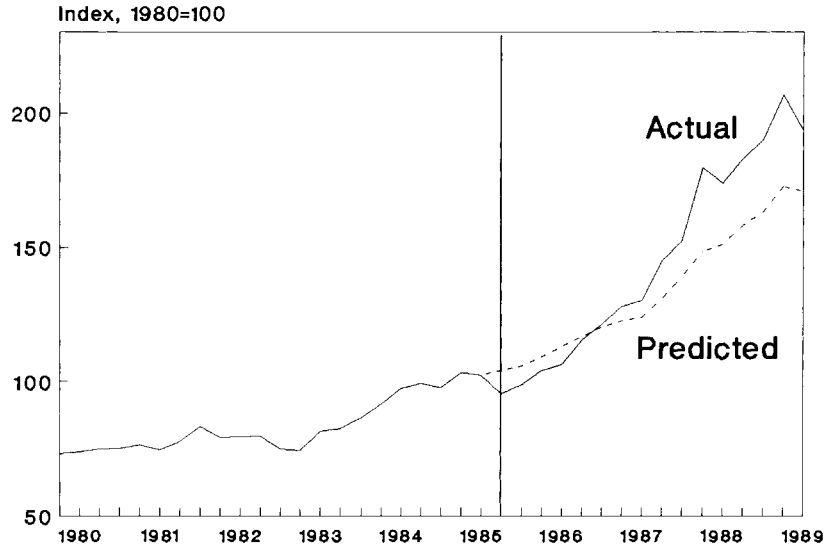

Fig. 2.4 Real imports of manufactures

2.3 The Partner Composition of Trade

There has been a dramatic expansion in Japanese trade with East Asian newly industrialized countries (NICs) and developed countries other than the United States. These two groups of countries together accounted for a smaller share of Japanese exports than the United States in 1985,[5] but each accounted for a larger share of the increase in exports between 1985 and 1988 than did the United States (see fig. 2.5). In Japanese imports (see fig. 2.6), the combined share of the East Asian NICs and other industrial countries in the increase between 1985 and 1988 was nearly three times as large as that of the United States.

The rapidity of change is illustrated in figures 2.7 and 2.8. Figure 2.7 shows that Japanese exports began to shift from U.S. markets to other markets soon after 1985, when global currency realignments resulted in a much larger appreciation against the United States than against other industrial countries. Although the yen initially appreciated sharply also against the East Asian

movements than the import price/wholesale price ratio (the denominator in the latter includes a much larger share of tradables), the estimated price elasticities are smaller than those obtained by using the wholesale price index.

5. Group definitions are as follows. "Other industrial countries" includes all industrial countries (see World Bank 1987) except the United States; "East Asian NICs" includes Hong Kong, (South) Korea, Singapore, and Taiwan; "East Asian LDCs" includes China, Indonesia, Malaysia, the Philippines, and Thailand; and "other developing countries" includes all other countries, including oil exporters.

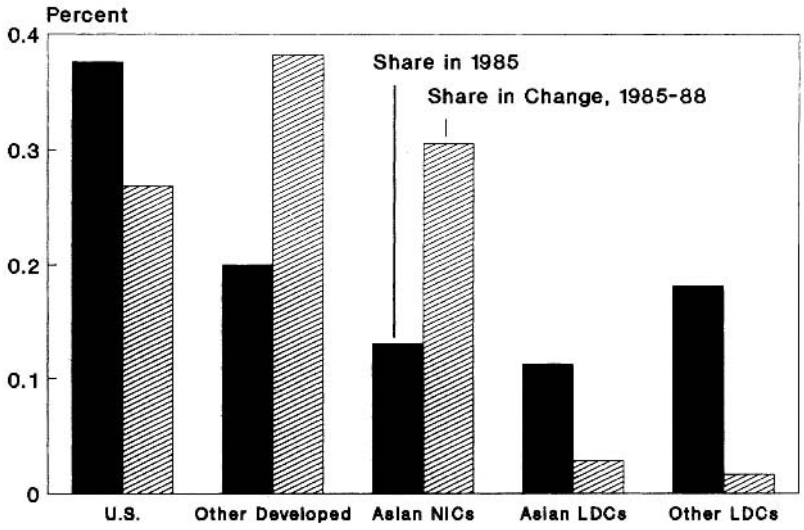

Fig. 2.5 Shares in Japanese exports

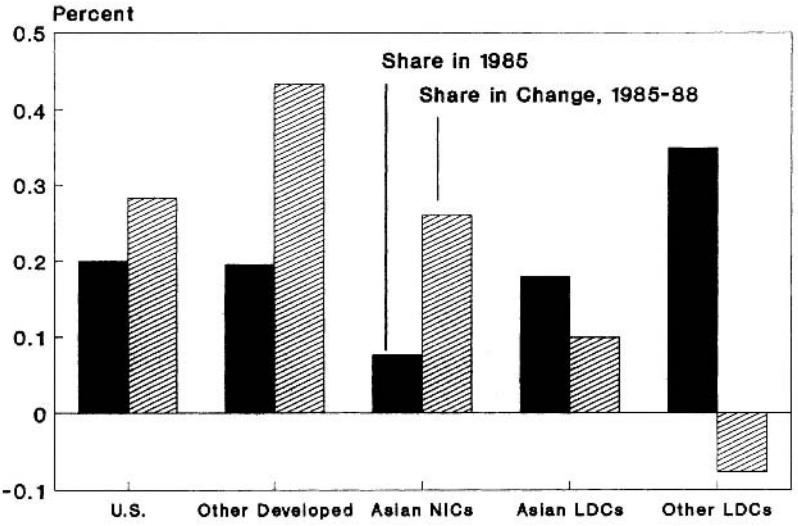

Fig. 2.6 Shares in Japanese imports

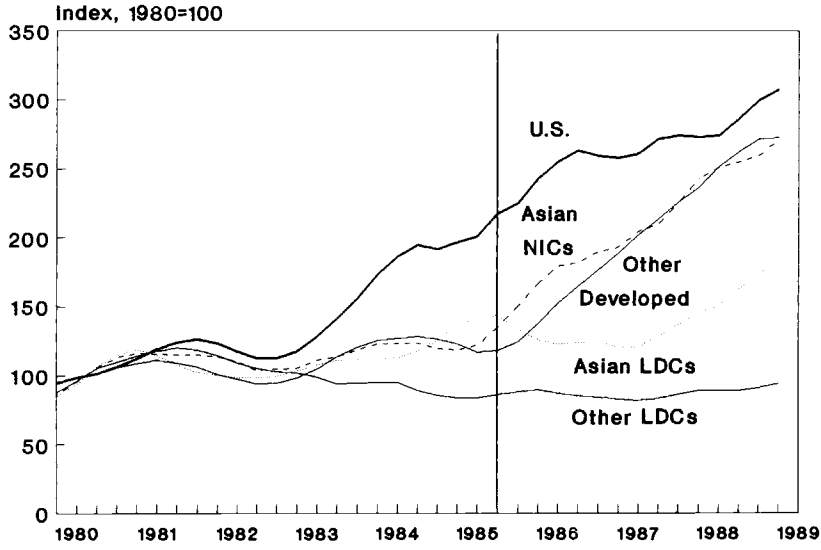

Fig. 2.7 Export values by partner ($ U.S.)

