Volume Title: The American Business Cycle: Continuity and Change

Volume Author/Editor: Robert J. Gordon, ed.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-30452-3

Volume URL: http://www.nber.org/books/gord86-1

Publication Date: 1986

Chapter Title: The Open Economy: Implications for Monetary and Fiscal Policy

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Chapter URL: http://www.nber.org/chapters/c10029

Chapter pages in book: (p. 459 - 516)

8 The Open Economy: Implications for Monetary and Fiscal Policy

Rudiger Dornbusch and Stanley Fischer

The exchange rate has by the mid-1980s become as central in United States economic policy discussions as it has long been in the rest of the world. Economists argue that the rapid dollar appreciation in the current disinflation has contributed powerfully to the speed of the disinflation. The 1984 *Economic Report of the President* fears that the "overvalued" dollar creates an unbalanced recovery by curtailing export growth and fears also that large current account deficits will lead to a depreciation of the exchange rate that will contribute to a resurgence of inflation.

As the Bretton Woods system came under increasing pressure in the 1960s, economic policymaking became more constrained by balance of payments and exchange rate considerations. Supporters of a shift to flexible exchange rates—and by the end this included most economists—believed that a shift to floating rates would enable countries to insulate themselves from foreign disturbances. That did not happen. One reason is that the dominance of supply shocks in the 1970s was certainly not foreseen: real shocks will be transmitted between countries under both fixed and flexible rates. A second reason is that with different speeds of adjustment of assets and goods markets, shifts in monetary policy produce *real* rather than merely nominal exchange rate changes.

We start by describing trends and cycles in United States international linkages, in goods, factor, and asset markets. We then develop

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We thank Stanley Black, Allan Meltzer, and Anna Schwartz for comments, David Wilcox for research assistance, and the National Science Foundation for financial support.

the analysis of the operation of fiscal and monetary policy in the current flexible rate environment.

8.1 The External Linkages: Trends and Cycles

The United States economy is linked to the rest of the world through goods, factor, and assets markets. The linkages are reflected in the flows of goods and services in international trade; in the relationships between goods and factor prices at home and abroad; and in the asset pricing and capital flow relationships between domestic and foreign assets markets. This section documents trends and cycles in these linkages.

We start with summary measures of the degree of coordination of business cycles in different periods. Morgenstern (1959) calculated the percentage of months when business cycles in the United States, France, Germany, and the United Kingdom were in the same phase in the periods 1879–1914 and 1919–32. In the pre–World War I period business cycles in the four countries were in the same phase 54% of the time; in the interwar period the phases coincided only 36% of the time. Working with the same four countries, over the period 1953 to 1980 we find business cycle phases coinciding 35% of the time.[1] There is no substantial difference in the measure of coincidence between the fixed and flexible exchange rate periods after World War II.[2] Thus business cycles seem to have been more coordinated internationally during the vintage gold standard period than subsequently. But the data are too crude and the differences too small to provide strong support for the view that the truly fixed exchange rates provided by the gold standard linked countries together more closely than the less reliable exchange rate arrangements of subsequent periods.

8.1.1 Trade in Goods and Services

Table 8.1 presents summary data on trade in goods and services for over a century. Data are expressed as a percentage of GNP. The table shows exports and imports of goods and net exports of services: net exports of goods plus net services exports constitute net exports in the national income accounts, shown as the fourth column in table 8.1. The current account is not shown in the table. The main difference between net exports (NIPA) and the current account is the inclusion

1. Calculations are based on growth cycle chronologies reported in Klein and Moore 1983.

2. However, including the years 1981–83 might tilt the balance to the conclusion that business cycles have been more coordinated in the flexible rate period than in the fixed rate period.

Table 8.1 **United States Trade and Tariffs, 1869–1983**

Period	*IMG/GNP*	*EXG/GNP*	*NSER/GNP*	*NX/GNP*	*TAR/IMG*
1869–76	7.7	6.6	−0.8	−2.0	35.1
1877–86	5.9	7.4	−0.9	0.7	29.8
1887–96	6.0	6.5	−1.3	−0.8	25.5
1897–1906	4.4	6.8	−0.8	1.7	26.3
1907–14	4.5	5.9	−0.8	0.7	19.7
1915–19	4.7	9.6	0.2	5.1	8.1
1920–29	4.4	5.6	0.4	1.6	13.0
1930–39	2.9	3.5	0.2	0.8	17.0
1940–49	2.3	3.8	0.0	1.5	9.7
1950–69	3.1	3.8	0.3	1.0	6.6
1970–73	4.6	4.5	0.7	0.5	5.9
1974–77	7.1	6.7	1.3	0.8	3.8
1978–83	8.4	7.2	1.7	0.4	3.5

Note: Data are expressed as a percentage of GNP for imports of goods (*IMG*), exports of goods (*EXG*), net exports of services (*NSER*), and net exports (*NX*). The last column shows tariff proceeds as a percentage of total imports of goods.

Sources: For the years to 1929, *Historical Statistics of the United States*, part 2, series U201, U202, U211, U1, U2, U8, U9.

in the latter of unilateral transfers and of government interest payments to the rest of the world.

The most striking point is the extent to which the United States economy has, from the viewpoint of trade in goods and services, been closed. Even back into the nineteenth century, neither exports nor imports exceeded 10% of GNP for any substantial period. Merchandise exports peaked as a percentage of GNP during World War I, falling in the 1920s to lower levels than ever before, and then in the 1930s and well into the 1960s remaining even below 4% of GNP. The merchandise trade balance was in surplus for a long time, but in the past decade it has moved into a large and growing deficit. Despite the doubling in the shares of both imports and exports in GNP since the 1950s, the United States remains the most closed of all industrialized countries.

The average rate of tariffs has fallen substantially over the past century. But the decline was not monotonic: tariff acts punctuated the generally declining trend, notably in this century the Fordney-McCumber tariff of 1922 and the Smoot-Hawley tariff of 1930.[3] The effect of the Smoot-Hawley tariff on the domestic economy will be discussed below.

3. Column 5 of table 8.1 gives the ratio of tariff revenues to imports of goods, dutiable and nondutiable. Such measures are imperfect indicators of the level of tariffs, as exemplified by the fact that a prohibitive tariff would have no weight in an index of this type.

The cyclical behavior of imports and exports (goods and services) is summarized in table 8.2, which presents correlations among the growth rate of real GNP, the growth rates of (real) exports and imports, and the change in the share of net exports in GNP over different periods. The consistent result is that imports are, as would be expected from the effects of aggregate demand on imports, procyclical. The cyclical behavior of exports varies over the different periods shown in table 8.2. There is no expectation of a consistent cyclical pattern in the case of exports: the correlation depends on the coordination of domestic and foreign business cycles and on whether a particular expansion is domestically led or export led. Net exports tend to move in an anticyclical direction, driven by the positive relationship between imports and the cycle. However, in periods in which export growth is positively correlated with GNP growth, as for 1954–83, net exports can on balance move procyclically.

The correlation results of table 8.2 agree with the findings of Mintz, who examined the cyclical behavior of exports, imports, and the trade balance over periods extending back to 1879. Mintz shows imports peaking at business cycles peaks and at their lowest at the trough.[4] Exports, by contrast, she shows not to have a consistent cyclical pattern, being strongly procyclical in the interwar period but peaking well after the business cycle peak in the pre–World War I era. The trade balance was on average countercyclical.

