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4 Realignment of the Yen-Dollar Exchange Rate: Aspects of the Adjustment Process in Japan

Bonnie Loopesko and Robert A. Johnson

The 50% appreciation of the yen-dollar exchange rate in the last two years (or the 90% appreciation when expressed in dollar-yen terms) appears dramatic even when compared to the frequent sizable swings in exchange rates that have characterized the floating rate period. For Japan, this is the largest unidirectional movement of its exchange rate since the advent of floating. (See Manuel Johnson and Bonnie Loopesko 1987 for an overview of the yen-dollar relationship during the floating exchange rate period.) In light of Japan's record external surpluses, it is widely agreed that the yen was substantially undervalued in early 1985 when it began its steep ascent. The only source of debate has been just how high the yen needs to go.

Faced with an unprecedented shift in its exchange rate and mounting domestic and international pressure to restructure its economy away from export-oriented growth, Japan has embarked on what may turn out to be a major transformation of its industrial structure. If the strong yen—termed *endaka* in Japanese—persists (and most analysts believe that it will), then steps already taken towards outsourcing of production and shifting of investment away from the manufacturing sector will be

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accelerated in the future. This adjustment process could be the most profound in Japanese postwar history.

As this process gets under way, the costs of adjustment are already apparent throughout the Japanese economy. Unemployment, while still low by international standards, has touched a record 3% level in recent months and is expected to continue to rise this year. In addition to the rise in unemployment, there is more subtle evidence of a slackening of labor market conditions. A recent survey by the Keidanren (Keizai Koho Center 1987), the Japanese equivalent of the Business Roundtable, indicates that nearly 60% of companies surveyed have instituted tighter control on overtime, and a third have reduced bonuses and cut back employment of part-time employees. A quarter of companies have increased transfers of employees to subsidiaries and begun training for reassignment. On the production side, 40% of firms reported they had reduced production, while one-third reported increases in their imports of parts. Outsourcing of production is also under way: the Keidanren survey indicates that a quarter of companies surveyed have already expanded offshore production facilities and another 20% have plans to do so. Thus important changes appear to be under way in Japan, and this paper examines several aspects of the adjustment process to endaka.

The next section provides a brief review of recent calculations of the appropriate level of the yen-dollar exchange rate. Evidence is then presented on the degree of trade balance adjustment that has occurred to date. The following section examines what econometric models of Japanese trade reveal about the traditional channels of trade adjustment, the income and relative price elasticities. The forecasting performance of the trade equations presented suggests that, while the model fits reasonably well over the floating rate sample period through 1984, it predicts stonger adjustment in Japanese trade than has actually occurred in the past two years. The next sections look at possible reasons why Japanese trade is adjusting more slowly to the yen's recent sharp rise than would be indicated by historical experience. Evidence on pass-through of the yen's appreciation to export and consumer prices suggests two possible explanations. Next, a model is presented to highlight the spillover effects of a recession in the export sector (resulting from the yen's sharp appreciation) to the entire economy. The danger of an economywide recession in Japan and its implications for trade adjustment are addressed. Finally, the role of fiscal policy in fostering external adjustment is explored. Evidence from the Federal Reserve Board staff's Multi-Country Model indicates that Japanese fiscal expansion would make a smaller contribution than U.S. fiscal contraction to the reduction of external imbalances between the two countries, but that potentially important third-country effects should not be ignored.

4.1 Purchasing Power Parity Calculations

The relative version of purchasing power parity (PPP) states that the movement in the exchange rate from some base period is determined by the inflation differential over the same period. There is a long history of debate over which price index is appropriate for PPP calculations (see Frenkel 1978, pp. 3–4), although most recent calculations are based on prices of homogeneous and internationally traded goods expressed in a common currency. The base year (or weighted average of years) is usually chosen to represent a period of approximate external balance. Despite the many well-recognized problems with PPP as a notion of the equilibrium exchange rate, calculations of the deviation from PPP are often cited in discussions of exchange rate misalignment.

Table 4.1 shows several recent PPP calculations for the yen-dollar exchange rate. While the differing calculation methods (e.g., selection of base year, type of price index used, other adjustments) yield quantitatively different PPP estimates, all of the simple (unadjusted) PPP calculations show the yen-dollar rate to be substantially overvalued at its recent level of about 140.

One important difficulty with the calculations shown in table 4.1 is that, except for Krugman's (1986b) calculation, they do not take account of possible changes in the long-run equilibrium exchange rate. Particularly for the case of the yen-dollar exchange rate, the assumption that the long-run equilibrium exchange rate is constant appears implausible. Marston (1986) has shown that productivity in the traded goods sector in Japan has exceeded that in the nontraded services

Table 4.1 **Purchasing Power Parity Calculations for the Yen-Dollar Exchange Rate**

Morrison and Hale	203
McKinnon and Ohno	215
Krugman adjusting for estimated divergence between manufacturing price and CPI	140

Notes: Morrison and Hale (1987): PPP calculations adjusted for "tradability." Deflators for disaggregated GDP components (provided in OECD, 1987) are weighted by trade shares to obtain a PPP rate for 1980. Then movements since 1980 in relative producer prices for manufacturing goods are used to update the calculation. McKinnon and Ohno (1987): estimated by the "price pressure method," incorporating the effect of exchange rate misalignment (deviations from PPP) on prices. The resulting PPP is that exchange rate which exerts no upward or downward pressure on domestic prices relative to those abroad. Krugman (1986b): taking the geometric average manufacturing real exchange rate over 1973–79 as the base period, he assumes that the manufacturing PPP rate has continued to fall relative to the ratio of CPIs at the same rate as during the 1973–83 period, i.e., 4.4% per year, and extrapolates using actual CPI inflation.

sector by a substantial margin, so that PPP comparisons of prices that include services will misrepresent the gains in competitiveness. Krugman's calculation attempts to adjust for Japan's relatively rapid productivity growth in the traded goods sector, and this adjustment alone suggests that the yen-dollar rate would have to appreciate to 140.

A more general problem with the PPP calculations is that, in theory, PPP provides a guide to the appropriate level of the exchange rate only if all disturbances since the base period are monetary in nature. In light of the sizable real disturbances that have characterized the past 15 years (e.g., oil price changes and changes in government net saving), PPP calculations provide a poor guide to the appropriate level of the exchange rate. If changes in real economic factors alter the equilibrium exchange rate after the base period, the PPP exchange rate may imply large and perhaps growing current account imbalances. In this case, there is nothing in PPP calculations to ensure that the current account imbalances associated with a given PPP exchange rate would be sustainable in terms of the accompanying capital flows required to finance the imbalances.

4.2 Sustainability Calculations

An alternative to PPP as an indication of the appropriate level of the exchange rate is the "underlying balance," or "sustainability," approach. An early formulation of this framework may be found in Nurkse (1945). In the 1970s, the International Monetary Fund (IMF) further developed the approach (see Frenkel and Goldstein 1986 for a description of the IMF framework).

A recent contribution to this tradition was provided by Williamson (1983) who asked the following question: "What set of exchange rates would have been needed in a specific period . . . to induce a set of current account balances that matched 'underlying capital flows'?" (p. 22). The concept of underlying capital flows is meant to capture the notion that the equilibrium exchange rate will change in line with shifts in propensities to save and invest. For example, a country with a high savings rate may save in excess of its domestic investment opportunities and hence tend to export capital. Thus differential rates of savings and investment across countries are reflected in underlying capital flows and associated current account imbalances.

Williamson calculated the exchange rates consistent with underlying capital flows in 1976–77, extrapolated forward based on differential inflation (a PPP approach), and finally adjusted the calculation for substantial changes in real factors that have affected the equilibrium exchange rate since the base period. The most recent calculation based on the Williamson approach, reported in Bergsten and Cline (1987),

suggests an equilibrium yen-dollar rate of about 150 by the end of 1986 and of 140–45 in 1987.

Krugman (1985, 1987) developed a simple model to address a related but slightly different question: what exchange rate is consistent with a sustainable current account imbalance? In essence, Krugman looks at the change in the exchange rate implied by the current interest rate differential and asks whether that change would suffice to eliminate the noninterest current account imbalance and thus stabilize the level of foreign debt relative to GNP. If the exchange rate change implied by the current interest differential would lead to an accelerating rise in the debt-to-GNP ratio, then the current exchange rate is judged to be unsustainable.

In September 1985, Krugman calculated that the dollar would have to decline 26% to restore U.S. current account balance. If the dollar declined equally against all currencies, this would imply a yen-dollar rate of about 175. He also calculated that if the dollar declined as slowly as the interest differential indicated at that time (1.6% per year), the U.S. debt-to-GNP ratio would rise for the next 30 years to a level of over 50%. This would bring U.S. external indebtedness to a level comparable to that of Brazil and Mexico, which, Krugman notes, few people would find feasible. In 1987, Krugman revisited the sustainability issue and concluded that if the dollar were to depreciate at the rate implied by the interest differential, external debt as a percent of GNP would rise to 38.8% after 10 years, again a level he thought unsustainable.

Morrison and Hale (1987) used Krugman's methodology and asked how much further the dollar would need to decline if the entire remaining U.S. noninterest current account deficit were to be eliminated within 10 years by exchange rate changes alone. On the assumption that the dollar declines equally against all currencies, they calculate that a sustainable yen-dollar rate would be about 135.

Laurence Krause (1986) took a similar approach: what dollar exchange rate is consistent with a balanced U.S. current account by 1990 or 1991, and what is the implied value of the yen? This is a stronger condition than that imposed by Krugman or Morrison and Hale, so it is not surprising that Krause finds that more yen appreciation—to 100 yen/dollar—is required.

The underlying capital flows–sustainability approach has the virtue of taking explicit account of the dynamic consistency of the implied exchange rate path. It also recognizes that some degree of persistent current account imbalance may be implied by differences in savings and investment propensities across countries. One limitation of this approach is that it requires as input a number of parameter values that are difficult to specify with confidence. For example, one parameter in

Table 4.2 Sustainable Yen-Dollar Exchange Rates

Williamson, as quoted in Bergsten and Cline (1987)	150 in 1986 140–45 in 1987
Krugman (September 1985)	26% dollar depreciation (a yen-dollar rate of about 175)
Morrison and Hale (1987)	135 yen-dollar
Krause (1986)	100 yen-dollar

Note: See text for descriptions of each calculation.

Krugman's calculations (assumed to be a constant) represents all factors other than the exchange rate change upon which the current account depends. Also, it is difficult to render concrete the notion of underlying capital flows in the IMF-Williamson approach.

A comparison of tables 4.1 and 4.2 shows that the estimates of the "equilibrium" yen-dollar rate from PPP calculations tend to indicate that the yen is currently overvalued, while the estimates derived from the sustainability–underlying capital flow approach often indicate a need for further yen appreciation. This divergence occurs despite the fact that both approaches incorporate some notion of external balance as the anchor for the calculations. The most likely explanation for the discrepancy is the earlier-noted failure of the PPP calculations to take account of real factors that have shifted the equilibrium exchange rate since the base period. The sizable shifts in fiscal policy in Japan and the United States are one likely important factor. Also, as noted above, the difference in productivity growth between traded and nontraded goods sectors was substantial in the 1970s. If productivity in the nontraded goods sector has changed little, then the fact that productivity growth in the Japanese manufacturing sector has slowed markedly in recent years—as can be seen in table 4.3—suggests that this factor may not continue to be an important source of secular appreciation of the yen. It is worth noting that the productivity differential between the United States and Japan in the manufacturing sector has narrowed in the 1980s, as can also be seen in table 4.3.

4.2.1 Capital Account Considerations

The sustainability approach applied to the current U.S. situation asks whether a decline of the dollar at the rate implied by the interest differential would produce a sustainable path for U.S. net external indebtedness. Even if the debt-to-GNP ratio does not rise at an accelerating rate, it may still increase to very high levels in the medium term. The question then becomes, would foreign investors be willing to finance the implied path of current account imbalances? This turns attention to the capital account side of the balance of payments.

Table 4.3 **Productivity Growth in the United States and Japan (Annual Percentage Growth In Output per Hour in Manufacturing)**

Period	Japan	United States
1950–59	11.4	2.1
1960–69	14.8	3.0
1970–79	7.7	2.5
1980–85	5.1	3.3

Source: Bureau of Labor Statistics (1986).