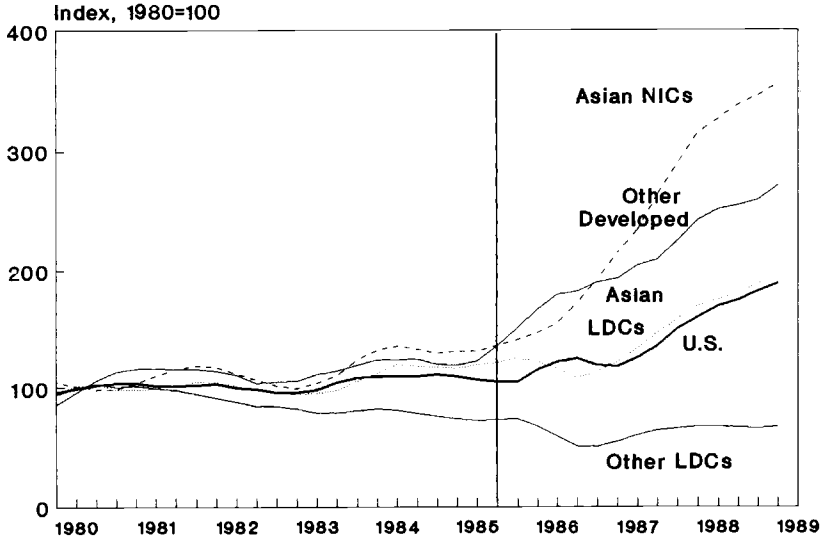

Fig. 2.8 Import values by partner ($ U.S.)

NICs, Japanese exports to these countries nevertheless expanded. A key reason for this was that *endaka* enabled the East Asian NICs to capture markets in the United States and elsewhere in products that required Japanese components and capital goods.[6]

Figure 2.8 shows sharp increases in Japanese imports from the NICs and other developed countries. The remarkable fact behind these statistics is that Japanese consumers have responded very positively to the availability of attractively priced imports. Contrary to conventional wisdom, this response has not been limited to high-quality, luxury goods from Europe, but has included inexpensive clothing, appliances, and consumer electronics from East Asia. To take advantage of these trends, a merchandising boom has developed, complete with the institution of the *bahgen say-ru*. Discount chains such Jusco, Daiei, and I World, feature aggressively priced, imported goods, and have been growing twice as fast as mainline department stores.[7]

These developments are clearly reflected in the changing patterns of Japanese manufactures trade with the NICs and other developed countries (table 2.3). Consumer goods are prominent among the most rapidly expanding manufactures imports, including wearing apparel and consumer electronics from the NICs and automobiles from other developed countries. Exports are dominated by electronic components and machinery to the NICs, and automobiles, consumer electronics, and machinery to other developed countries.

Is this evidence of a "yen bloc" and a new phase in East Asian economic integration? The answer to this question is far from self-evident. Trade links between Japan and its East Asian neighbors have been historically strong, and, given East Asia's high growth relative to the rest of the world, the region's importance to Japan (and every other country) has increased. From the perspective of the East Asian partners, however, the importance of Japanese linkages has declined relative to extraregional trade, especially during the period of the strong dollar and U.S. economic recovery in the mid-1980s. Recent increases in East Asian–Japanese trade have partially retraced this decline (see table 2.4), but only for Malaysia was the share of trade with Japan actually higher in 1988 than in 1975. Thus, the period since 1985 may be alternatively viewed as retracing or slowing the secular *dis*integration of the East Asian economy, which, in turn, is driven by growing worldwide economic integration.

The growth of Japan's trade with the East Asian NICs has recently slowed: exports plus imports grew at a 32 percent annual rate between the second quarter of 1985 and the first quarter of 1988 but only at a 13 percent rate since, as compared to 14 and 13 percent for Japan's overall trade over the two peri-

6. The import content of Korean exports, for example, is 43 percent.

7. See, e.g., articles by Meyer, Hoshiai, and Takayama (1987), Darlin (1988), and Rapoport (1989).

Table 2.3 Shares of Categories in Increase of Trade, 1985–88

Japanese Imports	%	Japanese Exports	%
TRADE WITH EAST ASIAN NICS:			
Wearing apparel	22.8	Radio, TV, components	24.2
Radio, TV, components	10.5	Basic iron & steel	8.2
Basic iron & steel	9.6	General industrial machinery	8.1
Miscellaneous products	6.0	Special industrial machinery	6.4
Plastic products	3.9	Electrical industrial machinery	6.1
Other metal products	3.2	Motor vehicles	6.0
Office machinery	3.1	Basic industrial chemicals	5.8
Leather footwear	2.9	Office machinery	4.8
Yarn and fabric	2.9	Synthetic resin	3.9
Electrical industrial machinery	2.8	Electronics	3.6
Top 10 categories	67.7	Top 10 categories	77.2
TRADE WITH OTHER DEVELOPING COUNTRIES:			
Motor vehicles	16.0	Motor vehicles	29.1
Basic industrial chemicals	12.6	Radio, TV, components	19.7
Drugs and medicines	6.6	Office machinery	12.5
Pulp	5.5	General industrial machinery	5.0
Lumber and plywood	5.4	Photographic equipment	4.2
Special industrial machinery	5.1	Special industrial machinery	4.2
Yarn and fabric	5.0	Basic industrial chemicals	2.7
Miscellaneous products	4.2	Electrical industrial machinery	2.6
Wearing apparel	3.8	Electronics	2.3
Scientific instruments	3.7	Scientific instruments	2.2
Top 10 categories	67.8	Top 10 categories	84.5

ods. It is possible that some of the rapid increase in East Asian trade during the early months of *endaka* was related to the delayed adjustment of the region's currencies to yen appreciation. Alternatively, the slowdown in recent trade may reflect supply problems in the NICs and thus may be temporary.

Ultimately, however, the outlook for strong economic linkages between Japan and other East Asian economies has to be bright. Japanese demand for foreign consumer goods is coming of age just as East Asian economies are assuming leading positions in the supply of high-quality consumer goods. There is also evidence of increasing direct integration in production. According to Takeuchi's (1989b) data, Japanese direct investment in Asian manufacturing has increased from $642 million per annum in 1980–84 to $1.7 billion in 1987 and $2.4 billion in 1988. More than half of this investment now goes into the machinery industries, where firms often export back into Japan; Asian subsidiaries of Japanese firms exported 16.7 percent of their output to Japan in 1987 as compared to 9.8 percent in 1980. These magnitudes, although not yet large relative to overall Japanese trade, do foreshadow the continued expansion of regional integration and trade.