Figure 8.1 shows the trade balance and the current account as a percentage of GNP over the period since 1946. The eye may see a generally deteriorating current account in figure 8.1, but more careful examination suggests that the enormous surpluses of the World War II era had been worked off by the end of the Korean War and that the current account then fluctuated around a basic surplus of about 1% of GNP until a marked deterioration took place at the end of the period. The absence of any strong cyclical behavior of net exports in table 8.2

Table 8.2 **Cyclical Behavior of Imports and Exports**

	1930–83		1946–73		1954–83	
	GNP72GR	*M72GR*	*GNP72GR*	*M72GR*	*GNP72GR*	*M72GR*
M72GR	.586		.611		.492	
EX72GR	.063	−.093	−.215	−.696	.359	.164
DNXSH	−.162		−.276		.052	

Note: Data are correlation coefficients. Variables are year-to-year growth rates of real GNP (*GNP72GR*), real imports (*M72GR*), and exports (*EX72GR*) and the change in the share of net exports in GNP (*DNXSH*).

4. See Mintz 1959 and 1967. Mintz 1959 presents the cyclical pattern of imports.

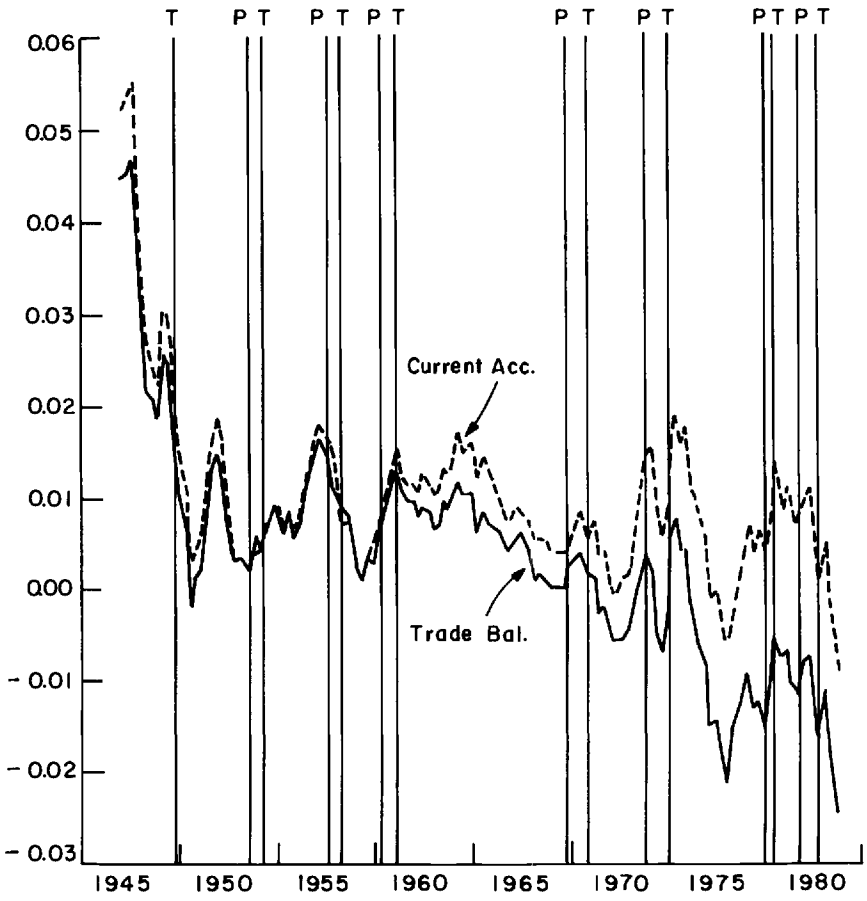

Fig. 8.1 The trade balance and the current account (relative to GNP).

is reflected in the differing behavior of the trade balance (and the current account) from cycle to cycle. The trade balance improved during the recessions in 1954, 1960, 1970, and 1980 and worsened during the recessions of 1957, 1973–75, and 1982.

Although the United States is, by the criterion of the shares of exports and imports in GNP, the most closed of the Western economies, it is not closed at the margin. Tariffs have declined to very low levels and leave only a few areas in which domestic industries are sheltered from foreign competition, except where quotas or their equivalent in the form of voluntary export restraints (automobiles, steel, textiles, etc.) have been imposed. Estimates of the income elasticity of aggregate imports are typically in the range of 1.5 to 2. Export shares in GNP have also fluctuated substantially.

Table 8.3 presents a measure of the variability of components of GNP over the period 1954 to 1983. The underlying data are year-to-year changes in the ratio of each category of spending to GNP, expressed in percent.[5] The data in table 8.3 are the variances of those changes. Exports and imports each vary less than the other components of GNP in absolute terms, but despite the low average ratios of imports and exports to GNP, their year-to-year variability is of the same order of magnitude as that of the remaining expenditure categories.

Shifts in the competitiveness of the United States relative to its trading partners are among the major determinants of merchandise trade. Competitiveness is shown in figure 8.2 by an index of the United States value-added deflator in manufacturing compared to the exchange-rate-adjusted, trade-weighted deflators of partner countries in international trade.[6] Note in figure 8.2 the large adjustment in the measure of competitiveness in the period 1971–73, in the transition to flexible exchange rates. The magnitude of the adjustment and its persistence demonstrate that the Bretton Woods system had led to a cumulative overvaluation of the dollar. Even after the rapid appreciation of the dollar in the early 1980s the real exchange rate is still well above its 1970 level.

Tables 8.4 and 8.5 show long-term shifts in the composition and direction of United States merchandise trade. The long-term shifts are, on the side of exports, entirely as expected. The United States shifted from exporting primarily food and raw materials in the past century to manufactures in the twentieth century. Even so, there is some tendency for the share of manufactures to fall in the post–World War II period. On the import side, raw materials are as significant a share of imports now as they were in the world wars; food imports are currently ex-

Table 8.3 **Variability of Components of GNP**

DCSH	*DISH*	*DINVSH*	*DGSH*	*DEXSH*	*DIMSH*
.589	.640	.642	.750	.540	.319

Note: Data are variances of the change in the shares (expressed as a percentage) of GNP of consumption (*DCSH*), fixed investment (*DISH*), inventory investment (*DINVSH*), government spending (*DGSH*), exports (*DEXSH*), and imports (*DIMSH*) for annual data, 1954–83.

5. We work with changes to remove possible trends in the shares of the different categories of spending in GNP.

6. The index is of manufacturing prices because the assumption is that agricultural goods prices, subsidies and tariffs aside, are equal across countries. See *International Financial Statistics* for other indexes and a discussion of the series. Exchange rates and measures of competitiveness frequently leave the reader not knowing which way is up. In this paper we adopt the convention that a depreciation of the dollar appears as an increase in the exchange rate and an increase in competitiveness.