Table 4.4 **U.S. Treasury Bonds and Notes: Foreign Transactions (Millions of Dollars)**

	1984	1985	1986	1986			1987
Purchaser				Oct.	Nov.	Dec.	Jan.
All foreign	16,496	28,768	25,210	2,778	−270	−543	353
Foreign official institutions	505	8,135	14,277	3,506	138	240	1,488
Other foreign	15,992	20,631	10,936	−727	−408	−783	−1,135
Japan	6,289	17,909	3,916	−453	186	−2,086	−76

Source: Federal Reserve Bulletin, April 1987, table 3.25.

Some recent developments may shed light on this issue. Japanese and other foreign investors appeared to be adjusting their investment portfolios in response to large perceived dollar exchange risk in late 1986 and early 1987. This may have indicated that some investors believed the yen-dollar exchange rate to be unsustainable (i.e., that the dollar must decline faster than the small decline implied by the interest differential). This shift in beliefs would be reflected in changes in interest rates and exchange rates.

One important implication of this portfolio reshuffling by Japanese and other foreign investors is that it became more difficult for the United States to finance its fiscal deficit by private capital inflows at unchanged interest rates and exchange rates. Indeed, interest rates on U.S. Treasury bonds rose in late March 1987, accompanied by renewed downward pressure on the dollar. Data from the *Federal Reserve Bulletin,* shown in table 4.4, indicate that for 1986 as a whole, Japanese purchases of Treasury notes and bonds fell 79%. Foreign purchases in 1986 were sustained by a 76% rise in purchases of Treasury securities by foreign official institutions, while "other foreign" purchases fell 46%. Since November 1986, total foreign purchases of Treasury securities have been negative (the total would have been even more negative if official purchases had not been positive).

Problems with this data, produced by the U.S. Treasury, are discussed by Drexler (1987) and Sargen and Schoenholtz (1987). The main difficulty is that data are gathered according to the geographic location of the investor rather than his nationality. Thus, purchases by Nomura Securities in London for eventual resale to Japanese residents would appear as a sale to the United Kingdom (the eventual sale back to Japan would not be tracked by the U.S. data).

Still, these data on Treasury securities may be indicative of a general trend whereby official purchases of dollar securities are substituting for private purchases. However, if official purchases do not continue higher U.S. interest rates and a lower dollar may result. A change in policy stance in either Japan or the United States could reverse this process and draw Japanese and other foreign money back into the U.S. Treasury securities market. For example, a substantial shift towards fiscal ease in Japan or fiscal restraint in the United States would affect both PPP and sustainability calculations.

4.3 Adjusting to Endaka

The sustainability calculations of the appropriate yen-dollar exchange rate cited in section 4.2 suggest that the current rate is either close to a sustainable level or that some further appreciation is required. These calculations thus indicate that the yen was dramatically undervalued prior to the appreciation that started in February 1985, and that the strong yen is likely to persist. This exchange rate adjustment will induce substantial trade balance adjustment and necessitate fundamental changes in the structure of industry in Japan.

The magnitude of the adjustment currently required of the Japanese economy is one powerful example of the costs of misalignment. To undo the substantial undervaluation of the yen that accumulated prior to 1985, the yen-dollar exchange rate has appreciated by 47% (or 90% in terms of the dollar-yen exchange rate) in the space of just two years. As can be seen in figure 4.1, this is the largest unidirectional percentage change of the yen-dollar rate since the advent of floating rates, although the sharp appreciation in 1976–78 was close to the same magnitude (42% in yen-dollar terms). Figure 4.1 shows that the trade weighted-average yen has also appreciated, but by a smaller amount. (Similar time paths are evident in the real yen exchange rate—see Manual Johnson and Loopesko 1987.) This section will look at the adjustment process currently under way in Japan and discuss how the dynamics of adjustment are influenced by structural features of the Japanese economy.

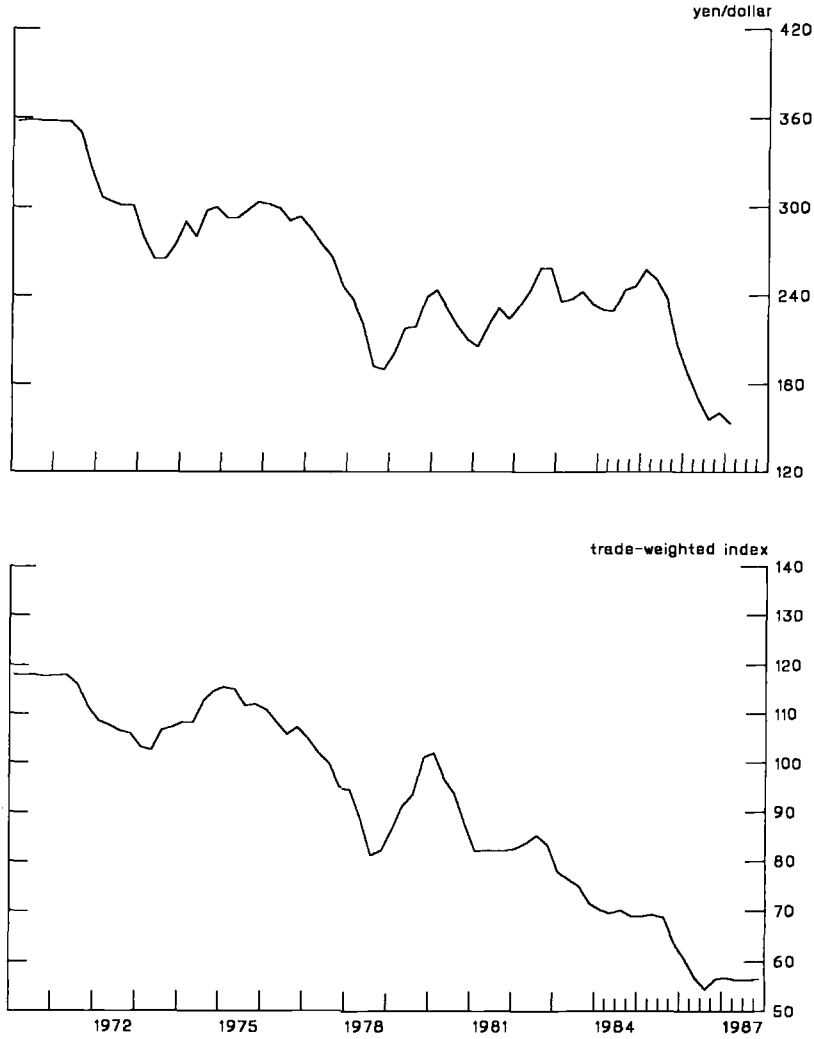

Fig. 4.1 Yen exchange rates. Source: Board of Governors. Note: The top panel plots the monthly average value of the yen-dollar exchange rate. The bottom panel plots a weighted-average yen exchange rate index based on bilateral exchange rates for 16 major trading partners, i.e., the 10 major industrial economies plus South Korea, the Philippines, Taiwan, Hong Kong, Singapore, and Malaysia. The weights are based on average multilateral trade in 1978–83.

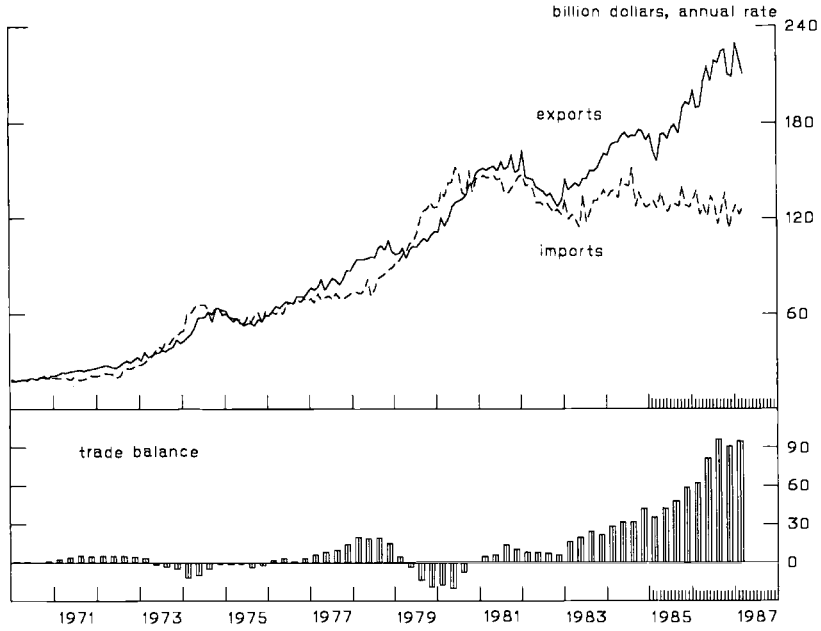

Fig. 4.2 Japanese trade (in dollars). Source: Board of Governors database. Note: Based on customs-basis trade data.

4.3.1 Recent Adjustment of Japanese Trade

The Japanese trade balance has already started to adjust to the sharp rise of the yen, as can be seen in figures 4.2 through 4.4. In both dollar and yen terms, shown in figures 4.2 and 4.3, the Japanese surplus has started to decline slightly. The decline is even more evident when the trade balance is expressed in real terms, shown in figure 4.4. Nonetheless, a record surplus remains (in 1986, the trade surplus reached $82.5 billion), and the arithmetic of adjustment of the trade imbalance implies that, over time, imports would have to grow about 80% faster than exports to attain balance (since exports are presently about 80% greater than imports).

Figure 4.5 highlights the growing importance of the bilateral trading relationship between Japan and the United States in Japan's overall trade pattern. Both Japanese exports to the United States and imports from the United States have grown in the 1980s. In 1986, the United States purchased 39% of Japan's exports and provided 23% of its imports.

Japan's trade imbalance vis-à-vis the United States measured in dollars, shown in table 4.5, may have started to decline in 1987. The surplus for the first quarter of 1987 fell to $11 billion dollars, compared to $14.4

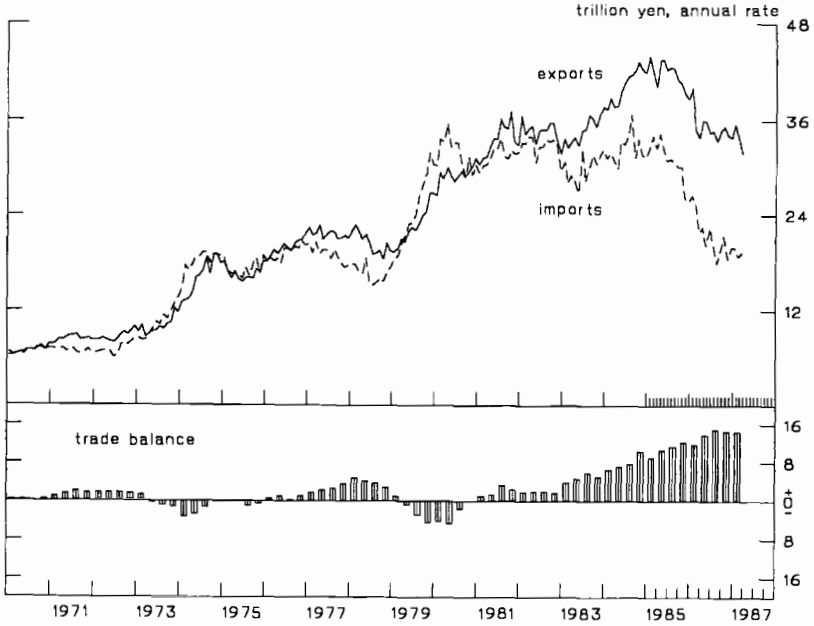

Fig. 4.3 Japanese trade (in yen). Source: Board of Governors database. Note: Based on customs-basis trade data.