Table 2.4 **Japanese Trade with East Asia**

	As % of Country's Exports, Imports			As % of Japan's Imports, Exports		
	1975	1985	1988	1975	1985	1988
East Asian NICs:						
Exports to Japan	16.0	12.0	15.3	4.6	7.6	13.3
Imports from Japan	32.6	26.6	31.4	13.0	13.1	18.9
Hong Kong						
Exports to Japan	4.1	2.6	3.3	.4	.6	1.1
Imports from Japan	20.4	22.1	18.3	2.5	3.7	4.4
Korea						
Exports to Japan	25.7	13.7	19.5	2.3	3.2	6.3
Imports from Japan	30.9	23.0	29.8	4.0	4.0	5.8
Singapore						
Exports to Japan	7.4	7.0	5.9	2.3	3.2	6.3
Imports from Japan	18.7	14.8	18.9	4.0	4.0	5.8
Taiwan						
Exports to Japan				1.2	2.6	4.6
Imports from Japan				3.7	3.1	5.5
East Asian LDCs:						
Exports to Japan	32.9	32.0	27.9	13.0	17.9	15.5
Imports from Japan	28.6	25.0	19.8	11.9	11.3	8.5
China						
Exports to Japan	19.9	23.9	20.7	2.6	5.0	5.3
Imports from Japan	28.5	29.6	17.2	4.1	7.1	3.6
Philippines						
Exports to Japan	48.8	27.2	29.1	1.9	1.0	1.1
Imports from Japan	27.3	17.3	20.0	1.8	.5	.7
Thailand						
Exports to Japan	32.8	14.5	31.1	1.3	.8	1.5
Imports from Japan	29.2	22.2	26.4	1.7	1.2	1.9
Malaysia						
Exports to Japan	19.8	28.1	22.5	1.2	3.3	2.5
Imports from Japan	15.9	17.8	18.5	1.0	1.2	1.2
Indonesia						
Exports to Japan	48.3	54.8	49.3	5.9	7.8	5.1
Imports from Japan	38.8	21.4	22.6	3.3	1.2	1.2

2.4 The Product Structure of Trade

2.4.1 Key Trends

In terms of the broadest categories, Japan's imports of manufactures have increased substantially relative to raw materials and now account for nearly one-half of total imports (fig. 2.9). This change is partly due to declining raw materials relative to prices, but, as demonstrated earlier, manufactures have also responded much more vigorously to income growth and appreciation than

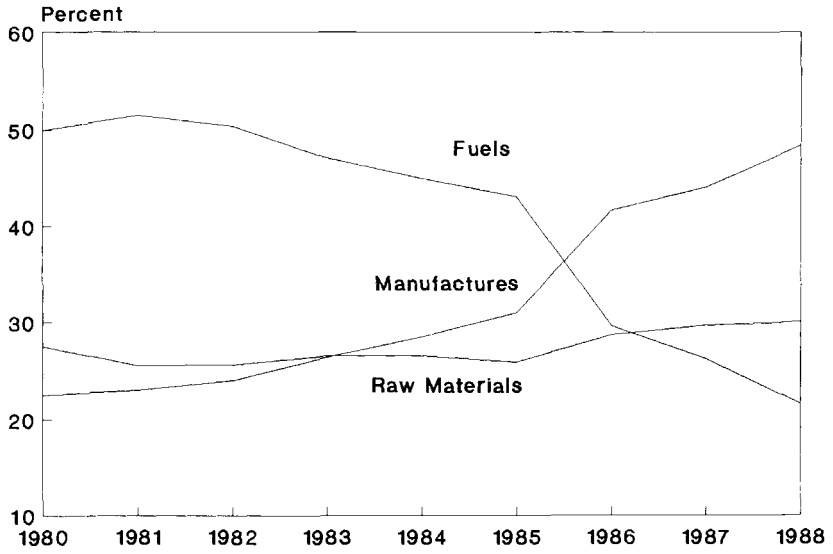

Fig. 2.9 Shares in Japanese imports

other imports. More important, however, the structure of trade in manufactures is also changing rapidly.

Table 2.5 presents trade data for 49 manufacturing sectors grouped into five categories according to their relative requirements for four inputs, raw materials (including energy), labor, capital, and technology. To determine the assignment of a particular sector, I computed its standardized deviation from the manufacturing average in each of the four input dimensions, and then placed it into, say, the labor-intensive category if its deviation was larger in this dimension than in others. Sectors near overall averages in all four dimensions were classified as "mixed." Sectoral assignments are presented in the appendix.

The lead story of table 2.5 is Japan's increasing specialization in technology-intensive products. On the export side, the share of raw-material-intensive, labor-intensive, and capital-intensive exports declined from 44 percent of all manufactures exports in 1970 to just 19 percent in 1988. The share of mixed exports grew between 1970 and 1980 but has been stagnant since. Only technology-intensive exports have shown steady gains in shares. Opposite trends are evident on the import side. Here the shares of labor-intensive, capital-intensive, and mixed imports increased from 36 to 50 percent, while raw-material-intensive imports fluctuated (mostly reflecting relative valuation effects) and the share of technology-intensive imports sharply declined.

A second important feature of Japanese trade patterns is that competitively strong Japanese industries tend to export and not import—intra-industry trade

Table 2.5 **Changing Composition of Manufacturing Trade**

	Japanese Exports				Japanese Imports			
To or From	1970	1980	1985	1988	1970	1980	1985	1988
World:								
Raw-material intensive	6.4	5.4	4.3	4.8	15.9	20.3	21.2	17.2
Labor intensive	17.3	9.0	7.3	6.4	23.7	28.8	24.8	29.0
Capital intensive	20.3	16.5	10.6	8.1	6.7	5.3	6.7	8.9
Technology intensive	40.7	42.3	49.7	53.3	47.8	37.8	40.1	34.3
Mixed	15.2	26.7	28.1	27.5	5.8	7.7	7.2	10.5
United States:								
Raw-material intensive	4.6	3.2	2.6	2.8	14.1	22.5	21.7	19.0
Labor intensive	16.0	6.0	5.1	4.4	14.3	15.9	9.3	12.5
Capital intensive	24.7	14.6	7.5	4.8	2.4	2.5	1.8	2.7
Technology intensive	34.9	34.9	46.0	50.4	62.7	53.2	62.9	59.9
Mixed	19.8	41.4	38.8	37.7	6.5	5.9	4.3	5.8
Other developed countries:								
Raw-material intensive	6.7	5.2	4.2	4.1	20.7	23.9	27.7	23.7
Labor intensive	15.6	9.4	7.5	6.0	21.7	26.5	23.5	23.3
Capital intensive	17.5	10.6	5.3	4.2	4.9	3.9	4.8	4.3
Technology intensive	45.7	48.7	54.9	55.7	46.8	35.9	32.0	30.9
Mixed	14.5	26.2	28.0	30.1	5.9	9.9	11.9	17.8
East Asian NICs:								
Raw-material intensive	8.3	9.7	9.0	8.6	2.0	7.5	7.7	6.4
Labor intensive	29.0	14.9	14.0	10.4	78.1	48.6	43.0	41.2
Capital intensive	13.2	16.5	11.0	10.6	4.6	11.3	16.2	16.4
Technology intensive	40.4	47.7	55.7	60.8	12.0	23.6	25.0	25.1
Mixed	9.1	11.2	10.3	9.6	3.4	8.9	8.2	10.9
East Asian LDCs:								
Raw-material intensive	14.6	9.8	6.1	7.8	20.6	12.9	14.8	11.0
Labor intensive	10.2	6.7	5.2	6.2	73.6	67.5	69.1	66.3
Capital intensive	28.7	24.9	25.1	21.4	.8	4.7	3.6	9.7
Technology intensive	33.5	39.8	47.0	49.3	1.0	8.9	7.0	7.6
Mixed	13.0	18.8	16.5	15.2	4.0	6.1	5.4	5.3
Other developing countries:								
Raw-material intensive	4.7	3.8	3.5	3.8	12.5	24.4	26.9	22.0
Labor intensive	16.6	9.4	8.1	6.9	32.9	33.8	33.7	35.4
Capital intensive	17.9	19.1	13.6	12.5	42.4	15.9	24.0	31.6
Technology intensive	46.5	42.4	49.2	48.0	7.9	20.3	12.1	8.2
Mixed	14.2	25.3	25.5	28.7	4.3	5.6	3.3	2.8

is low (Lawrence 1987; Carliner, as quoted in Takeuchi 1989b). This problem is confirmed in table 2.6, which presents, for broad manufacturing groups, "cross-hauling" ratios—that is, the ratios of overlapping exports and imports in individual sectors to sectoral exports plus imports.[8] This index ranges from

8. Specifically, intra-industry trade index $= 1 - \Sigma_i|E_i - M_i|/[E_i + M_i]$, where E and M are exports and imports, and i ranges over all sectors included in a given sectoral grouping.