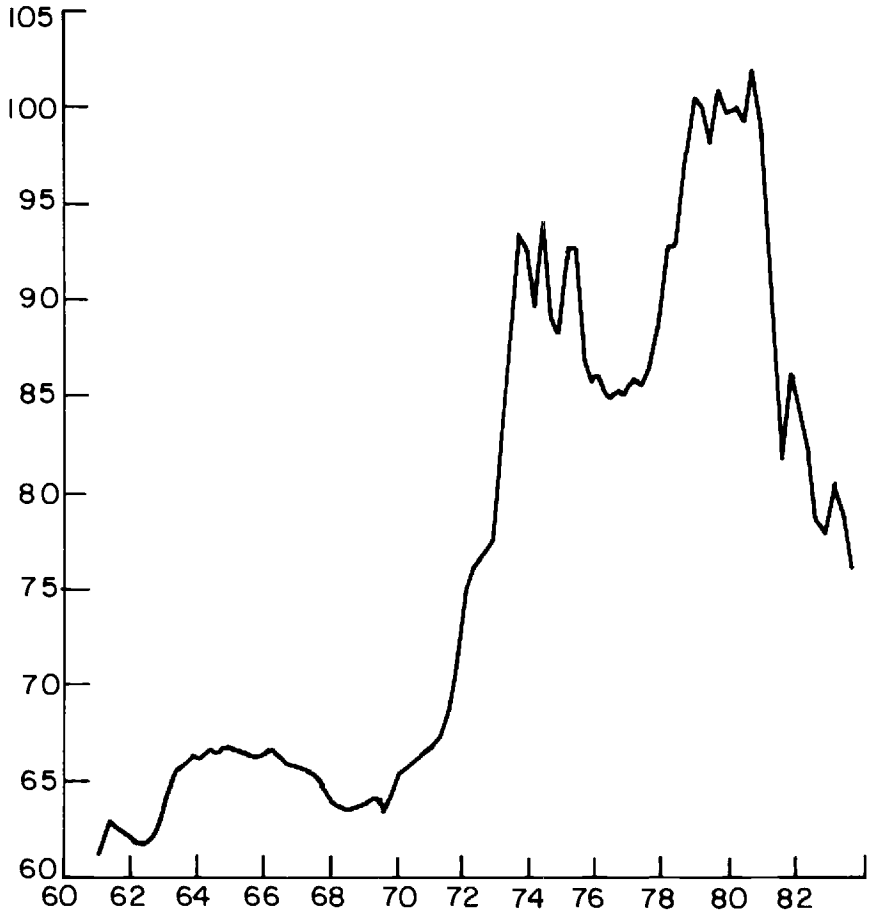

Fig. 8.2 The real exchange rate (index, 1980 = 100).

tremely low. The reorientation in the direction of trade is also simple: away from Europe, especially the United Kingdom, and toward Asia.

We conclude the review of trade patterns with a comment on the importance of the United States in world trade. The share of the United States in world trade has steadily declined over the post–World War II period. In 1951–53 the United States share of world exports was 21%, in the early 1960s and 1970s respectively 17.2% and 13.5%. By 1981–82 the United States share of world exports had declined to 12.5%, despite the increase in the share of exports in United States GNP. Germany and Japan are becoming near equals of the United States in world trade as their share of exports approaches 10% in the early 1980s.

Table 8.4 **The Composition of United States Trade**

	Exports			Imports		
Years	Raw Materials	Food	Manu-factures	Raw Materials	Food	Manu-factures
1869–76	47	33	20	15	35	49
1877–86	33	47	20	20	36	44
1887–1906	32	40	28	28	31	41
1907–14	33	23	44	35	24	42
1915–19	17	29	54	41	27	32
1920–29	26	21	53	37	25	39
1930–39	28	12	62	30	28	41
1940–49	10	15	75	33	27	39
1950–69	13	15	72	21	23	58
1970–73	14	14	72	16	14	70
1974–77	16	15	69	35	10	55
1978–82	16	15	69	35	8	57

Source: Historical Statistics of the United States, part 2, series U-214 through U-224, and *Economic Report of the President*, 1983.

Digression: The Smoot-Hawley Tariff and the Great Depression

The tariff changes shown in table 8.1 have been receiving increasing attention as a macroeconomic phenomenon. In particular, the Smoot-Hawley tariff of 1930 is argued to have played an important role in the Great Depression. This view is certainly not found in the classic Friedman/Schwartz account of the depression:[7] the Hawley-Smoot Tariff Act does not appear in the index; when it does appear, in a footnote on page 342, it is only as a contributor to the gold inflow of late 1930; and it is not featured in the discussion (359–63) of the international character of the depression. Kindleberger gives the tariff act a substantial role, but on symbolic grounds: its signing represented United States abdication of its responsibility to take charge of the world economy.[8]

The modern interest in the Smoot-Hawley tariff traces mainly to Meltzer's brief analysis.[9] The argument "assigns a large role to the

7. Friedman and Schwartz 1963. Schwartz 1981 discusses the Smoot-Hawley tariff at greater length. Although she regrets the tariff, she does not give it any greater role in the propagation of the depression than do Friedman and Schwartz.

8. See Kindleberger 1973. See, too, League of Nations 1942. In the *World Economic Survey*, the impact of the Smoot-Hawley tariff is described in terms of its effects on protection: "From the middle of 1929, the steady deepening of depression, particularly in the raw material producing countries, greatly reinforced the pressure for higher tariffs. . . . The whole movement was undoubtedly accentuated both by the alarm and resentment felt in many countries as the discussions of the new Hawley-Smoot tariff dragged on in the United States Congress from May 1929 to June 1930, and by the real effects of that tariff when it went into operation." There is no suggestion that the tariff is *the* or even a chief cause of the depression.

9. See Meltzer 1976, especially 459–61. Meltzer refers also to Haberler 1976.

Table 8.5 **The Direction of United States Trade, 1869–1982 (%)**

	Imports					Exports				
Years	Canada	Other America	United Kingdom	Other Europe	Rest of World	Canada	Other America	United Kingdom	Other Europe	Rest of World
1869–76	6	28	35	20	11	6	12	53	27	3
1877–86	6	28	26	27	13	5	9	53	29	4
1887–1906	5	27	20	32	16	7	10	45	32	7
1907–14	5	25	16	34	18	13	14	28	37	9
1915–19	12	36	10	12	30	12	11	32	34	10
1920–29	11	27	9	20	32	15	18	20	31	17
1930–39	14	25	7	22	33	15	17	18	28	23
1940–49	23	37	4	8	28	15	18	21	25	21
1950–69	23	27	6	20	25	20	20	6	28	26
1970–73	27	14	5	23	31	23	15	5	28	30
1974–77	22	16	4	18	41	21	15	5	26	33
1978–82	18	15	4	17	46	17	17	5	26	35

Source: Historical Statistics of the United States, part 2, pp. 903–6, and *Survey of Current Business,* various issues.

Hawley-Smoot tariff and subsequent tariff retaliation in explaining why the 1929 recession did not follow the path of previous monetary contractions but became the Great Depression" (460). The detailed explanation gives considerable weight to the reductions in imports of semifinished goods and exports of agricultural goods following the tariff, suggesting that the fact that bank failures in 1930 and 1931 were concentrated in agricultural regions was in part a consequence of the tariff. But it is important to note that Meltzer is mainly discussing the onset and rapid worsening of the recession rather than the responsibility of macroeconomic policy for the depression's becoming great. There is no implication that intelligent macroeconomic, and particularly monetary, policy could not have prevented the disasters of 1932–33.

In table 8.6 we present summary data on trade and GNP in the periods 1918–23 and 1928–33. Each of these periods saw a major recession and a major increase in tariffs. Indeed, the 1922 Fordney-McCumber tariff increased tariff rates (calculated as the ratio of duties to either total imports or dutiable imports) as much as the Smoot-Hawley tariff.[10] In light of the increases in tariffs shown in table 8.5, it is difficult to accept Haberler's "skyscraper" description of Smoot-Hawley (1976, 8, 33). Fordney-McCumber would on the same scale qualify as a "rocket" tariff. Further, as a matter of arithmetic, part of the blame for the increase in tariffs between 1929 and 1933 goes to the drop in price levels, since many tariffs were specific—that is, specified in dollar terms—rather than ad valorem.[11]

Fordney-McCumber was imposed in 1921–22 and was followed by an *increase* in imports and a decrease in exports. The economic expansion was responsible for the import increase; the decrease in exports was a deflationary impulse, outweighed by the start of the expansion of the 1920s. A recession did begin in May 1923, but it was brief; 1924 real GNP was unchanged from that of 1923, and imports fell very little. Smoot-Hawley was also followed by a reduction in exports, but this time there was a reduction in imports. These were primarily the result of the recession. The decline in agricultural exports following Smoot-Hawley was large, but so was the decline following Fordney-McCumber.