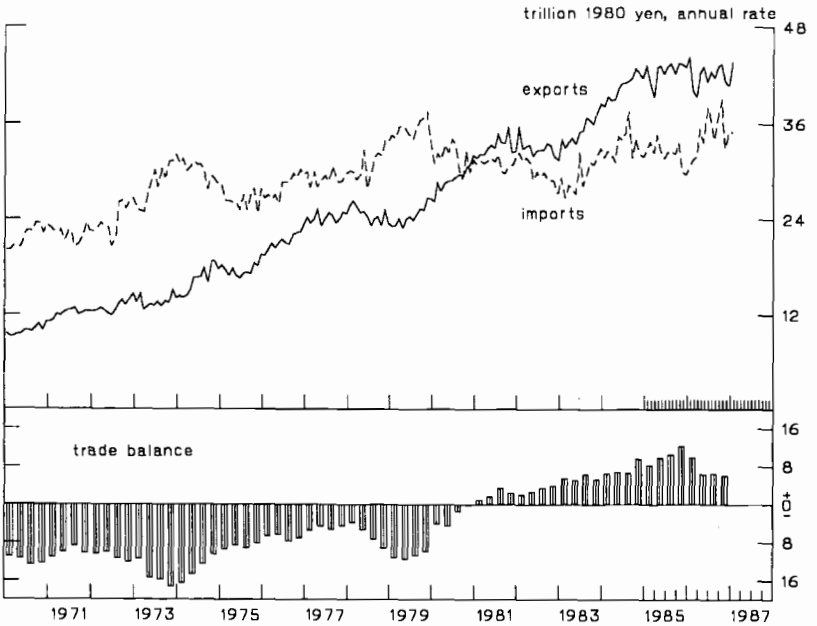

Fig. 4.4 Japanese real trade (in 1980 yen). Source: Board of Governors database and Bank of Japan. Note: Customs-basis data on nominal exports and imports in current yen were deflated by export and import price indices that are reported in the Bank of Japan, *Economic Statistics Monthly*, table 120.

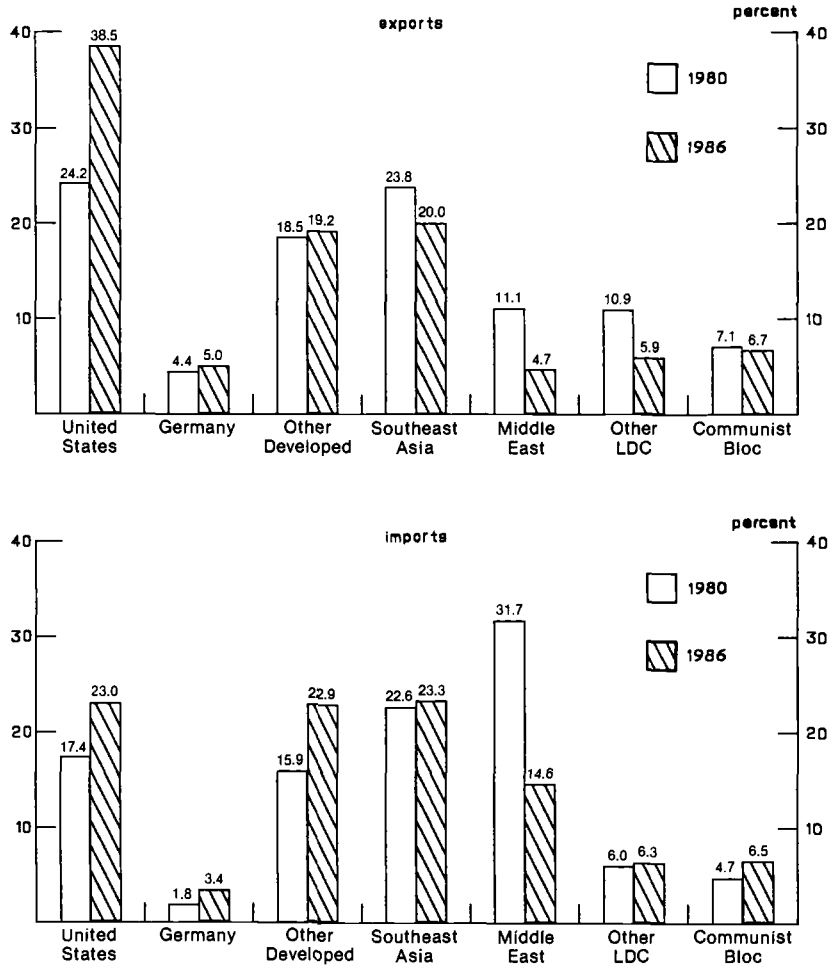

Fig. 4.5 Direction of Japanese trade, 1980 and 1986. Source: Japan Tariff Association, *The Summary Report on Trade of Japan.*

billion in the fourth quarter. However, since these data are reported on a seasonally unadjusted basis, and declines in the first quarter are common, it is too early to determine if the turning point has been reached. Calculations by the Bank of Japan of the real trade balance between the United States and Japan, shown in figure 4.6, indicate that the decline in the real bilateral trade surplus started early in 1986. The Bank of Japan calculations also show declines in Japan's real surplus vis-à-vis Asia and the European Community.

Table 4.5 **Japan-U.S. Trade (in Billions of Dollars)**

	Exports (F.O.B.)	Imports (C.I.F.)	Trade Balance
1982	$36,330	$24,179	$12,151
1983	42,829	24,648	18,181
1984	59,937	26,862	33,075
1985	65,278	25,793	39,485
1986	80,462	28,984	51,478
1986:I	16,706	6,275	10,431
1986:II	20,923	8,272	12,651
1986:III	21,281	7,518	13,764
1986:IV	21,552	6,920	14,632
1987:I	17,979	6,948	11,031

Source: Japan Tariff Association, *Summary Report of Trade.*

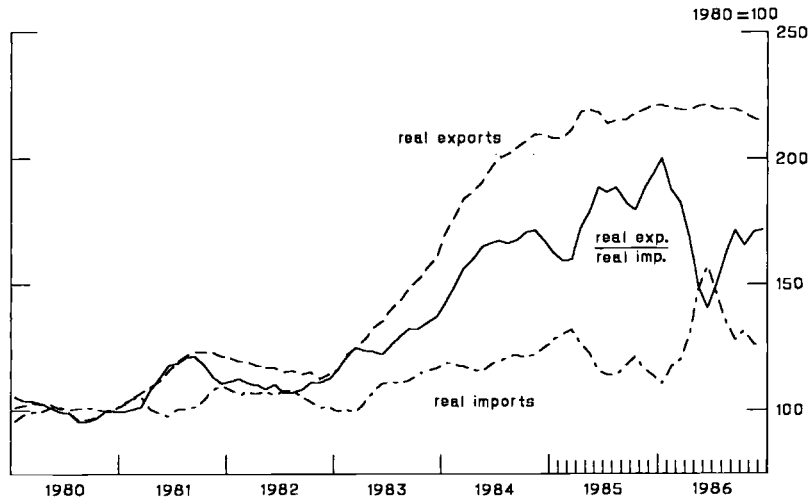

Fig. 4.6 The U.S.-Japan real trade balance (in 1980 yen). Source: Bank of Japan. Note: Real exports and imports vis-à-vis the United States have been estimated on the basis of the commodity composition of exports and imports between the United States and Japan.

4.4 Traditional Channels of Trade Balance Adjustment

It is interesting to investigate the channels through which this trade balance adjustment can be expected to occur in Japan. Much of the empirical literature on trade balance adjustment focuses on income and price elasticities in export and import demand equations. This section first reviews some of the estimates of Japanese trade equations provided

Table 4.6 **Elasticity Estimates for U.S.-Japan Trade**

	Relative Price Elasticity	Income Elasticity
Bergsten and Cline (1987)		
1960–84 (annual data)		
Japanese exports	−2.12[a]	1.62[b]
Japanese imports	−1.16	1.81[c]
Craig (1986)		
1961:III–1985:IV		
Japanese exports	−1.14	3.57
Japanese imports	0.66	0.75

[a]Constrained to equal 2.12, which is the elasticity estimated by Peter A. Petri (1984).
[b]Ratio of U.S. actual to trend GNP.
[c]Ratio of Japanese actual to trend GNP.

by earlier research and then presents some new estimates. The review proceeds from the most partial of partial equilibrium frameworks, equations for bilateral trade between Japan and the United States, to equations for Japanese multilateral trade. Because it is impossible to evaluate the role of policy in fostering trade adjustment in these partial equilibrium frameworks, section 4.8 provides some empirical evidence based on simulations of the Federal Reserve Board staff's Multi-Country Model (MCM).

4.4.1 Bilateral Trade Equations

Trade between the United States and Japan has been modeled recently by Bergsten and Cline (1987). Their elasticity estimates are summarized in table 4.6. In the equation for Japanese exports to the United States, they estimate two income elasticities, one for the ratio of actual GNP to trend GNP to capture the cyclical position of the economy and another for real U.S. GNP. The cyclical income elasticities are reported in the table (the other income elasticity is 0.7 for Japanese exports—but it is not statistically significant—and 0.8 for Japanese imports). While the elasticity estimates reported in table 4.6 suggest a substantial responsiveness of Japanese exports and imports to fluctuations in both relative prices and cyclical fluctuations in real income, there appear to be some technical problems with the estimates. In particular, the income elasticity of U.S. demand for Japanese exports is arrived at using an unusual estimation procedure. The authors take as given the relative price elasticity (using the elasticity estimated in a study by Petri 1984) and then estimate the remainder of the equation. Clearly, by construction, the Petri elasticity is an estimate that is conditional on the other variables included in his equation and cannot simply be transplanted into another equation with a different functional form.

Because of these problems, table 4.6 also reports estimates by Craig (1986) which are derived from very simple equations incorporating a lagged dependent variable, a contemporaneous activity variable, and a contemporaneous relative price term. These estimates suggest that the income and price elasticities of U.S. demand for Japanese exports are of a typical magnitude for a major industrial economy, but that those for Japanese demand for imports from the United States are quite low. Very substantial increases in Japanese real income would then be required to induce a significant change in Japanese imports.

Both sets of equations suggest that changes in relative prices are an important influence on Japanese exports to the United States. It is important to note, however, that in both sets of estimates the relative price terms are not constructed to isolate the relative prices of goods traded between the United States and Japan. Instead, aggregate price indices are used which may be heavily influenced by prices of goods that are not involved in U.S.-Japanese trade. For this reason, the price estimates should be interpreted with caution.

Table 4.7 reports the full set of Japanese bilateral trade elasticities estimated by Craig. It is interesting to note that while Japanese income elasticities of demand for imports from all of the major industrial countries studied are quite low, the income elasticity is largest for imports from the developing countries. Japanese imports from industrial countries other than the United States are moderately price elastic, while Japanese exports to the industrial countries are quite responsive to changes in foreign real economic activity. Taken together, these estimates suggest that quite different geographic patterns of bilateral trade

Table 4.7 **Japanese Bilateral Trade Elasticities (1961:III–1985:IV)**

	Japanese Imports		Japanese Exports	
	Price	Income	Price	Income
United States	−0.66	0.75	−1.14	3.57
	(0.06)	(0.05)	(0.10)	(0.31)
Canada	−1.12	0.61	−1.39	2.19
	(0.09)	(0.05)	(0.19)	(0.20)
United Kingdom	−1.14	0.78	−1.06	5.90
	(0.18)	(0.10)	(0.09)	(0.34)
Germany	−1.00	0.71	−0.50	4.80
	(0.08)	(0.06)	(0.15)	(0.28)
Other OECD	−1.08	0.92	−1.09	2.45
	(0.10)	(0.10)	(0.08)	(0.20)
Developing countries	−0.20	1.39	−0.71	0.74
	(0.08)	(0.14)	(0.07)	(0.07)

Source: Sean Craig (1986).

Note: Standard errors in parentheses.

Table 4.8 **Survey of Estimates of Japanese and U.S. Long-Run Income and Price Elasticities: Average and Range of Estimates**

	Exports		Imports	
	Japan	U.S.	Japan	U.S.
Long-run price elasticity	−1.4 (−3.0 to −0.5)	−1.2 (−2.3 to .03)	−1.0 (−1.2 to −0.7)	−1.3 (−1.7 to −1.0)
Long-run income elasticity	2.6 (1.5 to 4.2)	1.4 (0.9 to 2.2)	1.2 (0.8 to 1.7)	1.9 (0.8 to 4.0)

Note: From Goldstein and Khan (1985), who report representative estimates of income and price elasticities from recent studies. The entries in this table are the average of the estimates reported, and the range of estimates is in parentheses.

adjustment would result from changes in relative prices versus changes in real economic activity.