Table 2.6 **Intra-industry Trade Index**

	1970	1980	1985	1988
Total:	37.4	29.3	26.1	34.9
Raw-material intensive	76.7	80.9	76.9	81.6
Labor intensive	43.9	50.8	53.4	59.0
Capital intensive	17.2	13.7	22.2	48.0
Technology intensive	40.4	28.1	22.4	28.1
Mixed	19.7	11.0	8.7	17.0

Note: Index = 100 × [1 − sum of absolute (exports − imports)/(sum of exports + sum of imports)].

zero percent, when a sector only exports or only imports, to 100% when exports are exactly equal to imports. Japan's intra-industry trade has recovered somewhat from its trough in 1985 (when imports were generally low relative to exports) but is still below 1970 levels.

Intra-industry trade appears to be inversely related to competitiveness across Japanese industries; for example, it is high in raw-material-intensive products and low in technology-intensive products. Intra-industry trade also appears to move as a coincident indicator of declining competitiveness; for example, intra-industry trade has risen sharply in capital-intensive sectors at the same time that the share of these sectors in Japanese exports declined. Thus, in Japan intra-industry trade seems to arise largely in industries that have come under general competitive pressure and have abandoned segments of their activities to foreign producers. This mechanism is different from that observed in other countries, where strong industries develop close trade ties with their counterparts in other countries by making different varieties or components of the same or similar products.

2.4.2 Methodology for Econometric Analysis

While the foregoing discussion suggests that Japanese trade may have unusual characteristics, detailed econometric investigation is needed to assess to what extent Japanese trade patterns are governed by comparative advantage as opposed to other determinants. To this end, we now present estimates of the relationship between the structure of Japanese import penetration ratios and export shares (the dependent variables in this analysis) and three types of explanatory factors: comparative advantage, Japanese market structure, and visible barriers. These relationships are examined using observations on 49 Japanese manufacturing sectors (see appendix).

This kind of sector-cross-section analysis of import and export structure—which we shall call the factor "intensity" approach to the study of trade determinants—was pioneered by Baldwin (1971), Harkness (1978), and Baldwin (1979). Most recent studies of Japanese trade, however, have used an alternative factor "endowment" approach, which essentially regresses trade flows on

factor endowments in a country-cross-section sample (Saxonhouse 1983; Leamer 1984; Saxonhouse and Stern 1989). It is useful to review the theoretical underpinnings of these alternative approaches.

The theoretical justification of the endowment approach is based on Heckscher-Ohlin assumptions, including factor price equalization (FPE).[9] These assumptions imply that exports and imports, in effect, trade away the differences between each country's relative factor supplies and international relative factor supplies. In Leamer's (1984) notation, trade has to satisfy the relationship:

$$At = v - sv_w, \tag{1}$$

where A is the factors-by-products matrix of input coefficients, t is the net trade vector, and $v - sv_w$ is the vector of excess factor endowments—the difference between a country's factor endowments v and its general share s of world factor endoments v_w.

If A is invertible (more on this below), then each product's net trade will be a linear function of the elements of the excess endowment vector:

$$t = A^{-1}(v - sv_w). \tag{2}$$

This is the equation estimated in the endowment approach, essentially by using data on factor endowments to estimate the coefficients A^{-1}. A good fit is then taken to confirm the underlying theoretical model.

Leamer and Bowen (1981) also use equation (2) to point out errors in the intensity approach. They argue that, in order to estimate relative factor abundance, it is necessary to estimate the excess factor endowment vector $(v - sv_w)$. They then show that to recover this vector, t should be regressed on data that are equivalent to columns of A^{-1}. But A^{-1} is not observed. The usual procedure of regressing t on input intensities A (which are observed) is not a satisfactory alternative, since this regression does not have stable coefficients across sectors and will not yield coefficients that are in any simple way related to $(v - sv_w)$.

Looked at this way, the intensity approach is an incorrect substitute for the endowment approach. Yet the failure of the intensity approach rests on the strong assumptions used to derive equation (2). A satisfactory rationale for the intensity approach can be built in the framework of Heckscher-Ohlin theory, provided, however, that the strong assumption of FPE is relaxed.

Suppose factor prices differ at home and abroad. Let product and factor units be normalized so that foreign product and factor prices equal 1. Let the vector of the costs of home products, p, be given by:

9. The basic model is developed in detail in Leamer (1984). Lawrence (1987) has sketched a version of the model emphasizing product differentiation; Saxonhouse and Stern (1989) develop a hybrid model which combines a version of the differentiated-products model with the Heckscher-Ohlin framework.

$$p = c(w), \tag{3}$$

where w is the vector of home factor prices and the vector of cost functions, c, is based on internationally shared technologies. For small deviations of home factor prices from factor prices abroad, dw, home costs will be given by:

$$p = 1 + dp = 1 + c_w(w)dw. \tag{4}$$

Since the derivative of cost with respect to factor prices is factor demand, $c_w(w) = A'$, and equation (4) becomes:

$$p = 1 + A'dw, \tag{5}$$

and since, by definition, $A'1 = 1$, equation (5) can be rewritten as:

$$p = A'(1 + dw) = A'w. \tag{5'}$$

The intensity model is completed by adding relationships between p and trade t. Assume that goods are differentiated by country of origin,[10] demand is homothetic, and demand is separable so that the choice among the varieties of one product does not depend on the choice among the varieties of other products.[11] Then the home country will produce some of each product even if its costs are higher than those abroad, with market shares given by the demand relationships s:

$$t = \hat{s}[p + b]d, \tag{6}$$

where $\hat{}$ denotes diagonalization, d is the vector of demands for the composite goods that encompass the several varieties of the various products, and b represents trade barriers. Substituting equation (5') into question (6) yields:

$$t/d = \hat{s}[A'w + b]. \tag{7}$$

In other words, home producers' market shares,[12] both in home demand (where the home market share is simply 1 minus the import penetration ratio) and foreign demand (where the home market share is represented as the country's share of world exports) will be a function of the input matrix A multiplied

10. The assumption of "differentiation by country of origin" is used in a stronger sense than by Helpman and Krugman (1985); in their model, if x has lower costs than y in making a particular variety, then x will win that market and become a producer of y-type products. In the present context the stronger Armington assumption is used; y's differentiated products remain permanently associated with y; that is, they possess some technical feature that cannot be duplicated by x.

11. This demand specification is widely used in computable general equilibrium models, e.g., Petri (1984).

12. The share functions that apply to different products may reflect differing elasticities of substitution between domestic and foreign varieties, so that a particular cost differential may be associated with different trade effects across the several sectors. In the econometric application, these differences are treated as noise. The effect of this noise on the accuracy of the estimates is mitigated by the fact that it appears in both the import and export equations for a particular sector and can therefore be estimated with Zellner's seemingly unrelated regression method.

by factor prices plus the tariff equivalent of trade barriers relevant to the market. In general, the form of this function is unknown, but in at least one important case it can be shown to be linear.[13]

The intensity approach involves estimation of equation (7). Thus, if factor prices are not fully equalized, then there is a rigorous justification for estimating the intensity model, and, furthermore, the endowment model is incorrect since trade is not a linear function of endowments and the coefficients A^{-1} are not fixed across countries. It would not be surprising, however, if the endowment model produced a good fit in empirical applications, since the excess endowment vector may still be an excellent proxy for international factor price differences.