From either a Keynesian or a monetarist perspective, the tariff by itself would have been an expansionary impulse in the absence of re-

10. Tariffs rose in 1921 as a result of "emergency" measures to aid agriculture and, because tariffs were partly specific, as a result of the fall in prices.

11. Taussig 1964 presents the results of a Tariff Commission calculation of what tariff revenues would have been in 1922 and 1930 for imports at the level of 1928. This index thus holds constant the composition of imports *and their prices:* tariffs increase for all categories, but the increases are small. The largest increase is from 19.9% to 33.6% for agricultural products and provisions. Other examples are chemicals, oils, and paints from 29.22% to 31.4%, metals and manufactures from 33.7% to 35.0%, and manufactures of cotton from 40.3% to 46.4%.

Table 8.6 **Tariffs and the Macroeconomy, 1918–23 and 1928–33**

Years	Real GNP (1918 = 100) (F3)	Ratio of Duties to Total Imports (%) (U211)	Ratio of Duties to Dutiable Imports (%) (U212)	Quantity of Imports (index) (U237)	Export Index (U225)	Exports of Crude Food (quantity index) (U229)
1918/1928	100/126	5.8/13.3	23.7/38.8	71/115	98/128	148/98
1919/1929	97/134	6.2/13.5	21.3/40.1	81/131	120/132	174/94
1920/1930	92/121	6.4/14.8	16.4/44.7	88/111	116/109	213/69
1921/1931	84/112	11.4/17.8	29.5/53.2	74/98	97/89	269/71
1922/1932	98/95	14.7/19.6	38.1/59.1	95/79	90/69	218/59
1923/1933	109/93	15.2/19.8	36.2/53.6	99/86	91/69	122/32

Source: Historical Statistics of the United States, 1970: series numbers indicated in column headings.

taliation. In the Keynesian view, the reduction in imports diverts demand to domestic goods; in the monetarist view the gold inflow increases the domestic money stock if not sterilized. In the event, the balance of goods and services fell after the imposition of the tariff. The behavior of net exports suggests the emphasis on recession abroad and retaliation, rather than the direct effect of the tariff, as a force contributing to recession. Exports were 7% of GNP in 1929. Between 1929 and 1931, they fell by 1.5% of 1929 GNP. Attributing the entire fall to the tariff retaliation and assuming a multiplier of two, real GNP would have fallen 3% on this account. The fall in real GNP between 1929 and 1931 was over 15%, thus indicating that the tariff could not have played the major role in creating the recession by affecting the demand for goods. Further, the 3% of GNP calculation is surely a high estimate of the effects of the tariff on exports.

In addition to the tariff United States net exports were, of course, affected by the extensive competitive depreciation on the part of foreign countries. This consideration further reduces the significance to be attached to the tariff as a cause precipitating the Great Depression.

On the monetary side, gold inflows increased at the end of 1930, but 1931 saw a reduction back to close to the 1929 proportion to NNP.[12] These inflows were an inflationary force. To the extent that the tariffs, via foreign retaliation, worked by creating distress in agricultural areas and thereby setting off early bank collapses, they had an adverse monetary effect. But this only emphasizes the perversity of the Fed's bank-closing policy. Further, it is not clear that a United States tariff on agricultural imports that sheltered domestic producers from the col-

12. Data in Friedman and Schwartz 1963.

lapse of world commodity prices would adversely affect those producers. Rather, it was likely to have raised their incomes (given inelastic supply) above the free trade level.

We can summarize our argument briefly: Fordney-McCumber increased tariffs substantially when the United States economy was in a deep recession that was followed by a rapid recovery. Smoot-Hawley increased tariffs at the start of a deep recession that was followed by the Great Depression. Neither should receive prime credit or blame for what followed: macroeconomic policies are far more significant.[13]

8.1.2 Goods and Factor Price Links

The strict purchasing power parity (PPP) theory of the exchange rate holds that exchange rates move proportionately with national price levels.[14] PPP thus implies a one-for-one link between domestic and foreign prices. Figure 8.3 and much other evidence show that PPP does not hold in any relevant sense. Relative national price levels, adjusted through exchange rates, can and do move for lengthy periods.[15]

Despite the absence of any strong relationship between national price levels, exchange rate and foreign price level changes do affect domestic prices. Changes in the dollar prices of imports directly affect goods and raw material input prices in the United States and thus affect the prices of final goods. The pressure of international competition on the prices of traded goods also affects domestic prices and the wage settlements reached in the affected industries. Links of these types, to be reviewed in the next section, change the dynamics of inflation between fixed and flexible exchange rate systems.

8.1.3 Asset Market Linkages and Capital Flows

The international integration of assets markets is in the 1980s an accepted fact. Interest rates are linked internationally (adjusted for anticipated depreciation), and capital flows are highly, perhaps excessively, responsive to anticipated return differentials.

Asset market integration was of course a well-known feature of the pre–World War I and interwar world economies. The thrust of careful empirical work is, however, to suggest that the linkages were less tight than simple accounts of the gold standard imply. Morgenstern calcu-

13. It should be unnecessary to add that we are not advocating raising tariffs as a way either into or out of recessions. Exchange rate changes that can be made to stick achieve most of the same purposes.

14. For a careful review and analysis of the alternative versions of PPP, see Katseli-Papaefstratiou 1979.

15. For discussion of the failure of PPP, see Kravis and Lipsey 1983 and Frenkel 1981. This is one of the key points at which the monetary theories of the exchange rate of the early 1970s, which linked the domestic price level to the domestic money stock and then set the exchange rate as the ratio of price levels, broke down.