4.4.2 Multilateral Trade Equations

Table 4.8 reports the average and the range of the elasticity estimates from recent studies of U.S. and Japanese multilateral trade equations surveyed in Goldstein and Khan (1985). As in the bilateral equations estimated by Craig, there appear to be some asymmetries between the Japanese and U.S. elasticity estimates. Both the average estimates and range of estimates for the Japanese import elasticities appear lower than those for the U.S. equations. In contrast, the average estimates and range of estimates for the Japanese export elasticities appear larger than those for the United States. This would suggest that efforts to stimulate the domestic economy in Japan would result in less trade adjustment than either changes in relative prices or a slowdown in domestic demand in the United States. The MCM simulations reported in section 4.8 confirm this impression.

Table 4.9 takes another look at Japanese and U.S. trade equations. These estimates are from work with Bill Helkie at the Federal Reserve Board. Japan's aggregate import elasticities again appear relatively low, but these aggregate elasticities mask substantial differences in the elasticities of the components of imports, shown in the bottom panel. The disaggregated Japanese import equations indicate that fuel and raw materials have quite low income and price elasticities. Table 4.10 shows that fuel and raw materials accounted for about 43% of Japanese imports in 1986 but only 28% of U.S. imports, so that these low elasticity components are more important as a percentage of total imports for Japan. Japanese manufacturing imports, about 42% of total imports, are more responsive to income and relative price movements. In fact,

Japan's elasticities for manufacturing imports look more like the typical elasticities of major industrial economies. This evidence suggests that the differences in elasticities between the United States and Japan may derive in part from the different commodity composition of trade of the two countries.

Table 4.9 **Estimates of Japanese and U.S. Multilateral Trade Elasticities**

	Income Elasticities		Price Elasticities	
	Japan	U.S.	Japan	U.S.
Aggregate trade equations				
Exports	1.60	2.19	−1.14	−0.83
1970:I–1986:I	(9.10)	(5.46)	(−3.57)	(−6.11)
Imports	1.07	2.11	−0.44	−1.15
1968:I–1986:IV	(14.03)	(5.30)	(−4.69)	(−10.03)
Disaggregated import equations				
Manufacturing	1.86		−0.90	
1975:I–1986:IV	(9.13)		(−9.21)	
Fuel	1.00[a]		−0.17	
1974:I–1986:IV			(−5.06)	
Raw materials	0.97		−0.50	
1974:I–1986:IV	(3.40)		(−7.24)	

Notes: For the United States, the table reports Helkie and Hooper's (1987) estimates for nonagricultural exports and nonoil imports. The estimates for Japan are based on work with William Helkie at the Federal Reserve Board. The dates refer to the estimation period for the Japanese equations. The U.S. equations were estimated over 1969:I to 1984:IV.

[a]Constrained to be unity.

Table 4.10 **Commodity Composition of Trade for the United States and Japan, 1986 (Percentage Shares)**

	U.S.	Japan
	Exports	
Agricultural products	12	1
Raw materials	25	1
Manufactured goods	63	98
	Imports	
Food and beverages	6	15
Raw materials, excluding fuel	20	14
Fuel	8	29
Manufactured goods	67	42

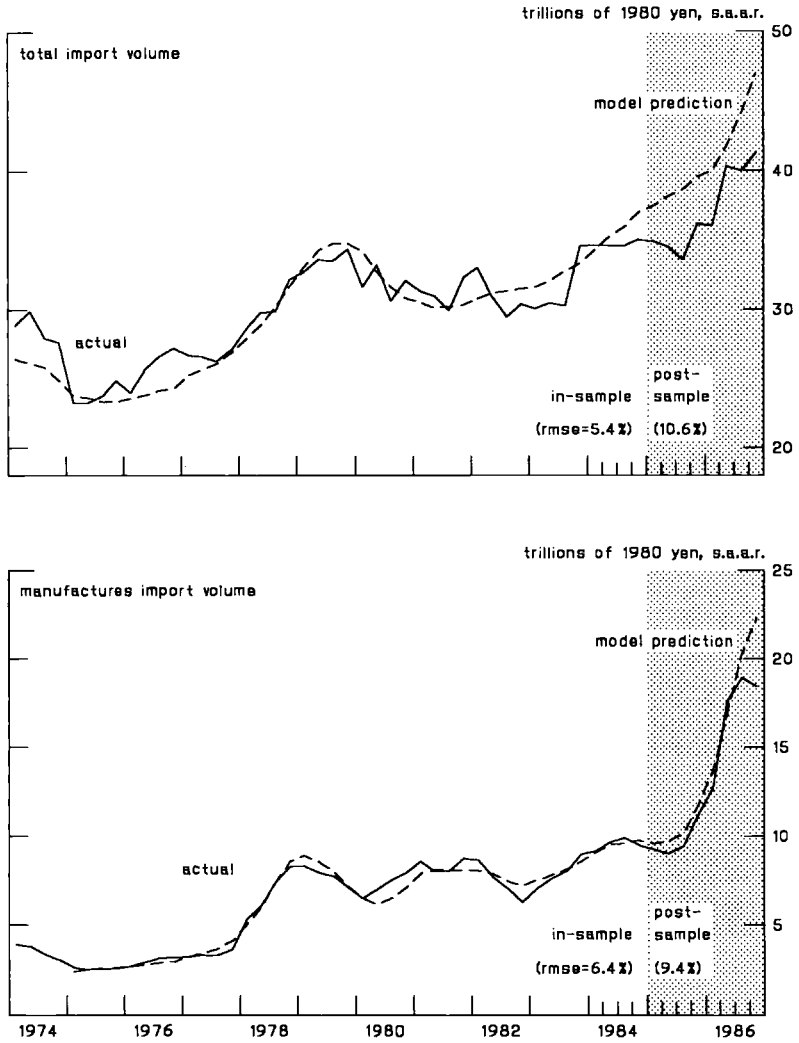

Fig. 4.7 Import volumes. Source: Board of Governors for actual data. Note: Detailed descriptions of the trade equations underlying the model prediction are available from the authors by request.

The forecasting performance of these Japanese trade equations, shown in figures 4.7 to 4.9, suggests that the current process of trade balance adjustment for Japan differs from that of recent historical experience. The total import volume equation tracks moderately well in sample, but predicts a more substantial rise in imports in 1985 and 1986 than actually materialized. This overprediction of Japanese imports is a feature of all of the disaggregated import equations, although the root-

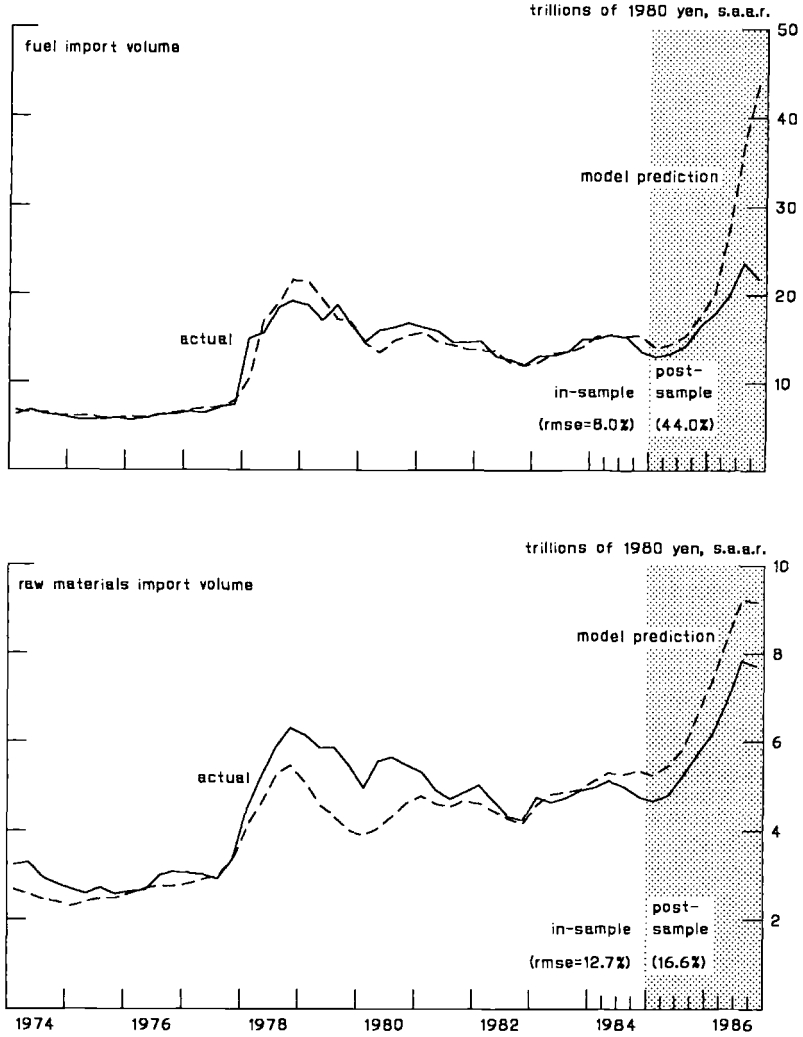

Fig. 4.8 Import volumes. Source: See fig. 4.7. Note: See fig. 4.7.

mean-squared error of the postsample forecast is largest for fuel. For aggregate Japanese exports, the equation again fits moderately well in sample, but predicts a more substantial decline in exports than has in fact occurred.

Based on these estimates, it would appear that Japanese trade has been less responsive to changes in income and relative prices in the last two years than would have been predicted based on recent historical experience. Section 4.5 explores some possible explanations for this slow adjustment of Japanese trade.

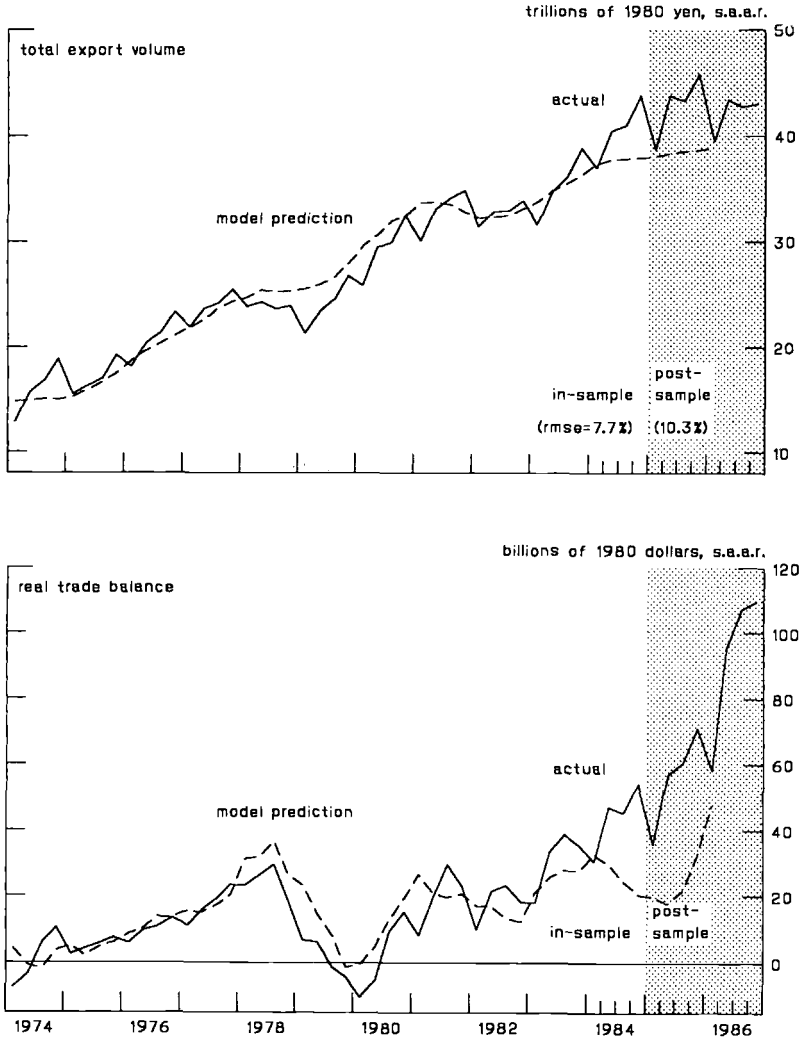

Fig. 4.9 Export volume and real trade balance. Source: See fig. 4.7. Note: See fig. 4.7.