The fact is that recent results based on the endowment approach are not easily reconciled with Heckscher-Ohlin FPE assumptions. Several studies based on this approach have found that trade performance in *many* industries is accurately predicted with a *small* number of factor endowment variables.[14] Paradoxically, the theory does not predict such "good" results. If the number of products is greater than the number of factors, then the theory predicts *either* that net exports in most product categories will be indeterminate (if transport costs are negligible) *or* that trade will be confined to a small number of goods (if transport costs are significant).[15] Alternatively, should the number of products equal the number of factors, then the theory predicts that a large number of factors will be needed to explain satisfactorily trade in a large number of product categories. *No* version of the theory predicts that a few factors will be sufficient to explain many categories of trade. By contrast, the intensity approach predicts meaningful international rankings of competitiveness for any number of products, regardless of how many factors matter.

2.4.3 Implementation

In this study, the intensity approach (eq. [7]) is used to estimate Japanese trade performance in both domestic markets and world markets. In the domestic market, for the sake of comparability with other similar studies, the depen-

13. It is possible to derive a strictly linear version of the relationship between import-penetration ratios (or export market shares) and factor intensities under Cobb-Douglas technologies and market shares. In this case, costs are given by: $\log p = A'$, $\log w$, and $t/d = e(A' \log w + q)$, where e is a substitution elasticity and q is the vector of ad valorem tariff equivalents. In this case, the sector-cross-section regression of t/d on A' and q directly yields the coefficient vector $[e \log (w), e]$.

14. Saxonhouse (1983) and Saxonhouse and Stern (1989), e.g., work with 109 products and only seven factors. In the 74 manufacturing sectors of this sample, only three have R^2 below 0.50, and 17 have R^2 greater than 0.90.

15. Leamer (1984, p. 18) suggests that one way around the dimensionality problem is to assume small transport costs and that trade is determined by a linear program that minimizes transport costs subject to the constraint of eq. (1). It is not clear how agents would know how to trade consistently with the results of such a linear program. In any case, the number of nonzero trading activities will be generally equal to the number of constraints, or, in this case, the number of factors. Most goods would not be traded.

dent variable was defined as *import penetration*, that is, the ratio of imports to total domestic demand. In the world market, the dependent variable was Japan's *share of world exports*. This means, of course, that comparable comparative advantage variables will have opposite signs in the two estimated equations. The estimates were implemented using trade and structural data for 49 manufacturing industries in 1985.

The explanatory variables of the study are collected and defined in three broad groups in table 2.7. The first group of variables focused on *comparative advantage*, and included the input-intensity indexes already mentioned in connection with the classification of industries. The second group described special characteristics of *market structure* that have appeared in the literature as possible "invisible" barriers to trade. Included in this group were measures of the importance of distribution in product marketing, the nature of a product's principal procuror (e.g., the shares of governments, households, and businesses in total procurements of the product), and the seller concentration of the domestic industry with which the import competes. A third group of

Table 2.7 Variable Definitions for Trade Structure Analysis

Comparative advantage:
- Raw-material intensity
  - Share of mining, refinery products, electricity, and gas in sectoral production costs, derived from 1985 input-output coefficients
- Capital intensity
  - Share of operating surplus depreciation in sectoral value added, derived from 1985 input-output coefficients
- Technology intensity
  - Share of scientists and engineers in sectoral employment, derived from 1985 data published alongside the input-output table

Market structure:
- Distribution margins
  - Wholesale plus retail margins associated with the sale of a product, expressed as fraction of the product's producer price, derived from 1985 input-output coefficients
- Business markets:
  - Share of intermediate users plus final investment demand, excluding those sectors classified as government, in purchases of the sector's products, derived from 1985 input coefficients
- Government markets:
  - Share of government, government investment, public enterprises and research institutes in purchases of the sector's products, derived from 1985 input coefficients
- Supply concentration:
  - Herfindahl index of supply concentration, 1986 (index value for a monopoly = 100)

Visible barriers:
- Protection:
  - Tariffs plus tariff equivalent of nontariff barriers, based on 1985 input-output coefficients and Saxonhouse and Stern (1989)
- Transport costs:
  - Weight/value ratio, derived from U.S. trade date

variables focused on *visible barriers* such as formal protection, including tariffs and the estimated tariff equivalent of nontariff barriers and transportation costs.

Zellner's "seemingly unrelated equations" technique was used to take advantage of correlation between the residuals of the import and export relationships. This correlation was negative and substantial (-0.37 for the trade structure equations reported in table 2.8, and -0.56 for the trade growth equations reported in table 2.9), presumably reflecting missing factors that affect Japan's competitiveness in both domestic and foreign markets.

The theoretical rationale of the intensity approach, as outlined in the previous section, is consistent with a linear specification of the effects of input-intensity variables, but does not strictly require this functional form. Results are therefore presented both for the simple linear specification and for an equation using log transformations of the dependent variables. In addition, quadratic terms were tried for each independent variable. Except in the case of technology intensity (as discussed below), the quadratic terms had little effect on the results and are not reported here.

2.4.4 Results

The results for import penetration and export shares in 1985 are presented in table 2.8. Most obviously, the results highlight the importance of technology intensity as a determinant of both imports and exports. However, technology intensity does not behave as a simple factor intensity variable; in both the import and export equations, its effects are best captured in quadratic form. A closer look at the quadratic estimates helps to explain why this happens. Typical sample values of the technology-intensity variable imply that the contribution of the quadratic term is generally greatest (most positive in the export equation, most negative in the import equation) for a technology intensity value of approximately 5–6 percent. This is a relatively high value; only one-third of manufacturing sectors have an index value this high or higher—machinery sectors, for example, fall in the 5–7 percent range. With technology values above 6 percent, exports generally decline and imports rise. Evidently, Japan's technology advantage peaks in the second highest quintile of industries and falls off for ultra-technology-intensive products, suggesting perhaps some missing factor (basic research?) that is correlated with very high levels of the technology intensity.

Trade patterns are weakly related to other input intensity measures beside technology. There is a hint that exports are negatively related to raw material intensity and that imports are negatively related to capital intensity, but neither of these coefficients is statistically significant at the 5 percent level. Furthermore, the signs of some of these variables change depending on whether the dependent variables are linearly or logarithmically specified.

The most interesting findings involve the market-structure variables. These variables approximately double the explained proportion of variance in the

import equation and also improve the fit of the export equation;[16] the hypothesis that industry structure coefficients are zero is rejected at the 1 percent level for both the import equation and export equations.

Two of the market structure variables, distribution margins and the share of business in the product's market, were introduced both by themselves and in interaction with concentration. The interaction variants reflect the hypothesis that distribution channels and business procurement will have an import-dampening character only when "activated" by a strong domestic supplier. For example, a concentrated domestic supplier should have greater voice in what other products are carried by its distribution channel than a competitive domestic supplier. As the results show, the distribution and business procurement variable indeed have more explanatory power when used in interaction with concentration.