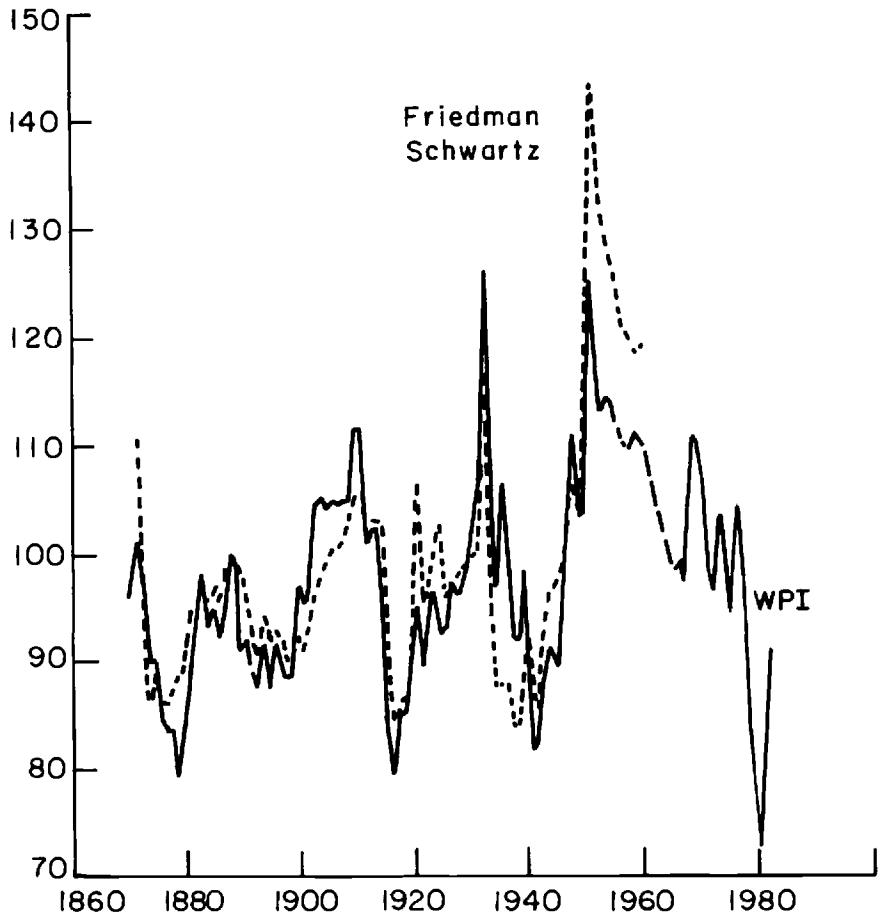

Fig. 8.3 International purchasing power comparisons: United States/United Kingdom. *Source:* Friedman and Schwartz 1963, 769–71 (wholesale prices).

lated correlation coefficients among short-term interest rates in London, New York, Paris, and Berlin. For the period 1876–1914 the correlation between the New York commercial paper rate and the London private discount rate is only .45; for the period 1925–38 the correlation is .93.[16] The correlation between monthly United Kingdom and United States treasury bill rates for the *flexible* rate period, January 1974 to

16. Morgenstern 1959, 105. The data and sources are described on pages 119–23. The meaning of these correlations is obscured by the fact that there are consistent and noncoincident seasonals in the rates in different countries.

November 1983, is .583,[17] above the correlation for short-term rates for the earlier gold standard period calculated by Morgenstern. During the adjustable peg period, January 1964 to July 1971, the correlation between monthly British and United States treasury bill rates was .794, below the correlation for the interwar period calculated by Morgenstern. Although the Morgenstern data give the impression that short-term interest rates had considerable latitude to move independently in the pre–World War I period, the economic significance of the low correlation depends on the absolute variability of the rates as well as their correlation.

Interest rate differentials during the gold standard period were substantial. Morgenstern (1959, 335) calculates that the degree of flexibility of the exchange rate implied by the gold points allowed an interest differential on ninety-day bills of 3.73% between London and New York.[18] In the period 1876–1914 the commercial paper rate in New York was on average 2.17% higher than the private discount rate in London. Risk and transaction costs of course permit differences in mean rates of return on apparently similar short-term assets.[19] But there was also considerable variability in the interest rate differential: the standard deviation of the difference between the London and New York rates was 1.21%. The differential exceeded 4% in more than 7% of the months in the pre–World War I period, and in July 1893, during a United States banking panic in which convertibility was suspended, it was 9.63%. In the flexible exchange rate period, 1974 to 1983, the standard deviation of the difference between treasury bill rates in the United States and United Kingdom, 2.66%, was substantially larger than in the early gold standard period.

The asset market linkages were closer in the interwar period and in the fixed exchange rate period 1964–71. In the period 1925–38 the mean London–New York differential was only 0.24% with a standard deviation of 0.71%. The mean differential in the period 1964–71 was 1.33%, with the standard deviation of the difference, 0.72%, almost identical to that for the interwar period.

There appear to be no reliable data on the size of short-term capital flows during the gold standard periods, but the presumption is that they were both large and an essential part of the mechanism that tied capital markets together. The extent to which disturbances to United States financial markets originated abroad rather than domestically has not

17. Calculations use *International Financial Statistics* data.

18. The gold points are given as $4.845 to $4.890, a range of 0.92%. Incidentally, one of Morgenstern's findings is that the gold points were on many occasions violated by actual exchange rates.

19. In this connection it would be useful to calculate differentials between similar assets in the same national market, as a benchmark for the international comparisons.

to our knowledge been documented, although there are discussions of the national origins of international financial crises.[20] Morgenstern (1959, 548–49) shows the United States as more frequently the originator than the recipient of (stock market) panics. Of the eleven first- and second-order United States panics recorded for the period 1873–1932, the United States transmits panic abroad in nine episodes and is the recipient of foreign shocks in only two (1890 and 1907). On other occasions, including 1914, foreign disturbances are transmitted to the United States without causing a panic.

There are estimates of aggregate capital flows, long- plus short-term, that are consistent with the net export data presented in table 8.1 above.[21] These show the United States as primarily an importer of capital (averaging 0.8% of NNP) over the period until 1896; an exporter of capital (average equal to 1.1% of NNP) over the next nine years; once more an importer on a small scale until 1914; exporting capital on a large scale during World War I (average of 4.8% per year of NNP for the years 1914–19) and continuing to do so until 1933; reverting to the role of importer until 1941; and thereafter exporting capital until the most recent period.

8.1.4 Adjustment under the Gold Standard

We now briefly pull together the strands in this discussion of the mechanisms linking the United States and foreign economies under the gold standard, as background for our analysis in the next section of the operation of the current flexible exchange rate system.

The earliest analysis of the operation of the gold standard, the Hume price-specie flow mechanism, focused on the goods markets and on movements in relative national price levels. These mechanisms should be expected to produce slow adjustment to disturbances. Consider, for example, the response of the economy to an upward shift in the domestic demand for money. Under the price-specie flow mechanism, the reduced demand for goods tends to reduce domestic prices and the demand for imports. The current account goes into surplus, and gold flows increase to satisfy the increase in money demand. The mechanism can operate successfully through real balance effects on the demand for imports even if PPP holds exactly. In the event the disturbance to money demand is temporary, the process will have to be reversed when the disturbance disappears.

Subsequent analysis described a system with more rapid adjustment in which asset market linkages allowed capital flows in response to in-

20. Kindleberger 1978 and Morgenstern 1959, 541–55. Friedman and Schwartz 1963 typically regard American banking panics as of domestic origin. An exception is the 1890 crisis, in which the Baring failure receives mention (p. 104).

21. For the period 1869–1960, see Friedman and Schwartz 1963, 769–71.

cipient interest rate movements, perhaps caused by active central bank (or in the case of the United States, Treasury) intervention, to help equilibrate the system.[22] We continue with the example of an upward shift in the demand for money. The impact of such a shift, which might be associated with a financial panic, is to increase domestic interest rates. There is a capital inflow that equilibrates interest rates at home and abroad and helps meet the increased demand for money. If the demand shift is temporary, there need be no major disruptions to the goods markets. Thus in this case the capital markets promote more rapid adjustment to a domestic disturbance. If the demand shift is permanent, goods market adjustments are needed to pay the interest on the capital inflow.

This example is chosen as a case in which capital flows ease domestic adjustment. But of course from the viewpoint of the foreign country the asset market linkages permit transmission of a disturbance that would otherwise have been much slower in appearing. Further, as we know from the downfall of the Bretton Woods system, international capital flows in fixed exchange rate systems are not always regarded as an unmitigated blessing. There are thus two questions: How did the gold standard system survive during the period 1879–1914 when capital flows were not restricted? And did capital flows on average ease the system's adjustment to disturbances?