4.5 The Slow Adjustment of Japan's Trade Surplus

4.5.1 Slow Pass-through

One factor that has contributed to the sluggish adjustment of Japanese exports is slow pass-through of the yen's appreciation to export prices in foreign currency terms. Failure to adjust foreign-currency prices of exports by the amount of an exchange rate change may correspond to an attempt to maintain market share. The resulting squeeze

Table 4.11 **Pass-Through of the Yen's Appreciation to Export Prices, November 1976 to November 1985 and February 1985 to February 1987 (%)**

Export Industry	Nov. '76–Nov. '78	Feb. '85–Feb. '87
Total exports	65.8	47.6
Chemicals	−25.4	9.5
Textiles	98.0	51.4
Metals and related products	50.8	20.0
General machinery and precision instruments	105.1	66.1
Electrical machinery	93.4	46.8
Transportation equipment	61.6	64.2

Sources: Bank of Japan, *Economic Statistics Monthly* (export prices) and Japan Tariff Association, *The Summary Report of Trade* (conversion exchange rate for custom-cleared exports).

on Japanese exporters' profit margins has been documented by Mann (1986) and Jones (1987). Recent theoretical explanations of pass-through and profit margin phenomena are provided by Dornbusch (1985) and Krugman (1986a). Fisher (1987) explores the dependence of the degree of pass-through on domestic and foreign market structures and the exchange rate regime.

Recent evidence on pass-through is presented in table 4.11, which presents pass-through estimates for various categories of Japanese exports for the period since the start of the yen's rise in February 1985. The percentage of pass-through is calculated by comparing the actual yen export price to the yen export price that roughly corresponds to full pass-through of the yen's appreciation. Zero pass-through implies that yen export prices would fall by the amount of the yen's appreciation against the dollar in order to keep dollar prices constant, while full pass-through implies that yen export prices would remain constant. Under the assumption that the change in the yen's value was the only influence on the yen export price since February 1985, the export price in February 1985 provides a rough approximation of the full-pass-through export price in February 1987 (i.e., no change should have occurred in yen terms if profit margins were not being reduced in response to the yen's appreciation). Thus, the calculations in table 4.11 compare the difference between the actual yen export prices in February 1987 and February 1985 to the exchange rate change over that period.

The calculated rate of pass-through of the 41% appreciation of the yen-dollar exchange rate over that period (calculated from the conversion exchange rate used for customs-cleared exports) is 47.6% for total exports. This is low in comparison to the 66% average pass-

through of a roughly comparable (37%) yen appreciation that occurred in November 1976–November 1978.

Lower pass-through in the recent period may reflect a number of factors. One important change since the mid-seventies is the greater degree of competition for Japanese exporters from the Asian NICs (Hong Kong, Singapore, Korea, and Taiwan). The most rapid rates of pass-through in the recent period occurred in industries such as general machinery and precision instruments and transportation equipment, whereas the lowest rates of pass-through occurred in competitive industrial materials industries such as metals and chemicals. In the former areas, Japanese exporters now have a well-established reputation for high quality, so that the new competition poses a less immediate threat to market share. It is interesting that the rate of pass-through is actually slightly more rapid in the recent period for the transportation industry, suggesting that the quality factor may have been particularly strong in this sector. In the latter (industrial materials) areas, international competition has been strong for many years, and even in the second half of the seventies these sectors had relatively low rates of pass-through.

Another factor differentiating the recent period from the mid-seventies is that the most recent episode of yen appreciation coincided with a period of sharply declining commodity prices, including a steep fall in the price of oil (petroleum product imports account for more than one-third of Japanese imports). This decline in costs of imported intermediate inputs to production has permitted Japanese producers to reduce production costs, thereby limiting the extent to which prices of their exports in foreign-currency terms need to be increased with the yen's appreciation.

A final factor that may have influenced the rates of pass-through in the two periods is the state of profit margins at the start of the yen's appreciation. It is frequently alleged that profit margins of Japanese exporters were unusually large in early 1985 when the yen started its prolonged ascent, thereby providing a considerable cushion before prices in foreign currency terms had to be raised. It would be an interesting topic for further research to explore the importance of this factor in pricing behavior.

Several Japanese government agencies have recently done some pass-through calculations, although unfortunately this work is only reported in Japanese-language sources. A few highlights of this work are reported below.

The Economic Planning Agency (EPA) has done calculations comparing rates of pass-through for various time periods. In particular, the EPA reports pass-through rates for November 1977–October 1978 and for September 1985–January 1987. They find that the rate of pass-through has declined from 64% in the earlier period to 43% in the most recent period. They report pass-through rates by industry for only the

most recent period. The EPA finds pass-through to be lowest in the chemical industry (35%) and metal industries (15%), but also (unlike in table 4.11) in the textile industry (31%). The EPA also finds high rates of pass-through in the electrical machinery industry (74%) and in general machinery industries (55%). Most of these EPA findings are qualitatively quite similar to the results in table 4.11.

The Japanese Ministry of International Trade and Industry (MITI) has also done some research on pass-through by industry for roughly the same time periods. MITI compares pass-through rates by industry for the June 1977–November 1978 and September 1985–February 1987 periods. The MITI findings again broadly support those in table 4.11. (Approximate figures are reported below, since only a chart, and not data, was readily available.) For all industries, the rate of pass-through slowed from about 65% in the earlier period to about 55% in the recent period. The decline was most dramatic in the iron and steel industries (from 55% to 10%), where international competition has become particularly intense. The MITI results also show that pass-through was quite high in the recent period in those industries where Japan has a well-established reputation for high-quality products (60% for passenger cars, 80% for photocopying machines, and 65% for machine tools).

MITI also has done some interesting calculations of the rates of pass-through adjusted for declines in raw materials costs for certain industries. As was noted above, the decline in prices of imported intermediate inputs to production has permitted lower pass-through rates in the recent period. After this adjustment is made, the overall pass-through rate for the two time periods appears to be quite similar (about 70% in both time periods). However, in the iron and steel and the passenger car industries, where international competition has been increasing, there was a sharp fall in even these adjusted rates of pass-through between the two time periods. Thus it would appear that the increase in international competition is a key factor explaining slower pass-through in a few industries, but in most industries the slower pass-through is more strongly related to the recent sharp declines in raw-material import costs.

The fact that pass-through has been slower in the past two years (for any of the above reasons) than in recent historical experience can help explain why adjustment of export volume has been slower than predicted. The out-of-sample predicted value for export volume in figure 4.9 is generated using predicted yen export prices, and the predicted yen export price has fallen less than the actual yen export price because of this weaker pass-through. Thus slow pass-through provides one explanation for the gap between the actual and predicted export volume.

The above evidence compares the response of Japanese export prices during two periods of yen appreciation. It is also interesting to ask whether an asymmetry exists in the adjustment process of Japanese

export prices to yen appreciations and yen depreciations. Such an asymmetry might occur if, as is often alleged, Japanese exporters use strategic pricing in order to maintain market share. In this case, they might attempt to keep the dollar price of exports constant in the face of a yen appreciation (i.e., reduce yen export prices), but would allow some decline in dollar export prices with yen depreciations (i.e., not increase yen export prices).

The Appendix reports a test of the particular strategic pricing hypothesis that yen export prices respond asymmetrically to a strengthening and weakening of the yen. The exchange rate enters a typical yen export price equation through its impact on the yen value of competitors' export prices. Thus the question of interest is whether Japan's export price responds differently to a rise in competitors' export prices (expressed in yen) than to a decline. More specifically, Japanese exporters are concerned about movements in competitors' export prices relative to their own export prices, so that the precise hypothesis test is in terms of the significance of a dummy variable, $a6$, that is unity when Japan's export price rises relative to competitors' export prices and zero otherwise. Competitors' export prices in yen terms may fall relative to the Japanese export price because of a decline in competitors' export prices in foreign currency terms or because of an appreciation of the yen. In either case, a Japanese exporter may choose to match declines in competitors' prices, but not increases, in order to maintain export share. The test is a simple variation on the profit margin theme.

Dummy variables that isolate appreciations and depreciations are entered multiplicatively with the competitors' export price variable. The null hypothesis that the coefficient on the appreciation dummy is equal to the coefficient on the depreciation dummy (or the equivalent test that the coefficient $a6 = 0$) is rejected at the 2% confidence level. This is further evidence of strategic pricing on the part of Japanese exporters.

4.5.2 Distributor and Dealer Margins

Another factor that may help explain the deviation between actual and predicted values for imports and exports is the behavior of Japanese retail distributors of imported goods and foreign dealers for Japanese exports. It is very difficult to obtain data to document these phenomena, but anecdotal evidence abounds. For example, it is widely recognized in Japan that Japanese retail distributors of imported goods have not been passing on fully the benefits of the yen's appreciation to consumers in Japan. Indeed, the issue has attracted the attention of Japanese policymakers, and recent demand-stimulus packages have all included promises to promote greater pass-through to consumers of

terms-of-trade gains. Thus, even though precise data on the pass-through of exchange rate changes to consumers is difficult to obtain, the authorities clearly acknowledge that the pass-through has been slow.

One institutional factor is worth noting in this regard. In Japan, the same trading companies generally handle both exports and imports. Thus, if Japanese trading companies' profit margins are being compressed to maintain export market shares, it is possible that some offset may be sought by slowing the pass-through of the yen's appreciation to domestic prices of imported goods. Again, it is not possible to find data to document whether this is in fact occurring, but numerous Japanese officials acknowledge that it is a reasonable hypothesis.

Most of the evidence of slow pass-through to consumer prices remains anecdotal, but it is reflected in the very modest decline in consumer prices relative to the sharp appreciation of the yen, shown in figure 4.10. In the 12 months through March 1987 when the yen appreciated about 20%, the CPI declined just 0.3%, while import prices fell 16%. The failure of consumer prices to fall further reduces the terms-of-trade gains to the consumer associated with the yen's appreciation (and with the recent decline in the price of oil as well).

The EPA has done some interesting work (again only available in Japanese) attempting to discern why consumer prices have declined less in the recent period than their model would have predicted. The model would have predicted a 4.2% fall in consumer prices between September 1985 and September 1986, whereas a 0.2% increase actually occurred. They show that sluggish adjustment of administered prices

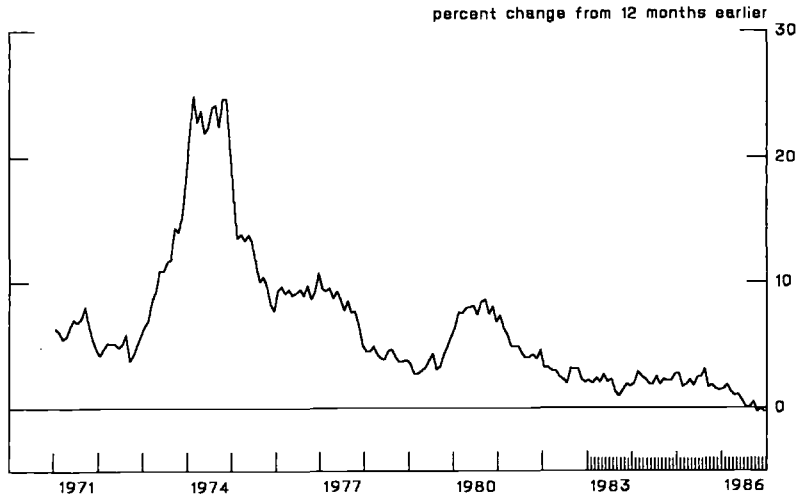

Fig. 4.10 Consumer prices. Source: Board of Governors database.

(such as those of public utilities and state corporations) was one key factor inhibiting consumer price adjustment. Their results also suggest that factors relating to the distribution network between the wholesale and retail levels and perhaps supply-and-demand conditions in particular markets may have contributed to the sluggishness of retail price adjustment following the yen's recent rise.