In general, four variables play particularly significant roles:

1. *Distribution margins are negatively related to import penetration.* This finding is significant at a 1 percent level in the linear model, but only at a 12 percent level in the logarithmic variant. In general, the sign of the estimated coefficient is consistent with the hypothesis that the Japanese distribution system acts as a barrier against imports. This hypothesis is discussed, for example, by Christelow (1985–86), the Advisory Committee for Trade Policy and Negotiations (1989), and Japan Economic Institute (1989).
2. *Markets where businesses account for a large share of purchases tend to have relatively low import penetration.* The excluded variable in this case is the share of purchases made by households, which has an implicit coefficient of zero. Goods purchased by businesses appear to have import penetration rates 15 percentage points lower than those purchased by households.
3. *Markets where the government accounts for a large share of purchases tend to have relatively low import penetration.* Goods purchased by the government appear to have import penetration rates 16 percentage points lower than those purchased by households. (The difference between business and government import behavior is not statistically significant.)
4. *Producer concentration is positively related both to import penetration and to exports.* This is an unexpected finding, but consistent with recent industrial organization models of international trade. In models of oligopolistic markets, concentrated industries sell into each other's markets in order to take advantage of high prices and price elasticities abroad. Since industries that are concentrated in Japan are also concentrated abroad

16. The improvement of fit in the export equation is expected to be much smaller, since market-structure variables that might have a substantial effect on Japanese exports—variables that capture the effect of foreign market characteristics facing Japanese exporters—are not available for this study.

Table 2.8 **Trade Structure Regressions**

	Import Penetration					World Export Share				
	Percent				Log	Percent				Log
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	9.32**	24.23**	9.37	6.05*	2.15**	.59	−.36	−.36	−.04	.92*
	(3.05)	(4.03)	(3.78)	(2.05)	(4.20)	(.11)	(−.07)	(−.08)	(−.01)	(2.22)
Comparative advantage:										
Raw-material intensity	−.033	.021	.084	−.168	.048	−.383	−.383	−.383	−.327	−.008
	(−.22)	(.17)	(.64)	(−.90)	(1.75)	(−1.49)	(−1.64)	(−1.64)	(−.93)	(−.39)
Capital intensity	−.017	−.078	−.081	−.074	−.032*	.059	−.006	.006	.005	−.009
	(−.20)	(−1.07)	(−1.13)	(−1.09)	(−2.13)	(.41)	(−.05)	(.05)	(.03)	(−.849)
Technology intensity	−3.28**	−3.67**	−3.20**	−2.78**	−.45*	7.66**	6.97**	6.97**	6.97**	.85**
	(−3.20)	(−4.05)	(−3.78)	(−3.24)	(−2.58)	(4.38)	(4.28)	(4.28)	(4.28)	(6.03)
Technology squared	.376**	.413**	.367**	.332**	.056**	−.708**	−.668**	−.667**	−.668**	−.081**
	(3.69)	(4.79)	(4.51)	(4.04)	(3.35)	(−4.07)	(−4.18)	(−4.18)	(−4.18)	(−5.88)
Industry structure:										
Distribution margins		−.163*								
		(−2.52)								
Distribution margins × concentration			−.013**	−.014**	−.001					
			(−3.76)	(−4.06)	(−1.47)					

Business markets		−.152**								
		(−2.93)								
Business markets × concentration			−.011**	−.011**	−.001*					
			(−3.62)	(−3.60)	(−2.42)					
Government markets		−.121	−.177*	−.178*	−.063**					
		(−1.68)	(−2.47)	(−2.59)	(−4.15)					
Supply concentration		.196**	1.278**	1.325**	.172**		.26	.26	.25	.02
		(2.73)	(4.55)	(4.88)	(2.91)		(1.94)	(1.94)	(1.77)	(1.54)
Protection:										
Tariff and NTB tariff equivalent				.225						
				(1.45)						
Weight/value				1.486					−.346	
				(1.77)					(−.21)	
Statistics:										
R^2	.276	.458	.504	.547	.450	.337	.386	.386	.386	.491
Adjusted R^2	.207	.344	.400	.421	.334	.273	.311	.294	.276	.415
Standard Error	5.82	4.76	4.61	4.35	.94	9.94	9.04	9.04	9.04	.74
F	3.99	4.44	5.33	5.07	4.29	5.33	5.28	4.41	3.78	6.75

Note: Eq. (1): OLS. Eq. (2)–(5): seemingly unrelated regressions. T-ratios are in parentheses.

*$P = .05$.

**$P = .01$.

Table 2.9 Trade Growth Regressions

	Import Growth		Export Growth	
	(1)	(2)	(1)	(2)
Constant	1.04**	1.02**	.019	−.025
	(5.03)	(4.99)	(.11)	(−.16)
Comparative advantage:				
Raw-material intensity	−.0033	−.0081	−.0083	−.0085
	(−.30)	(−.71)	(−.91)	(−1.01)
Capital intensity	.0069	.0095	.0054	.0037
	(1.12)	(1.52)	(1.04)	(.76)
Technology intensity	−.0769**	−.0806**	.0418*	.0325*
	(−3.81)	(−3.54)	(2.48)	(1.96)
Industry structure:				
Distribution margins × concentration		.0002		
		(.87)		
Business markets × concentration		.0003		
		(1.17)		
Government markets		.0055		
		(.97)		
Supply concentration		−.4270		.8179
		(−.72)		(1.69)
Statistics:				
R^2	.253	.281	.184	.231
Adjusted R^2	.201	.152	.127	.158
Standard Error	.424	.402	.354	.329
F	4.74	2.34	3.16	3.15

Note: Eq. (1): OLS. Eq. (2): seemingly unrelated equations. T-ratios in parentheses. Dependent variable is $\log[x(1988)/x(1985)]$, where x is exports or imports.

*$P = .05$.

**$P = .01$.

(Caves 1976), it appears that strategic behavior in mutually concentrated industries tends to enhance intra-industry trade.

In interpreting these results, three caveats must be noted. First, since this study addresses only the effects of industrial organization variables in Japan, it cannot determine whether the variables examined have an unusual impact in Japan as compared to other countries. For example, it is possible that high household procurement or low distribution margins are also positively related to import penetration in, say, Germany.[17] We are not aware of other studies

17. Low distribution margins may be associated with high import penetration in general. Assume, for example, some preference bias for domestic goods, implying that foreign products must enjoy a price advantage over similar domestic products in order to be imported. Now consider two different potential imports with the same relative producer's price advantage over their domestic competitors. Of these two, the product with a lower domestic distribution margin will have a greater relative consumer's price advantage (even if the exact same margin is applied to its domestic competitor) and is therefore more likely to be imported.

that have estimated these effects; clearly, it would be useful to know whether they can be found in other economies.

Second, the estimated effects provide information only on relative aspects of the trade performance. Consider a negative coefficient on, say, the distribution margin variable in the import equation. All that the foregoing analysis suggests is that high values of distribution are associated with low value of import penetration and vice versa; the analysis cannot determine whether high values of distribution are associated with too *little* imports, or low values of distribution with too *much* imports.

Third, the analysis cannot determine whether any particular relationship is good or bad from a welfare perspective. For example, even if it is known that close buyer-supplier relationships inhibit international trade, it does not follow that such inhibited trade is "distorted." Indeed, such relationships may play a valuable economic role, say, by facilitating the diffusion of information and technology. Countries without such relationships may in effect import too much—that is, have a distorted trade profile relative to the welfare-maximizing benchmark.

The final group of variables show that explicit barriers, including protection and transportation costs, play a modest role in determining the relative trade performance of different industries. The coefficients of both the protection and transportation variables have incorrect signs and are not significantly different from zero. The likely reason for this is that there is very little formal protection in Japanese manufacturing; average tariff rates are 4.1 percent and the tariff equivalent of NTBs is only 0.9 percent (Deardorff and Stern 1986). Transportation costs are proxied by weight/value ratios; it is possible that transportation costs do not matter, or that more comprehensive measures of transportation and communication costs would produce better results.