Bloomfield argues that because there was no serious belief, even during the silver agitation in the United States, that exchange rates would change, capital flows under the pre–World War I gold standard, though substantial and sensitive to interest rate movements, were not destabilizing. He argues also that over the period, the discount rate actions needed for external balance typically coincided with those needed for internal stabilization, so that capital flows were on balance stabilizing. The latter argument is vitiated by the well-known fact that even during the heyday of the gold standard central banks did not conform to the rules of the game and frequently sterilized gold flows.[23]

The issues of the stabilizing or destabilizing roles and relative importance of the goods market, price-specie flow, and asset market linkages, and of intervention, under the gold standard have not been settled,

22. Sayers 1958 describes the use of bank rate in maintaining the international financial system and includes references to earlier literature, including Clapham, Hawtrey, and Viner. See also Bloomfield 1959, 41–46. Keynes 1930, chaps. 35–38, describes the operation of the international gold standard and the role of central banks. Nurkse 1978 [1944], 98–105, also describes the adjustment mechanism.

23. Bloomfield 1959, 69, for the interwar period. It was suggested during discussion that the behavior of central banks was different in the heyday of the gold standard. Bloomfield 1959, 48–51, compares central bank behavior before 1914 with the post–World War I behavior studied by Nurkse. His conclusion on the propensity to sterilize is noteworthy (50): "By an amazing coincidence, these overall percentages [frequency of offsetting] are virtually identical to those reached in the League study for the interwar period. . . . One might even conclude, on the basis of this formula, that central banks in general played the rules of the game just as badly before 1914 as they did thereafter!"

despite the extensive literature. Friedman and Schwartz emphasize the importance of relative national price level adjustments in response to money flows.[24] Nurkse (1978) argues that adjustment was typically more rapid than the price-specie flow mechanism implies and credits multiplier effects of the trade balance for part of the speedup. The capital account tended to move procyclically, apparently offsetting the stabilizing effects on the system of the money stock movements implied by the anticyclical current account. Such capital flows might appear to have been destabilizing from the viewpoint of the cycle, but that would not be the case if they were accommodating temporary disturbances.[25] And the issue of whether central bank sterilization had and can have any real effects, and if so whether the effects are stabilizing, is still alive.

8.2 Open Economy Macroeconomic Linkages

In this section we study the ties between United States macroeconomic variables and the world economy and discuss how the openness of the economy affects stabilization policy. The analysis relies on the theoretical model sketched in the appendix to this chapter, which embodies the main channels and effects that are given emphasis in open economy macroeconomics.[26] As in the previous section, we start with goods market linkages between the United States and other economies.

8.2.1 Goods Markets

The channels of transmission in the goods market are described by equations (1) and (2) below. (For notation, and other arguments of the demand function, see the appendix; time subscripts are omitted when there is no risk of confusion.)

$$(1) \quad Y = D(eP^*/P, Yd, q, V, \ldots) + NX(eP^*/P, Yd, Y^*d, V, V^*, \ldots).$$

Equation (1), the goods market equilibrium condition, describes the contribution of net exports to aggregate demand. The demand for domestic goods is determined by real disposable income, the profitability of investment, the real exchange rate eP^*/P, and real wealth. Exports depend on the real exchange rate, and on domestic and foreign income and wealth.

24. Friedman and Schwartz 1963. Friedman and Schwartz calculate the PPP data presented in figure 8.3 in examining the role of capital flows in moving relative goods price levels.

25. Aghevli 1975 estimates an econometric model that includes both capital flows and the influence of the current account on the money stock. He concludes that though capital flows moved in a procyclical direction, thus offsetting the effects on money supply of the anticyclical current account, the current account effects dominate.

26. For recent discussions of open economy macroeconomics, see Branson 1980, Branson and Buiter 1983, Dornbusch 1982a, 1983, Frenkel 1983, Henderson 1984, Mussa 1984, and Obstfeld and Stockman 1983.

Equation (2) is the price equation:

$$P = C(W,Pm,eP^*,Y/K). \tag{2}$$

In (2) the materials price term, Pm, changes as the prices of imported inputs change. The term in foreign prices, eP^*, represents the effects of foreign competitiveness on domestic prices. Equation (2) can be thought of either as a markup equation or as the description of equilibrium price determination in a competitive economy.

Several channels of transmission, which can be described in aggregate supply and demand terms, emerge from equations (1) and (2).[27] We confine ourselves for the moment to impact effects, thus taking into account only short-run cyclical flexibility of prices and wages. The channels are:

1. Most familiar, a rise in foreign income and spending raises the demand for our goods, shifts the aggregate demand curve up, and thus leads to an increase in output and home goods. An example is an increase in foreign import demand as a result of expansion abroad. This channel is of course present under both fixed and flexible exchange rates. Such multipliers should be close in size to government spending multipliers.[28]

2. A rise in import prices, induced by exchange depreciation or increased foreign prices, shifts *both* aggregate demand and supply curves. On the demand side, assuming a sufficiently large price elasticity, there is a shift toward domestic goods and therefore a tendency for output and prices to rise. On the supply side, the increase in competitors' prices leads to an increase in home prices as domestic firms increase their markup.[29] Domestic prices certainly rise; we would expect output to increase.

The effects of an import price increase in practice depend on the extent to which other endogenous and policy variables react to the disturbance. In particular, it is important to know whether wages rise in response to higher import prices and whether the monetary authorities accommodate the disturbance. The more wages rise with import prices, and the more accommodating is money, the smaller the real effects, and the larger the impact of the import price change on prices.

27. To derive the aggregate demand schedule, we assume away complications in the model presented in the appendix that result from the multiplicity of assets and direct links between exchange rates and asset markets.

28. Multiplier assumptions or estimates in large-scale trade models range between one and two. For instance, the OECD international linkage model assumes a first-year government spending multiplier for the United States of 1.5. See *OECD Economic Studies* (1983). The EPA model has an implied first-year multiplier closer to one. See Amano, Sadahiro, and Sasaki 1981, 50. (Calculation based on the elasticity of United States GNP with respect to world imports in the EPA model.) However, Darby and Stockman find very weak multiplier effects in their international model. See chapters 5–7 in Darby et al. 1983.

29. Here obviously we interpret (2) as a markup equation.

Results of simulations of econometric models, such as the OECD interlink model, the Japanese Economic Planning Agency (EPA) model, or the Federal Reserve's multicountry model (MCM) will differ in their assumptions about the nominal feedbacks resulting from an import price increase, and conclusions about the effects of disturbances are likely to differ.

Even leaving aside feedbacks from wages and money, there are effects of import price changes on aggregate demand. To the extent that higher import prices raise the price level, without there being offsetting reductions in domestic prices, the real money stock falls and the equilibrium interest rate that clears the assets markets will rise. Higher interest rates in turn imply a reduction in income and spending and reduced aggregate demand and employment.

It is well known from the literature on trade equations[30] that higher import prices can in the short run lead to increased import spending and a decline in net exports. The fall in net demand may imply a reduction in demand for domestic goods or possibly a reduction in saving.[31] If increased import spending is financed by a reduction in domestic saving, output will expand. If it has as its counterpart reduced spending on domestic goods, output will fall. Theoretical analyses show that in this context it matters whether the disturbance is permanent or transitory and whether consumers strongly prefer smooth consumption streams and do not react to changes in the intertemporal terms of trade. The case most favorable to expansion of employment occurs if a disturbance is believed to be temporary and consumption smoothing dominates effects induced by real interest rates.