On the export side, dealer margins may have affected the adjustment of Japanese exports. For example, in the United States many consumers who purchased a Toyota or other popular Japanese cars prior to the yen's appreciation had to pay a dealer markup over the list price reflecting excess demand. In the Washington, D.C., area, these markups often were on the order of $1,000 to $2,000. More recently, as Toyota's import price has risen and demand has accordingly waned, dealer markups have generally been reduced or eliminated.

Thus, even though the dollar export price may rise, a concurrent decline in dealer markups means that the effective price facing the U.S. consumer has not changed by the full amount of the yen's rise. As a result, the relative export price in the export demand equation does not fully capture the movements in prices facing consumers. Since these dealer markups are a fairly recent phenomenon, they would not be captured in a stable manner by the coefficient on relative export prices in the reported equation. If such markups were common for a wide variety of Japanese exports, they might be one source of the less-than-predicted decline in exports in the postsample period. This could be a topic for further research.

4.6 A Model of the Adjustment Process in Japan

Beyond the issue of explaining the prediction errors in our forecasting equations, there is the broader question of whether an overreliance on exchange rate movements to correct external imbalance can actually turn out to be counterproductive. As the dollar has fallen relative to the yen, some observers have suggested that the rapid depreciation of the dollar may actually worsen the U.S. trade balance. They emphasize that the sharp rise of the yen will induce a recession in Japan and therefore reduce the demand for U.S. exports in the short-to-medium term. In essence they claim that the recession-induced income effects will dominate the substitution effects associated with the change in the exchange rate. Those advocating this point of view do not necessarily argue that the dollar has overshot its equilibrium position. Rather they emphasize that the speed of the yen's appreciation has been too rapid to allow Japan to adjust without experiencing a sharp deceleration of economic activity.

It is difficult to believe that the induced income effects would dominate the substitution effects, given the small income elasticity of Jap-

anese demand for U.S. exports of about 0.75 (see table 4.7). The induced recession effect on the bilateral trade balance between the United States and Japan is probably quite small even when Japan experiences a severe contraction of economic activity. Thus, one may desire to slow the descent of the dollar to alleviate the burden of adjustment on Japan or for other reasons, but if reducing the U.S. trade balance is the primary objective, a fall in the dollar will almost assuredly bring about an improvement in the bilateral balance of trade.

There may be considerations other than the U.S.-Japan bilateral trade balance that could influence policymakers to try to reduce the adjustment costs borne by the Japanese economy. Quite simply, trade is multilateral and the evidence in table 4.9 indicates that the Japanese multilateral income elasticity is not particularly small. As is shown in table 4.7, the Japanese income elasticity of demand for imports from developing countries is the largest of the bilateral income elasticities, so that Japanese income growth may bear heavily upon the ability of debt-burdened developing countries to service their external debt. A recession in Japan, given their dependence on imported raw materials, would increase the strain on some of these countries. This could occur despite the fact that the appreciation of the yen has made these inputs to production cheaper in Japan, which may have helped raw-materials exporters.

In light of these broader multilateral considerations, it seems fruitful to investigate the impact of a large exchange rate change on the Japanese domestic economy. This section will present a stylized model of the Japanese economy in the short run and analyze the impact of an exchange rate appreciation on output, employment, and the trade balance. The model emphasizes the interaction between the tradable and nontraded goods sectors of the economy and also examines the influence of intermediate imports on sectoral adjustment and the trade balance when wages are rigid. We employ a slightly modified version of a model by Dornbusch (1980) as the workhorse, but perform some different exercises with the model which are particularly relevant to the recent Japanese experience. In this framework, one can illuminate some of the forces within the Japanese economy that might lead to a deceleration of economic activity in the short run as well as those elements of economic structure that would help mitigate the difficulties of adjustment to an exchange rate change.

We begin with a model that has two sectors, tradable and nontraded goods. Each sector utilizes two inputs to production: labor and an imported factor of production. Each sector's production technology exhibits constant returns to scale. Therefore prices can be related to factor prices as follows:

$$P_T = a_T * w + b_T * (e * p_r). \tag{1}$$

$$P_N = a_N * w + b_N * (e * p_r) \tag{2}$$

where P_T = price of tradable good
P_N = price of nontraded good
a_i = input of labor per unit of output in sector i
b_i = input of imported factor per unit of output in sector i
e = exchange rate (yen per unit of foreign currency)
p_r = world price of imported factor of production.

Taking the total differential of equations (1) and (2) yields

$$\hat{P}_T = \Theta_{LT} * \hat{w} + (1 - \Theta_{LT}) * (\hat{e} + \hat{p}_r). \tag{3}$$

$$\hat{P}_N = \Theta_{LN} * \hat{w} + (1 - \Theta_{LN}) * (\hat{e} + \hat{p}_r) \tag{4}$$

where Θ_{ij} = factor i's share in sector j ($\Theta_{Lj} = a_j * w/P_j$)
"$\hat{x}$" denotes a percentage change of x.

The demand structure of the model consists of three components. The first two, the domestic demand for tradable goods, D_T, and the domestic demand for nontraded goods, D_N, are both functions of real income, Y, and the relative price of tradable and nontraded goods, P_{TN}.

$$D_T = D_T(Y, P_{TN}). \tag{5}$$

$$D_N = D_N(Y, P_{TN}) \tag{6}$$

where $P_{TN} = P_T/P_N$.

The third component of demand is the foreign demand for the home country's exportable goods, M^*:

$$M^* = M^*(P_{TW}, Y^*) \tag{7}$$

where Y^* = exogenous foreign income
$P_{TW} = P_T/(e * P_w)$
P_w = the world price of exportable goods.

Define real income as

$$Y = (w * L)/Q \tag{8}$$

where $Q = P_T^{\delta} * P_N^{(1-\delta)}$, the weighted-average consumer price index, and δ = the share of tradable goods in domestic consumption.

A change in real income can be expressed as

$$\hat{Y} = \hat{w} + \hat{L} - \delta * \hat{P}_T - (1 - \delta) * \hat{P}_N. \tag{9}$$

Combining equations (3) and (4) and substituting into (9) yields

$$\hat{Y} = \hat{L} - \Omega * (\hat{e} + \hat{p}_r) - \alpha * \hat{w} \tag{10}$$

where $\Omega = \delta * \Theta_{MT} + (1 - \delta) * \Theta_{MN}$
$\alpha = 1 - (1 - \delta) * \Theta_{LN} - \delta * \Theta_{LT}$.

To solve equation (10) for income or employment, one must utilize another equilibrium condition. The derived demand for labor used in the production of both tradable and nontraded goods can be expressed as

$$L^d = a_T * [D_T + M^*] + a_N * D_N. \tag{11}$$

When wages are fixed in the short run, employment is demand determined. Fixed wages in conjunction with the explicit incorporation of the effects of labor income on product demand implies a multiplier effect on demand. A fall in demand implies layoffs which reduce income and further reduce demand.

Taking the total differential of (11) and substituting in (10), one can produce an expression for $\hat{L}$:

$$\begin{aligned}\hat{L} = {} & 1/(1-\tau) * (\lambda_{LM} * \epsilon_M^{Y^*}) * \hat{Y}^* + 1/(1-\tau) * [\lambda_{LM} * \epsilon_M^P] \\ & * \hat{P}_W - 1/(1-\tau) * [\lambda_{LM} * \epsilon_M^P * (1 - \Theta_{LT}) - \phi + \tau\Omega] \\ & * \hat{p}_r + 1/(1-\tau) * [\tau\alpha + \phi - \lambda_{LM} * \epsilon_M^P * \theta_{LT}] \\ & * \hat{w} + 1/(1-\tau) * [\lambda_{LM} * \epsilon_M^P * \Theta_{LT} + \phi - \tau\Omega] * \hat{e}.\end{aligned} \tag{12}$$

where $\phi = (A/wL) * \epsilon_T^P * \delta * [\Theta_{LT} - \Theta_{LN}]^2$,

λ_{Li} = the proportion of total labor employed producing good i and $\lambda_{LM} + \lambda_{LT} + \lambda_{LN} = 1$.

Θ_{ij} = the income share of factor i in sector j

γ_i = the marginal propensity to consume good i

δ = the expenditure share of the traded good

$\tau = \Theta_{LT} * \gamma_T + \Theta_{LN} * \gamma_N$

$\alpha = 1 - (1 - \delta) * \Theta_{LN} - \delta * \Theta_{LT}$

ϵ_j^i = the elasticity of demand for j with respect to argument i. (Defined as a positive quantity. For instance, if dD/dP is negative, then the elasticity is defined as $-dD/dP * (P/D)$.)

The expression for $\hat{L}$ can be introduced into equation (9) to solve for the changes in real income in terms of the change in the various exogenous variables. We now turn to the model's implications when the only exogenous change is an appreciation of the exchange rate.

4.7 Effects of a Currency Appreciation

An exchange rate appreciation, holding wages, foreign income, and the world price of both factors and goods constant in the short run, will transmit through the economy along several channels. The rise in the exchange rate will alter the domestic relative prices of tradable and nontraded goods if the relative factor intensities of the two sectors differ. If the tradable goods sector is less labor intensive (more imported

factor intensive) than the nontraded sector, as is likely to be the case in Japan, the fall in the price of the imported factor will lead to a fall in the relative price of the tradable goods. This can be seen by subtracting equation (4) from equation (3), while holding wages constant:

$$\hat{P}_T - \hat{P}_N = (\Theta_{LN} - \Theta_{LT}) * \hat{e}. \tag{13}$$

The implications of an appreciation for output and employment are somewhat more difficult to ascertain. The expression shown in equation (12) can serve as a guide to these effects. Equation (12) can be rewritten when the only shift in the exogenous variables is a change in the exchange rate:

$$\hat{L} = 1/(1 - \tau) * [\lambda_{LM} * \epsilon_M^P * \Theta_{LT} + \phi - \tau\Omega] * \hat{e} \tag{12'}$$

$$\text{where } \phi = (A/WL) * \epsilon_T^P * \delta * [\Theta_{LT} - \Theta_{LN}]^2$$

$$A = (P_T * D_T + P_N * D_N).$$

The first term in parentheses reflects the influence of the exchange rate on employment resulting from the change in foreign demand for the exportable good. An appreciation increases the price of exportables relative to the world price, because of the increase in the labor costs in terms of foreign currency. This term implies a reduction in employment when the exchange rate appreciates.

The second term in parentheses represents the employment effects of demand substitution between tradable and nontraded goods by domestic consumers. An exchange rate appreciation reduces the relative price of the import-intensive sector, which induces a demand shift toward the sector that is less labor intensive. Employment declines are sharper when the relative price elasticity of tradable goods demand is high, when the share of labor in the two sectors is greatly different, and when the trade surplus is small, or equivalently, when domestic absorption, A, is large in relation to domestic income.

The third term in parentheses represents the stimulus to demand in both sectors resulting from the increase in real income created by the appreciation of the currency. That appreciation will lower prices and raise the real consumption wage. The stimulus to income will increase employment in both sectors. Overall, the combined effect of the three terms is ambiguous, so that the effect of an exchange rate change on employment will depend on the relative magnitudes of the three terms.

From equations (10) and (12') one can also assess the impact of the appreciation on real income:

$$\hat{Y} = [1/(1 - \tau) * [\lambda_{LM} * \epsilon_M^P * \Theta_{LT} + \phi - \tau\Omega] - \Omega] * \hat{e}. \tag{10'}$$

Here the income-effect terms enter twice, once because prices fall and raise income when the currency appreciates and a second time

because that same effect raises employment and demand. Overall, however, the result is still ambiguous, although an appreciation will always increase real income by a greater percentage than the percentage increase in employment (or decrease it by a lesser percentage).

Also of interest is the impact of an exchange rate change on the trade balance. For simplicity in this model, the trade balance consists of manufactured exports and intermediate imports.

$$T = P_T * M^* - p_r * [b_T * (D_T + M^*) + b_N * D_N]. \tag{14}$$

The change in the trade balance as a fraction of total earnings in response to an exchange rate change can be expressed as follows:

$$dT/wL = (1 - \rho) * \hat{Y} + \Delta * \hat{e} \tag{15}$$

where $\Delta = [\delta * (1 - \Theta_{LN}) + (1 - \delta) * (1 - \Theta_{LT})] * (T * Q)/Y$.