To get a better sense of the estimated effects, let us abstract from the caveats and assume that the results reflect the popular hypotheses that distribution and government and business procurement depress Japanese imports. Consider some rough upper limits on the effects of eliminating these biases. Average import penetration rates in Japanese manufacturing in 1985 were approximately 6 percent. Households account for one-third of manufactures demand, and business and government purchasing behavior was estimated to reduce import penetration, on average, by roughly 13.5 percentage points below household rates. Thus, if governments and businesses suddenly behaved like households, then manufactured imports would rise by $.135 \times .667$, or 9 percent of manufactures demand. Similarly, average wholesale and retail margins in manufacturing were approximately 20 percent, and a 1 percent increase in such margins has been estimated to reduce import penetration by .16 percentage points of demand. Thus, if products requiring distribution suddenly achieved import penetration ratios similar to products that are sold directly to purchasers, then imports would increase by $-.16 \times -.20$, or an additional 3.2 percent of demand.

Together, the first-round effects appear to triple manufactures imports to 18 percent of demand. Of course, if imports of the manufactured products constrained by these barriers increased, other imports would likely decline, yielding a substantially smaller net effect—say, a doubling of manufactured imports. This would represent a large change, but the resulting ratio of trade in manufactures relative to GNP (approximately 4 percent) would still amount to less than half that of the next-lowest-ranking industrial country (Takeuchi 1989a).

2.4.5 Recent Compositional Changes

In light of the earlier discussion of structural change since 1985 in the aggregate import and export relationships, it is natural to ask whether these changes are related to changes in the determinants of import and export composition. To this end, additional equations were estimated to see how import and export growth since 1985 have been affected by the explanatory variables used above. The dependent variables for this analysis, for both imports and exports, are the logs of the ratios of 1988 trade to 1985 trade.[18]

The import and export growth equations are presented in table 2.9. Comparative advantage variables carry a substantial part of the explanation of trade growth rates and confirm the earlier finding of increasing specialization in technology-intensive products. Technology intensity is negatively related to import growth and positively related to export growth.[19] In these equations, raw material and capital intensity appear with the same signs in both equations, presumably reflecting general trends in demand growth for these products relative to demand for technology-intensive goods.

Market-structure variables are less helpful in explaining changes in exports and imports than trade composition at a particular time. In the case of import growth, none of the market-structure variables is significant at the 5 percent level. However, the coefficients for distribution margins, business purchases, and government purchases have signs opposite to those estimated in the earlier composition equations. In other words, it appears that import growth during the last three years has been faster in goods that had relatively low penetration ratios in 1985—that is, in goods with larger distribution margins and with markets dominated by business demand. These results, though statistically weak, are tantalizing in light of the earlier finding of structural change in aggregate imports as well as anecdotal evidence on the development of discounted distribution channels.

18. The reason for using these dependent variables instead of changes in import penetration ratios and world export shares is that the denominators needed to construct these variables were not available for 1988.

19. In these equations there is no clear statistical preference for a quadratic technology term, and therefore the simpler single-variable specification is used.

2.5 Conclusions

This paper has collected evidence from several data sets regarding trends in Japanese trade behavior since the yen began its steep rise in 1985. On the whole, the evidence suggests that Japanese trade is changing in each of the three dimensions analyzed: in aggregate level, partner structure, and commodity structure.

Aggregate Trade. In line with historically estimated price elasticities, yen appreciation has only marginally reduced the dollar value of Japan's large trade surplus. But there is some evidence that the "normalcy" of the trade balance hides departures by both imports and exports from historical relationships. Some researchers have concluded that export prices have risen less than suggested by historical pass-through relationships and that export market shares have been held unusually firmly. This paper has presented evidence that imports are now running 10–20 percent ahead of historically estimated import functions and that import functions based on recent data show increased sensitivity to economic determinants.

Partner Trade. Japan has rapidly expanded its trade linkages with the East Asian NICs and developed countries other than the United States. This trade consists of the exchange of exports of advanced consumer goods and (especially in the case of NICs) capital goods and sophisticated components, for imports of consumer goods (at both ends of the quality spectrum) and industrial supplies. The outlook for regional economic integration is bright, but the increase in intraregional trade so far has no more than retraced the decline in the relative importance of East Asian linkages since 1975. The data do not yet suggest a dramatically new regional economy.

Product Trade. Japanese trade data have been widely scrutinized for evidence that Japan imports fewer manufactured goods than other similarly endowed countries. This study does not compare Japanese trade to international norms, but it does provide new, related evidence regarding the determinants of Japanese trade. Among the conventional comparative advantage determinants, it appears that Japanese products are competitive in technology-intensive sectors (although not in the most technology intensive sectors).

It also appears that industry-structure variables are important correlates of trade performance:

products with high distribution margins are less likely to be imported than those with low margins, especially when the import-competing Japanese industry is concentrated;

products purchased by business are less likely to be imported than those purchased by households, especially when the import-competing Japanese industry is concentrated;

products purchased by government are also less likely to be imported than those purchased by households;

products with high supplier concentration in Japan are more likely to be both exported and imported than other products.

As discussed in the text, these findings need cautious interpretation since they are consistent with several alternative hypotheses. Nevertheless, they represent the only empirical evidence we are aware of regarding the relationship between widely conjectured "causes" of Japan's low imports of manufactured goods and measures of trade performance. This evidence needs to be further refined, but it suggests that distribution and business and government procurement are indeed negatively correlated with import penetration.

The effect of market-structure variables on recent changes in import penetration are opposite the effects of these variables on levels of penetration. Thus, while the trade structure regressions are consistent with some anti-import bias in the distribution system and in business and government procurement, the trade growth regressions suggest a diminution in this bias.

Overall, the changes reported in this paper raise intriguing questions about the evolution of Japan's external sector. There is evidence of statistically significant breaks with the past, but the economic significance of the changes that can be documented at this time is limited. The key question is whether the changes observed so far represent *shifts* or *trends*. If, say a decade from now, Japan imports a wide range of goods for household, business, and government uses, and engages in substantial intraindustry trade, perhaps with other East Asian countries, then 1985 will be seen as a turning point. But it is also possible that the changes identified so far are once-and-for-all shifts—completed responses to the appreciation of the yen. In this extreme, *endaka* and the changes it wrought have modest long-term significance. It is too soon to tell which scenario lies closer to the truth.