3. Increased materials prices imply increased costs and therefore cause the aggregate supply curve to shift up. But there are also demand side effects. Increased prices of imported materials imply a reduction in real disposable income, since there is a reduction in value added at a given level of output. Domestic real disposable income falls because, with real output unchanged, the higher real price of imported intermediate products implies that real income available for domestic factors of production is reduced. Aggregate demand therefore declines. Bruno and Sachs (1985) have discussed the relative importance of the supply and demand shifts and the resulting ambiguity for the net effects. There is no question that output will decline, but the price level may rise or fall. We assume the net effect is an increase in prices.

Materials prices are determined by supply and demand conditions in the world market. Equation (3) describes the price of materials:

$$Pm = v(Y, Y^*, \ldots, P, eP^*). \tag{3}$$

30. See, for example, Stern et al. 1976.

31. See Laursen and Metzler 1950 and Razin and Svensson 1983.

We assume $v(\ )$ is degree-one homogeneous in the domestic and foreign price levels. Accordingly, we can rewrite (3) as

$$Pm/P = v(Y, Y^*, \ldots, eP^*/P). \tag{3a}$$

Equations (3) and (3a) make the important point that exchange rate disturbances unrelated to price level movements directly change commodity prices, both in dollars and in real (United States goods) terms. In addition, of course, the real price of commodities is affected by short- and long-run supply conditions, such as OPEC shocks.

4. The wealth and disposable income terms in equation (1) point to a further channel of international linkage. Changes in the world real interest rate redistribute wealth and income internationally between net creditors and net debtors. A rise in the real interest rate is an intertemporal terms of trade change that benefits lenders, whose real income rises, and hurts borrowers. At the same time, higher real interest rates affect the valuation of existing assets. The values of real capital and long-term debt decline, thereby reducing world wealth. The net impact of these changes on aggregate demand for United States goods is not obvious.

5. Wealth effects are also important in the context of persistent international capital movements, for instance, arising from persistent public sector deficits. With marginal spending patterns differing internationally, international redistributions of wealth associated with capital account imbalances shift the pattern of world demand toward the goods demanded by persistent lenders and away from those demanded by persistent borrowers.[32]

8.2.2 Goods and Factor Price Linkages

Equations (2) and (3) show the external sector affecting domestic prices directly, both through the effects of competitive import prices on domestic markups and because import prices affect costs and thus prices. Equation (2) also points to two indirect routes through which the foreign sector affects domestic prices. Exposure to foreign competition may affect wage settlements in industries substantially involved in the international economy. Further, demand pressures from abroad affect domestic prices through their impact on aggregate demand.

32. Ideally we would want to quantify each of the five channels isolated in the discussion above. However, since in practice they all operate at the same time, it is not easy to separate them. Nor are we aware of attempts to do so. Large-scale econometric models typically explicitly embody some but not all of these channels; for instance, the EPA model includes the multiplier, relative price, oil (equivalent to raw materials in our discussion), and some wealth redistribution effects.

Tables 8.7 to 8.9 report evidence on the impact of the external sector on domestic inflation.[33] For simplicity, and to avoid "overfitting," we did not allow ourselves the use of dummy variables, nor did we experiment much with lag lengths. The basic approach was to enter four lagged values of each of the right-hand-side variables, but not to restrict the shape of the lag distribution. The coefficients on the wage change variable were still increasing up to the fourth lag, so we extended that lag length to six quarters. Contemporaneous values of the right-hand-side variables are generally excluded; ordinary least squares regressions suggested that the omission was serious only in regression (3) (and 6), where a contemporaneous value of the rate of change of the import price deflator is accordingly entered.[34]

The exchange rate variables in each case affect the inflation rate in the expected direction, and for the most part significantly. Further, the mean lag by which the exchange rate affects the inflation rate is always shorter than that by which wage changes affect inflation.[35] Equation (1) gives the most direct relationship between the rate of change of the

33. Inclusion of external variables in the Phillips curve, particularly import prices, has a long tradition in open economies such as the United Kingdom. Without serious loss of generality, we confined our search of the United States literature to the *Brookings Papers on Economic Activity* (*BPEA*). Foreign variables first appeared in a United States Phillips curve in *BPEA* in Nordhaus 1972. Gordon 1973 reported on a reestimate of his basic Phillips curve to include import prices. Interestingly, at that time import prices fed through only slowly into domestic prices. Pierce and Enzler 1974 used the MPS model to examine the effects of foreign disturbances. More recent empirical work that emphasizes external effects includes Gordon 1982.

34. Here are further details of and comments on our estimation or search procedure. (*a*) We also experimented with adding the rate of change of the food price deflator, omitting that variable because of collinearity with included variables. (*b*) The theoretical specification of the markup equation in equation (2) includes the level of output, but we did not find output measures or the unemployment rate entering the regressions of table 8.6 significantly. (*c*) Given the serial correlation, the endogeneity problem remains even when the right-hand side contains only lagged variables. However, the problem is limited because the serial correlation coefficient in most of the equations is low, and because the lag coefficients in the most problematic case—that of wages—typically peak only at the third lag and are small at the first lag. Instrumental variable techniques are used in equations (3), (6), and (7) to (9). We did not use the technique more extensively because we were unable to persuade ourselves that the instruments we used—the monetary base, full employment budget surplus,and military spending—were indeed exogenous, except perhaps the last. In the cases where we used instrumental variable estimation, the ordinary least squares and two-stage least squares estimates were quite similar.

35. This is not a reflection of the fact that we allow six lags for the wage variable and only four for the exchange rate variables; when we allowed only four lags for wages, the mean lag for this variable was still longer than that for exchange rates. The mean lag is easy to interpret when all lag coefficients are of the same sign. In all but one case, the coefficients on wage change are all positive. In the case of exchange rate changes, though, either the first or the last lag coefficient is usually of a different sign (though statistically insignificant) than the remaining coefficients. To avoid prejudicing the comparison of mean lags in favor of the exchange rate, we define the mean lag as $\sum^{i} \frac{|a_i|}{(\Sigma a_i)}$, where the a_i are the estimated coefficients.

Table 8.7 **Exchange Rates and the GNP Deflator, 1962:4 to 1983:3**

Regression Number	Dependent Variable	C	Exchange Rate Change		*DWAGE*	*DPROD*	*DPOG*	p	$\bar{R}^2$	DW	SER
			DWAX								
1	*INFDEF*	.419	.062		0.722	−.107	.089	.371	.81	2.04	1.18
		(0.61)	(2.12)		(6.96)	(−1.53)	(4.64)	(2.71)			
			[2.15]		[3.08]						
			DEX								
2	*INFDEF*	.211	0.089		0.745	−.122	.089	.328	.83	2.01	1.14
		(0.33)	(3.04)		(7.85)	(−1.87)	(4.94)	(2.42)			
			[2.14]		[3.12]						
			*IMP**	*IMPL*							
3	*INFDEF*	.133	.055	.074	0.713	−.108	0.11	.278	.83	1.99	1.13
		(0.25)	(1.74)	(1.72)	(8.65)	(−1.89)	(0.51)	(2.56)			
			[2.72]		[3.57]						

Notes:

1. All variables are quarter-to-quarter changes, at an annual rate.
2. Variables are defined as follows:
   INFDEF = Inflation rate, GNP deflator
   C = Constant
   DWAX = Rate of change of weighted average United States exchange rate
   DEX = Rate of change of real exchange rate, defined as relative prices of manufactured goods
   IMP = Inflation rate of import price deflator.
   IMPL = Lagged values of IMP
   DWAGE = Rate of change of hourly wage rate, manufacturing
   DPROD = Rate of change of output per hour, manufacturing
   DPOG = Rate of change of price of oil and gas.
3. All variables except wage enters with four lags. *DWAGE* has six lags. Coefficients and t-statistics are for sums of coefficients on variables. No contemporaneous variables are included except for *IMP* in regression (3).
4. Equation (3) is estimated using instrumental variables for *IMP*; instruments are current and lagged values of the monetary base, full employment deficit, and military spending. (Asterisk indicates use of instrumental variables.)
5. Entries in [ ] are mean lags; e.g., in regression (1), mean lag of distribution of coefficients on *DWAX* is 2.15 quarters.

exchange rate and the inflation rate of the GNP deflator. According to (1), a 10% change in the exchange rate directly changes the GNP deflator by only 0.6%. Even the largest effect, in regression (3), would change the GNP deflator by only 1.3% in response to a 10% change in import prices.[36] The direct effects are not, however, the end of the story, because we shall see in discussing table 8.8 that changes in the exchange rate affect wages.