Note that when trade is in balance this equation reduces to $dT/wL = (1 - \rho) * \hat{Y}$, which is the result of Dornbusch (1980).

Using equations (10′) and (15), one can derive an expression for the change in the trade balance as a function of the exchange rate change.

$$dT/wL = ((1 - \rho) * [1/(1 - \tau) * [\lambda_{LM} * \epsilon_M^P * \Theta_{LT} + \phi - \tau\Omega] - \Omega] + \Delta) * \hat{e}. \tag{16}$$

Alternatively, one can look at imports and exports separately:

$$dX = X * [(1 - \Theta_{LT}) + \epsilon_M^{P^*} * \Theta_{LT}] * \hat{e}. \tag{17}$$

$$dM = M * [\lambda_{rT} * \epsilon_T^Y + \lambda_{rN} * \epsilon_N^Y] * \pi * \hat{e} + M * [1 - (\Theta_{LN} - \Theta_{LT})^2 * \epsilon_{DT}^P * \delta * M/(W * L) + \lambda_{tM}{}^* * \epsilon_M^{P^*} \Theta_{LT} + \phi - \tau\Omega] - \Omega] \tag{18}$$

where $\tau + [1/(1 - \tau) * [\lambda_{LM} * \epsilon_M^{P^*} \Theta_{LT} + \phi - \tau\Omega] - \Omega]$

X = exports
M = imports
λ_{ri} = the proportion of total imported materials used in sector i
ϵ_i^Y = the income elasticity of demand in sector i
ϵ_i^P = the relative price elasticity of demand in sector i.

The effect of an appreciation on exports is negative. First, the rise in the exchange rate lowers the domestic currency price of exports because the lower price of raw materials is passed through to goods prices. Second, volume falls as exports become more expensive to

foreigners because domestic labor costs do not fall along with materials costs as a result of the change in the exchange rate. An increase in the foreign relative price elasticity will increase the decline in exports associated with an appreciation. Also, if the export sector reduces its labor intensity, the effects will be offsetting. The greater pass-through of the exchange rate change into prices will reduce prices by more but volume by less. The net effect will depend upon whether the magnitude of the foreign price elasticity is greater or less than one.

Equation (18) shows the expression for the change in intermediate imports. The first term represents the change in volume because of the change in derived demand resulting from the effects of the exchange rate on real income. If real income falls when the exchange rate appreciates, $\pi > 0$, then demand will decline and factor imports will fall.

The second bracketed term represents three effects. First, the value of imports falls directly because of the appreciation. Second, an appreciation will reduce the relative price of the sector that uses the imported factor most intensively. That will shift demand toward that sector and increase the volume of imports. Finally, the third term represents the decline in imports resulting from foreign consumers substituting away from domestic exports when the exchange change does not entirely pass through into prices because of the rigidity of wages in the short run.

Overall, the implications of an exchange rate change for the Japanese economy in the model above is ambiguous. The model predicts that (1) exports will decline both in value and in volume terms; (2) if real income falls, imports of the intermediate input will also decline in both value and volume terms; (3) employment will decline on net if the propensity to consume is low and/or the share of intermediate imports in production is small; and (4) if real income falls, the trade balance will worsen if the income elasticity of demand for imports is large.

From this discussion it is clear that the effect of the yen's appreciation on real income and the Japanese trade balance is ambiguous. However, as noted earlier, even if real income declines in Japan, this would probably translate into a relatively small increase in imports from the United States given the small Japanese income elasticity of demand for U.S. imports. Thus it is unlikely that even a strong yen appreciation would have a recessionary impact large enough to actually cause a widening of Japan's trade surplus with the United States.

While this model captures many of the structural links affecting the Japanese economy, it does not address some of the other elements of economic structure that would affect performance in the short-to-medium run. First of all, it does not include an imported final good. An appreciation would lower the price of a final-good import and provide another channel for terms-of-trade gains to reach consumers.

Second, capital accumulation is neglected. A model such as the one presented by Mussa (1974), which emphasizes the role of sector-specific capital in the adjustment process, would further illuminate the impact of an exchange rate change on economic activity in Japan. (The Krugman contribution to this volume incorporates a model of this nature.) Such a specification would highlight the idea that the appreciation of the yen would reduce capital in the traded goods sector while either stimulating or retarding investment demand in the nontraded sector in the short run. The compression of profits in the export part of the tradable goods sector would also constitute a source of income deterioration that would reduce domestic demand for both tradable and nontraded goods.

A third element not addressed in the model is the role of consumer imports and pass-through of exchange rate changes into imported final goods prices. The pass-through, or lack thereof, would influence real income, demand, and employment growth.

Finally, there is no attempt to incorporate the effects of policy into this framework. If domestic demand stagnation and unemployment resulted from exchange rate appreciation, then domestic macroeconomic stimulus could alleviate some of the costs of transition. To explore the role of policy in the adjustment process, section 4.8 employs the Federal Reserve Board staff's MCM to evaluate the impact of fiscal policy on the trade adjustment process.

4.8 Asymmetries in the Impact of U.S. and Japanese Fiscal Policy on External Adjustment

The spillover effects described in the theoretical model above highlight the danger of a recession in Japan from the effects of the yen's appreciation. Japanese growth has already slowed dramatically, with real GNP increasing only 2% in 1986 on a fourth-quarter-over-fourth-quarter basis. As a result, domestic and international pressure has been mounting on Japan to relax fiscal policy. The Japanese government (the Ministry of Finance in particular) has been reluctant to abandon its policy of fiscal restraint adopted in 1979 to reverse the sharp rise in the debt-to-GNP ratio. The authorities have repeatedly expressed concern over the unfunded liabilities of the social security system in Japan in light of the rapid aging of the population. Nonetheless, temporary fiscal stimulus is currently being instituted through the so-called "Emergency Economic Measures" entailing about 6 trillion yen (about 1.8% of GNP) of supplementary government spending and tax measures for fiscal year 1987 (ending 31 March 1988).

There are at least three issues in the debate over the effectiveness of temporary fiscal stimulus in Japan: the ability of Japanese fiscal

policy to offset the deflationary impact on the domestic economy of the yen's rise, the potential for Japanese fiscal policy to offset the recessionary impact on the world economy of the withdrawal of stimulus implied by the (even partial implementation of the) Gramm-Rudman-Hollings Act in the United States, and the ability of Japanese fiscal actions to foster a reduction in Japan's trade surplus. The first two issues are the least controversial, while the third issue is disputed. For example, U.S. authorities have strongly urged Japanese fiscal stimulus as an antidote to trade imbalances, while some Japanese authorities including Masaru Yoshitomi (1987), using the OECD (Organization for Economic Cooperation and Development) Interlink model, have argued that Japanese fiscal policy can have little impact on Japan's trade imbalance.

These issues are evaluated below in the context of the Federal Reserve Board staff's MCM. Table 4.12 reports the results of simulations on the MCM of the impact of a permanent standardized fiscal shock equal to 1% of GNP for the United States and Japan (about 3 trillion yen for Japan and $40 billion for the United States). The complete set of simulation results is analyzed in Craig and Loopesko (1986) (which also reports similar results for Germany). The baseline for the simulations is derived from a recent OECD forecast. Exchange rates are flexible and monetary policy is assumed to be nonaccomodative in the sense that the path for the targeted monetary aggregate is unchanged.

Table 4.12 **Asymmetries in the Effects of U.S. and Japanese Fiscal Policy**

	Japanese Fiscal Expansion		U.S. Fiscal Contraction	
Impact on:	After 1 Year	After 5 Years	After 1 Year	After 5 Years
U.S. current account[a]	2.0	0.9	13.7	41.9
Japanese current account[a]	−3.1	−5.9	−2.0	−10.7
U.S.-Japan bilateral imbalance[b]	0.2	0.1	1.7	2.9
U.S. real GNP	0.1	0.0	−1.9	−0.5
Japanese real GNP	1.3	1.1	−0.7	−1.3
Foreign real GNP[c]	0.4	0.3	−0.4	−0.5

Source: Craig and Loopesko (1986)

Note: The U.S. fiscal contraction equals 1% of U.S. real GNP and the Japanese fiscal expansion equals 1% of Japanese real GNP. Both shocks are permanent.

[a]Absolute deviations from baseline.

[b]A positive entry indicates an improvement for the United States.

[c]Defined as a weighted average of the four other MCM countries (the MCM includes the United States, Japan, Germany, the United Kingdom, and Canada).

A Japanese fiscal expansion causes the Japanese current account to worsen as expected, but by a relatively small amount ($5.9 billion after 5 years). The U.S. current account improves by a smaller amount ($0.9 billion after 5 years). The U.S.-Japan bilateral trade balance improves by yet a smaller amount, indicating that other foreign economies benefit more. Thus Japanese fiscal stimulus does little to foster a reduction in the U.S. current account or in the U.S.-Japan bilateral trade imbalance.

It has a more powerful impact, however, on domestic and foreign (defined as the four other industrialized economies included in the MCM) growth. Japanese real GNP rises by more than 1% over the forecast horizon, and although the impact on U.S. GNP is negligible, that on foreign GNP is just under 0.5%.

A U.S. fiscal contraction has a much more powerful impact on external imbalances, causing a $41.9 billion improvement in the U.S. current account after five years and a $10.7 billion narrowing in the Japanese current account surplus over the same time period. The U.S. fiscal contraction initially has a strong deflationary impact on the domestic economy (U.S. real GNP falls by almost 2%), but that effect declines over the forecast horizon. The associated decline in the U.S. demand for imports translates into a sharp decline in real activity in Japan and other foreign economies as well.

These simulations suggest that an asymmetry exists between the effects of U.S. and Japanese fiscal policy on external imbalances. A U.S. fiscal contraction makes an important contribution to the reduction of U.S. and Japanese current account imbalances, while a Japanese fiscal expansion fosters less external adjustment. Similarly, while Japanese fiscal policy has little impact on the U.S. current account, U.S. fiscal policy exerts a powerful influence on Japan's current account.

The effects of fiscal policy on income are the primary source of the differences between the two policy experiments. There are three facets of the income transmission channel of fiscal impulses which contribute to the asymmetry. First, in the MCM the income elasticity of Japanese demand for imports from the United States (0.8) is less than half that of U.S. demand for imports from Japan (1.8). Second, Japan's exports are substantially greater than its imports, while the opposite is true for the United States. For both of these reasons, the policy experiment that has the greatest impact on U.S. income (i.e., a U.S. fiscal contraction) has the greatest impact on the U.S. and Japanese current accounts. Finally, the dollar value of the impact of the two shocks on the current account is influenced by the absolute size of the two shocks: the standardized shocks are each 1% of the country's real GNP, but the mean level of U.S. GNP is approximately twice that of Japan's over the baseline forecast horizon. Taken together, these three influ-

ences on the magnitude of the income effects of fiscal policy account for most of the observed asymmetry.

Even though Japanese fiscal policy does not provide a strong impetus towards external balance in the MCM simulations, it still has substantial effects both on domestic growth and on growth abroad. Although the MCM explicitly models only five major industrialized economies (the United States, Japan, Germany, the United Kingdom, and Canada), growth in the developing world is generally thought to be quite sensitive to growth in the industrialized economies. Thus the positive impact of Japanese fiscal stimulus on these industrialized economies implies that a Japanese fiscal expansion could provide an important impetus to growth in the developing world. Moreover, the evidence in table 4.7 showing that the income elasticity of Japanese demand for imports from the developing countries is the largest of the bilateral elasticities reported suggests the potential for Japanese fiscal stimulus to help growth prospects in the developing world. Thus Japanese fiscal stimulus could be particularly valuable as an offset to the deflationary impact of a U.S. fiscal contraction on the developing countries.

4.9 Concluding Remarks

Calculations of the appropriate yen-dollar exchange rate based on the sustainability of the implied path of the noninterest current account indicate that the substantial appreciation of the yen that has occurred to date is warranted, and that even further appreciation may be required. Some of the difficulties associated with the perception of an unsustainable yen-dollar rate may have been evident recently in the U.S. Treasury bill market, when foreign private purchases declined (particularly Japanese private purchases) and foreign official purchases rose. The latter may prove to be temporary, however, and a reduction in foreign official purchases could cause higher bond yields and a lower dollar. The recent rise of interest rates in the United States in conjunction with the lowering of interest rates in Japan may help prevent this in the near term at least.