Appendix
Sectoral Classification Scheme

Commodity		Group	ISIC/Concord	1985 IO/Concord	SITC/Concord
1	Yarn & fabric	Labor	3211	1511,1512,1514	651,652,653,654
2	Knitted fabric	Labor	3213	1513	655
3	Other textiles	Labor	3212,3214,3215,3219	1519,1529	656,657,658,659
4	Wearing apparel	Labor	3220	1521,1522	842,843,844, 845,846,847,848
5	Leather footwear	Mixed	3240	2411	851
6	Other leather products	Mixed	3231,3232,3233	2412	611,612,613
7	Lumber & plywood	Raw	3311	1611	633,634
8	Wood products	Mixed	3312,3319	1619	635
9	Furniture & fixtures	Labor	3320	1711	821
10	Pulp	Raw	3411	1811	641
11	Paper	Raw	3412	1812,1813	641
12	Containers & paper products	Mixed	3419	1821,1829	642
13	Printing, publishing	Labor	3420	1911	892
14	Basic industrial chemicals	Raw	3511	2021,2029,2031, 2032,2033,2039	511,512,513,514, 515,516,522,523,524
15	Fertilizer	Raw	3512	2011	562
16	Synthetic resin	Tech	3513	2041,2051	531
17	Paint, varnish	Tech	3521	2072	532,533
18	Drugs & medicines	Tech	3522	2061	541
19	Soap & cleansers	Capital	3523	2071	551,553,554
20	Other chemical products	Labor	3529	2073,2079	572,582,583,584, 591,592,598
21	Tire & tube	Mixed	3551	2311	625
22	Rubber products	Mixed	3559	2319	621,628
23	Plastic products	Capital	3560	2211	893

(continued)

Sectoral Classification Scheme *(continued)*

Commodity		Group	ISIC/Concord	1985 IO/Concord	SITC/Concord
24	Pottery china	Raw	3610	2531	666
25	Glass & glass products	Raw	3620	2511,2512,2519	664,665
26	Cement, lime	Raw	3692	2521,2522,2523	661
27	Other nonmetallic minerals	Raw	3691,3699	2599	662,663
28	Basic iron & steel	Capital	3710	2611,2621,2622, 2623,2631	671,672,673,674, 675,676,678,679
29	Structural metal products	Mixed	3813	2811,2812	691
30	Other metal products	Mixed	3811,3812,3819	2891,2899	692,693,694, 695,696,697
31	Engines & turbines	Tech	3821	3011	711,712,713,714, 716,718
32	Machine tools	Tech	3823	3024	736,737
33	Special industrial machinery	Tech	3822,3824	3021,3022,3023, 3029,3112	721,722,723,724, 725,726,727,728
34	General industrial machinery	Tech	3829	3012,3013,3019,3031	741,742,743,744,745,749
35	Office machinery	Tech	3825	3111,3311	751,752,759
36	Electrical industrial machinery	Tech	3831	3411	771,772,773
37	Radio, television	Tech	3832	3211	761,762,763
38	Electronics	Tech	3833,3839	3321,3331,3341,3421,3431	764,774,775,776,778
39	Shipbuilding	Tech	3841	3611	793
40	Railroad equipment	Labor	3842	3621	791
41	Motor vehicles	Mixed	3843	3511,3521,3541	781,782,783,784
42	Motorcycles & bicycles	Capital	3844	3531	785
43	Aircraft	Tech	3845	3622	792
44	Other transport equipment	Labor	3849	3629	786
45	Scientific instruments	Tech	3851	3719	871,872,873,874
46	Photographic equipment	Tech	3852	3711	881,882,883,884
47	Watches & clocks	Labor	3853	3712	885
48	Sporting & athletic goods	Capital	3903	3911	894
49	Miscellaneous	Labor	3901,3902,3909	3919	895,898

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Comment Daniel A. Citrin

Peter Petri's paper provides an interesting analysis of recent developments in Japanese trade flows. I focus my comments on the section that deals with structural changes to aggregate Japanese trade, and on that which looks at the product composition of Japanese trade.

On Structural Changes in Aggregate Trade

The first portion of the paper reviews and presents further evidence, based on the predictive abilities of standard trade equations, that suggests structural changes have affected Japanese export and import behavior in recent years.

With regard to exports, updated predictions of Corker's model through 1988 do indeed indicate a continued underprediction of export volume (and value). This underprediction is reflected in a rise in the measured income elasticity and a fall in the relative price elasticity when the export volume equation is estimated through 1988.

Before reaching any conclusions however, I would note the following. First, Japanese exports, especially of capital goods, were pushed up considerably in 1988 by the global investment boom as well as by direct investment

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overseas by Japanese firms. The activity variable in the export volume equation would not fully capture this investment-oriented demand. Second, some preliminary results of further work on measuring competing prices indicates that Japanese exporters may have lost *less* competitiveness since 1985 than had been previously estimated. This result largely reflects the use of competitor weights that assign a larger weight to non-U.S. third-country suppliers—both European countries and the NICs—against whom the real effective appreciation of the yen has been smaller. In addition, use of a fixed-weight manufacturing export unit value for the United States, rather than nonoil export unit values results in higher competing U.S. export prices. Of course, one would expect the use of such a revised indicator of competitiveness to predict higher Japanese exports over the recent period.

On imports, updated predictions of Corker's model show an increasing underprediction of Japanese import volumes. At the same time, estimation results indicate a significant rise in the relative price elasticity of Japanese imports, particularly of manufactured imports. These results are in line with those contained in the paper and indeed would suggest an increased preference for imported goods on the part of Japanese consumers as well as positive effects of trade liberalization. The results do not seem to reflect the drop in the household saving rate or the strength of investment in Japan, since the measured income elasticity is unchanged. A recent Bank of Japan study also yielded substantial underpredictions using disaggregated equations where the real consumption and capital goods shipments were used as the relevant domestic activity variables.[1]

More generally, however, I think that it is important to remember—and particularly when forecasting future movements in Japanese trade flows—that the increases in measured elasticities are likely picking up the temporary effects of structural transition or adjustments. Once the shift in preferences, or the adjustment to a more liberal trade regime has taken place, it is by no means certain that the elasticities will remain at these higher levels.

On the Product Composition of Trade

The portion of the paper that analyzes the commodity structure of Japanese exports and imports is the most interesting part of the paper and thus naturally the most difficult to comment on. I would like to offer the following remarks.

1. To what extent is the use of 1985 data in the cross-sectional analysis influencing the results of estimation? This was the year that the Japanese economy was subjected to a large exchange rate shock. As a result, real product prices changed substantially, and producers must not have operated on their long-run equilibrium supply curves. In particular, there were substantial

1. Bank of Japan, "Balance of Payments Adjustment in Japan: Recent Developments and Prospects," Research and Statistics Department, Special Paper no. 178 (May 1989).

swings in producers' profit shares, which, inclusive of depreciation, is the measure of capital intensity in the paper. As the exchange rate shock presumably had differential impacts across the spectrum of industries in the sample, one would think that the estimation results would have been affected substantially.

2. The significance of the consumer-markets variable in the import penetration equations could be picking up the influence of comparative advantage. Namely, to the extent that the consumer goods industries are relatively labor-intensive ones in which Japan had already lost comparative advantage by 1985, one would expect that the import-market share would be higher.

3. As I think the paper itself acknowledges, the distribution margin variable is itself an endogenous variable and thus its estimated coefficient is subject to simultaneity bias. In other words, one would expect low rates of import penetration to lead to rents and to higher distribution margins, particularly in a country where close relationships between manufacturers and distributors are common. Moreover, the existence of large margins does not necessarily imply the existence of import restraints. They could just reflect the often-noted observations that the Japanese place a high premium on service and have a high degree of brand loyalty. Thus, I am not convinced that the results can be used to claim that the Japanese distribution system acts as a barrier to imports.

4. In a similar vein, the paper argues that markets where businesses account for a large share of purchases tend to have relatively low rates of import penetration. However, this does not necessarily reflect an anti-import bias amongst Japanese producers. Rather, it could reflect a production structure that is not vertically integrated in a formal sense, but one in which affiliated producers supply goods to other business customers that are tailored to their specific demands.

In sum, it is not at all clear what the market-structure variables are actually capturing. Thus, while the paper presents some interesting correlations, these results should not be taken as new evidence regarding the determinants of Japanese trade.