In Japan, a major restructuring of production away from export-oriented growth is currently under way in response to the yen's rise. This paper has examined several aspects of this adjustment process, focusing particularly on factors affecting Japan's record external surplus. Evidence is provided that, at least in real terms, the Japanese trade surplus has started to decline, both on a multilateral basis and on a bilateral basis vis-à-vis the United States.

We find that an econometric model of Japanese trade that tracks moderately well through 1984 veers substantially off track in forecasting both exports and imports over the 1985–86 period. In particular, actual

adjustments in both export and import volumes are less than what is predicted by the model. Possible reasons for this slower-than-predicted adjustment in trade volumes were examined. Evidence that the pass-through of the effects of the yen's appreciation to export prices is slower than in the past provides one explanation. Also, we find econometric evidence supporting the notion that Japanese export prices in yen respond asymmetrically to yen appreciations and depreciations. This is consistent with the hypothesis that Japanese exporters have been squeezing their profit margins during the yen's recent appreciation in order to preserve market share. On the import side, the slow pass-through of the fall in import prices to consumer prices may be a factor.

A theoretical model of the adjustment process in Japan is used to examine the claim frequently made by policymakers both here and abroad that a very sharp rise in the yen can induce a recession in Japan that, in turn, can frustrate the process of trade adjustment. While this is shown to be a theoretical possibility, it is argued that this is unlikely for an economy with Japan's structure.

Finally, evidence from the Federal Reserve Board Staff's MCM suggests that a fiscal expansion in Japan will have little impact on the U.S. current account, but that it can have a greater impact on domestic demand in Japan and on growth and trade in the developing economies. This in itself may justify a Japanese fiscal expansion, particularly in light of the recessionary impact on the world economy of the U.S. fiscal contraction implied by the Gramm-Rudman-Hollings Act.

Appendix

A Test of Strategic Pricing by Japanese Exporters

The following equation was estimated over the period 1974:I–1986:I:

$$\log(PXY/PXY_{-1}) = a1 + a2 * \log(PXY_{-1}/PXY_{-2}) + a3 * \log(JWPI/JWPI_{-1}) + a4 * \log(PCOM/PCOM_{-1}) + a5 * \log(PXCOMP/PXCOMP_{-1}) + a6 * DUM * \log(RPXCOMP/RPXCOMP_{-1})$$

where PXY = yen Japanese export price index
JWPI = Japanese wholesale price index for manufactures
PCOM = yen commodity price index
PXCOMP = weighted-average competitors' export price index (expressed in yen)
RPXCOMP = PXY/PXCOMP
DUM = 1 when Japan's export prices rise relative to competitors' export prices and 0 otherwise.

The estimated coefficients are (t-ratios in parentheses):

$$a1 = -0.01\ (-2.14)$$
$$a2 = -0.16\ (-2.28)$$
$$a3 = 0.82\ (4.42)$$
$$a4 = 0.05\ (1.44)$$
$$a5 = 0.45\ (5.95)$$
$$a6 = -0.25\ (-2.51)$$
$$R_2 = 0.76\ \text{DW} = 1.89.$$

Note: The hypothesis of strategic pricing—that Japanese exporters respond asymmetrically to increases and decreases in competitors' export prices expressed in yen (relative to Japanese export prices)—is a simple t-test of the null hypothesis that the coefficient $a6 = 0$. This is because it is equivalent to estimating an equation with two dummy variables multiplying the competitors' relative price variable: one isolating increases in Japanese export prices relative to competitors' prices and one isolating decreases. If the coefficients on the two dummy variables are $b1$ and $b2$, then it can be shown that the coefficient $a6$ in the equation above is equivalent to $(b1 - b2)$. Thus the null hypothesis $a6 = 0$ is equivalent to the hypothesis $b1 = b2$ (i.e., that increases and decreases in Japanese export prices relative to competitors' prices have the same impact on yen export prices). The null hypothesis is rejected at the 2% confidence level.

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Comment Richard C. Marston

Loopesko and Johnson have provided us with a wide-ranging investigation of Japan's adjustment to the yen's appreciation. The paper raises a host of interesting issues about this adjustment process, including, for example, the extent of currency pass-through, the price sensitivity of Japanese trade, and the effects of fiscal policies on income and the trade account. I will divide my comments along the lines of three questions about Japanese adjustment: (1) has the yen appreciated enough (or has the dollar fallen enough)? (2) have Japanese prices changed enough to reflect the appreciation of the yen? and (3) is the Japanese trade balance likely to respond to the appreciation of the yen?

To make sense of the first question, I would like to distinguish three possible approaches to measuring the yen's equilibrium value.

Purchasing Power Parity

Many recent estimates of the yen-dollar equilibrium exchange rate, several of which have been cited by Loopesko and Johnson, rely on a purchasing power parity (PPP) calculation. As is well known, PPP estimates which are based on general price series like the consumer price index can be seriously misleading as measures of international competitiveness, because they reflect the prices of nontraded goods and services as well as traded goods. In the case of comparisons be-

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between the yen and other currencies, the distortion introduced by using broad-based indexes is particularly large. That is because productivity growth is so much greater in the traded sector of Japan than in its nontraded sector (over 70% greater during the 1973–83 period), so prices in the traded sector fall relative to those in the nontraded sector (by almost 60% over this same 11-year period). In Marston (1986), I show that bilateral PPP calculations between the yen and dollar based on the consumer price index mistakenly indicate that the yen had appreciated in real terms between 1973 and 1983, rather than depreciated. In contrast, estimates based on prices in the traded sector show a depreciation of from 25 to 35%, depending on the price series used.

Real Exchange Rates in Traded Sectors

More reliable as a measure of competitiveness are estimates of the yen's equilibrium value based on prices in the traded sectors of Japan and its trading partners. One common approach is to measure changes in the real exchange rate based on traded goods prices relative to some base year. A real exchange rate series can provide a measure of changes in competitiveness relative to this base year, although as Williamson (1983) has emphasized, investigators must be careful to adjust such series for real changes in the economy, such as the oil price shocks, which alter the competitiveness of a country's traded sector. In the study cited above, I used real exchange rate series based on traded goods prices adjusted for changes in the prices of imported inputs to measure how much the yen had depreciated relative to the dollar over the period from 1973 to 1983. Loopesko and Johnson cite Krugman's recent estimate of ¥140/$ for the equilibrium value for the yen-dollar rate based on a similar type of calculation.

Current Account Estimates

Measures of an equilibrium exchange rate based on trade competitiveness alone may be misleading if interest payments or other elements of the service account change dramatically. In the case of the U.S. service account, the accumulation of debt which will occur before the current account deficit is reversed is likely to lead to sizable interest payments which must either be financed or paid for by trade surpluses. How the United States services this debt will make considerable difference to the bilateral exchange rate between the yen and the dollar (as well as other key bilateral rates). At one extreme, the United States might be able to continue running current account deficits indefinitely as long as it stabilizes its debt-GNP ratio. This is the suggestion made by Paul Krugman in his paper for this volume. Whether this is feasible depends on whether foreign investors are willing to continue to maintain

U.S. dollar holdings at present levels (in relation to GNP), which are much higher than in the early 1980s. (In fact, investors would have to hold even higher levels than at present, since it will take several years to stabilize the debt-GNP ratio even under the most optimistic scenarios.) Loopesko and Johnson present evidence in table 4.4 which suggests that the Japanese private sector has already cut back drastically on its purchases of U.S. securities.

At the other extreme, it could be argued that the United States must stop generating new debt by achieving equilibrium in its current account.[1] The U.S. trade surplus would then have to be large enough to pay interest on its newly acquired debt. For the trade surplus to be that large, the dollar would have to fall substantially further than to date. Loopesko and Johnson cite Lawrence Krause's estimate of an exchange rate for the yen of ¥100/$, a number which two years ago would have been regarded by many economists as implausible.

The preceding discussion presumed that the adjustment process can proceed without a hitch. As long as the correct exchange rate is achieved, the trade account will adjust accordingly. But in the case of the yen, additional questions about the adjustment process have been raised. Loopesko and Johnson ask whether the appreciation of the yen has been "passed through" to final goods prices. Table 4.11 indicates that pass-throughs have varied widely, from 9.5% in chemicals to over 60% in machinery and transport equipment.

I would have liked to see the paper sketch out a theoretical model of pass-through in order to suggest what patterns are to be expected in different industries. For example, how does pass-through vary depending on the nature of competition in the industry? To what extent is actual price discrimination involved? Is a low degree of pass-through a temporary phenomenon, and will greater pass-through be observed once firms become convinced that the yen's appreciation is more than a temporary shock?

The paper presents very intriguing evidence indicating that pass-through behavior in Japan may be asymmetric. In the Appendix, Loopesko and Johnson report estimates of a pricing equation with significantly different pass-through coefficients for periods of yen appreciation than for periods of yen depreciation. They interpret these differences as reflecting strategic pricing behavior by Japanese export firms. According to the estimates, Japanese firms lower the prices of exports (in yen terms) when the yen appreciates more readily than they raise prices of exports when the yen depreciates. By lowering yen prices

1. Actually, there is an even more extreme case where the United States must pay back its debt, returning dollar holdings to their 1980 levels. This would require an even lower yen-dollar rate.

when the yen is appreciating, Japanese firms attempt to maintain shares in foreign markets. The equation that is estimated is based on aggregate price data. I would have liked to see the same equation estimated with disaggregated data to see if pass-through behavior varies systematically across industries depending on the degree of competition in each industry.

The final piece of the puzzle about Japanese adjustment concerns the trade balance itself. Why hasn't the bilateral balance between the United States and Japan, or the Japanese trade balance as a whole, responded more sharply to the yen's appreciation? Loopesko and Johnson paint a somewhat grim picture of the prospects for trade adjustment. They point out that with such a large trade imbalance, Japanese imports must increase much more than exports to reduce the surplus significantly. The price responsiveness of Japanese imports, moreover, is unlikely to be very high, since imports are so heavily weighted towards price-inelastic commodities.

The variety of evidence which they present concerning price elasticities is somewhat confusing. For bilateral trade between the United States and Japan, they show in table 4.6 that Bergsten and Cline (1987) have reported much higher price elasticities than Craig (1986). For multilateral trade, they show that Goldstein and Khan (1985) have reported price elasticities greater than one for Japan as well as the United States, whereas table 4.9 (based on work at the Federal Reserve) reports elasticities for Japanese imports much lower than one. Yet the estimates based on disaggregated data reported in table 4.9 do follow a discernible pattern. The price elasticity of Japanese imports of manufactured goods is almost one, while those of fuel and raw materials are much lower. Given the low percentage of manufactured goods in Japanese imports, these elasticities suggest only limited scope for improving the trade imbalance through the expansion of Japanese imports.

My own view is that trade adjustment will occur mostly on the export side and not primarily through a reduction of exports to the United States (unless there is a recession here). Instead, the main benefits of the yen's appreciation and the dollar's depreciation will be found in third markets, where until recently U.S. firms were effectively priced out of the market by the dollar's misalignment. With the sizable changes in relative prices which have already occurred, U.S. firms should begin to make inroads in third markets and Japanese firms will have to surrender some market share to firms from the United States as well as from the newly industrializing countries of Asia.

In figures 4.7–9, the authors present some interesting simulations of the Board's disaggregated trade equations over the recent period. Not only do actual exports exceed predicted exports, but actual imports also fall short of predicted imports. This suggests that recent trade

adjustment has been less extensive than even historical experience would suggest. The limited pass-through of the yen's appreciation to export and import prices may explain part of this pattern, but the failure of the Japanese and U.S. trade accounts to adjust more rapidly remains in part a mystery.

Although various questions remain unresolved, Loopesko and Johnson succeed admirably in clarifying many of the issues involving Japanese trade adjustment. I have not discussed other interesting sections of the paper, which are recommended to the reader. These include an analysis of trade adjustment in a model with only imported inputs to demonstrate the role of such imports in the adjustment process and simulations of the Federal Reserve Board's MCM model to investigate the effects of fiscal policy changes in Japan and the United States.

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