Comparing tables 8.7 and 8.8, we find a generally more powerful effect of the exchange rate variables on consumer prices than on the GNP deflator. The feedthrough to consumer price inflation is particularly rapid in the case of changes of import prices. Even in this case, though, the sum of the lag coefficients is only 0.14: a 10% change in import prices changes the personal consumption deflator by 1.4%, with most of the effect taking place contemporaneously.

Table 8.9 examines the impact of the exchange rate on the rate of change of wages.[37] The results across the three equations show a consistent effect of exchange rate movements on the rate of change of manufacturing wages: a 10% rate of change of the exchange rate reduces the rate of wage change by between 1% and 1.5%. The mean lags are, however, longer than in the price equations.

Taking the price and wage equations together, and at a given unemployment rate, an appreciation of the currency affects the domestic price level first through direct price effects and then through indirect effects on wages. The direct effects are relatively quick, and they imply that a 10% change in the exchange rate affects the price level within a year by about 1%. There is then a second, slower-working, effect on prices, working through wages, amounting to somewhat under 1% for each 10% change in the exchange rate. We take the latter effect to represent the impact of foreign competition on domestic wages.

The results of tables 8.7 to 8.9 thus support the argument that exchange rate changes affect the domestic price level and, during the

36. It is noticeable in both tables 8.7 and 8.8 that the coefficient on *DEX* is larger than that on *DWAX*. The reason is probably that *DEX*, the rate of change of the real exchange rate, is approximately equal to *DWAX* plus the foreign inflation rate minus the domestic inflation rate. Since *DEX* enters negatively, it essentially includes positive lagged values of the dependent variable. Its coefficient is therefore increased as a result of serial correlation of the dependent variable. This interpretation is strengthened because the coefficient of serial correlation in regression (2) is lower than that in (1), and similarly in regressions (5) and (4).

37. In table 8.9 we use a simple adaptive expectations formulation to generate expected inflation. We have also reestimated equation (7) using a three-period distributed lag on the predicted inflation rates from equation (4) as the expectations variable. This change reduces the coefficient on the unemployment rate and also reduces the coefficient on the exchange rate to $-.11$ with a t-statistic of 2.43. The sum of the coefficients on the expected inflation rate is .93.

Table 8.8 **Exchange Rates and the Consumption Deflator, 1962:4 to 1983:3**

Regression Number	Dependent Variable	C	Exchange Rate Change		*DWAGE*	*DPROD*	*DPOG*	p	$\bar{R}^2$	DW	SER
			DWAX								
4	*INFPCD*	1.024	.083		.601	−.102	.085	.588	.82	1.94	1.15
		(1.10)	(2.39)		(4.36)	(−1.29)	(3.60)	(4.87)			
			[3.38]		[3.97]						
			DEX								
5	*INFPCD*	0.443	.125		.666	−.099	.089	.509	.84	1.96	1.09
		(0.57)	(3.72)		(5.83)	(−1.38)	(4.34)	(4.13)			
			[2.87]		[3.96]						
			*IMP**	*IMPL*							
6	*INFPCD*	0.198	.086	.054	0.658	−.095	.012	.405	.85	1.93	1.06
		(0.34)	(2.85)	(1.23)	(7.26)	(−1.59)	(0.50)	(3.99)			
			[1.61]		[3.75]						

Note: INFPCD *is inflation rate of personal consumption deflator. Other details are as for table 8.7.*

Table 8.9 **Exchange Rates and the Phillips Curve**

Regression Number	Dependent Variable	*C*	*DWAX*	*DEX*	*IMPL*	*LOGUMM**	*EXPINF*	ρ	$\bar{R}^2$	DW	SER
7	*DAHM*	3.757 (5.31)	.141 (3.34) [4.02]			−1.821 (−2.01)	0.966 (6.94)	.059 (0.53)	.50	1.98	1.93
8	*DAHM*	3.922 (5.46)		.126 (3.08 [4.03]		−2.393 (−2.76)	1.033 (7.27)	0.83 (0.76)	.49	2.00	1.96
9	*DAHM*	4.340 (6.68)			.108 (3.07) [4.47]	−2.096 (−2.54)	0.745 (4.54)	.044 (0.40)	.50	1.99	1.94

Notes

1. Variable definitions as in table 8.7. *EXPINF* is the expected inflation rate, calculated as a weighted average (with decay coefficient of .15 per quarter) of past PCE quarter over same quarter a year before inflation rate. *LOGUMM* is logarithm of unemployment rate for married men.
2. Exchange rate variables are entered with six lags.
3. Asterisk indicates treated as endogenous, using same instruments as in table 8.6.

adjustment period, the inflation rate.[38] To the extent that monetary and fiscal policy affects exchange rates, a flexible exchange rate regime provides an extra channel of influence of policy on prices.

Table 8.10 summarizes the channels and lags with which a 10% real depreciation translates into an increased consumption deflator. The table highlights the fact that for given unemployment and expected inflation rates, real depreciation exerts a significant impact on prices and does so quite rapidly. The exchange rate must play a part in explaining United States inflation and in assessing the impact of policy changes on the price level.

Figure 8.4 shows the actual inflation rate and also an estimate of the inflation rate purged of exchange rate effects. The latter series is constructed using the estimated coefficients of the real depreciation variable in equations (5) and (8) in table 8.8 and 8.9 respectively. The adjusted series is an estimate of what inflation would have been had there been no effect of real depreciation on prices, either directly or indirectly via wages. Figure 8.4 brings out the role of exchange rate changes in the major episodes of inflation acceleration and deceleration: 1973–74, 1978–80, and 1981–83. In the acceleration periods exchange depreciation increases inflation substantially, whereas in 1981–83 exchange appreciation strongly reinforces the deceleration of inflation. This role of exchange rates in the wage/price sector of the economy is accepted as obvious in small countries. In the United States it is already part of macroeconometric models but is not yet accepted by mainline macroeconomics.[39]

We now turn to the asset markets to explore further the effects of monetary and fiscal policy on the exchange rate.

Table 8.10 **Effect of a 10% Real Depreciation on Wages and the Consumption Deflator**

	Wages	Direct Effect on Prices	Total Effect on Prices
Magnitude	1.26	1.25	2.09
(% change) mean lag (quarters)	4.03	2.87	n.a.

Source: Tables 8.8 and 8.9, equations (5) and (8).

38. Our direct coefficients are typically smaller than those of Gordon 1982. This may be a result of our choosing not to use dummy variables to account for episodes such as wage/price controls. Nonetheless, the sum of the direct and indirect effects is quite smiliar to the coefficients obtained by Gordon, whose sample period was 1952 to 1980.

39. See, for example, Blinder 1982.

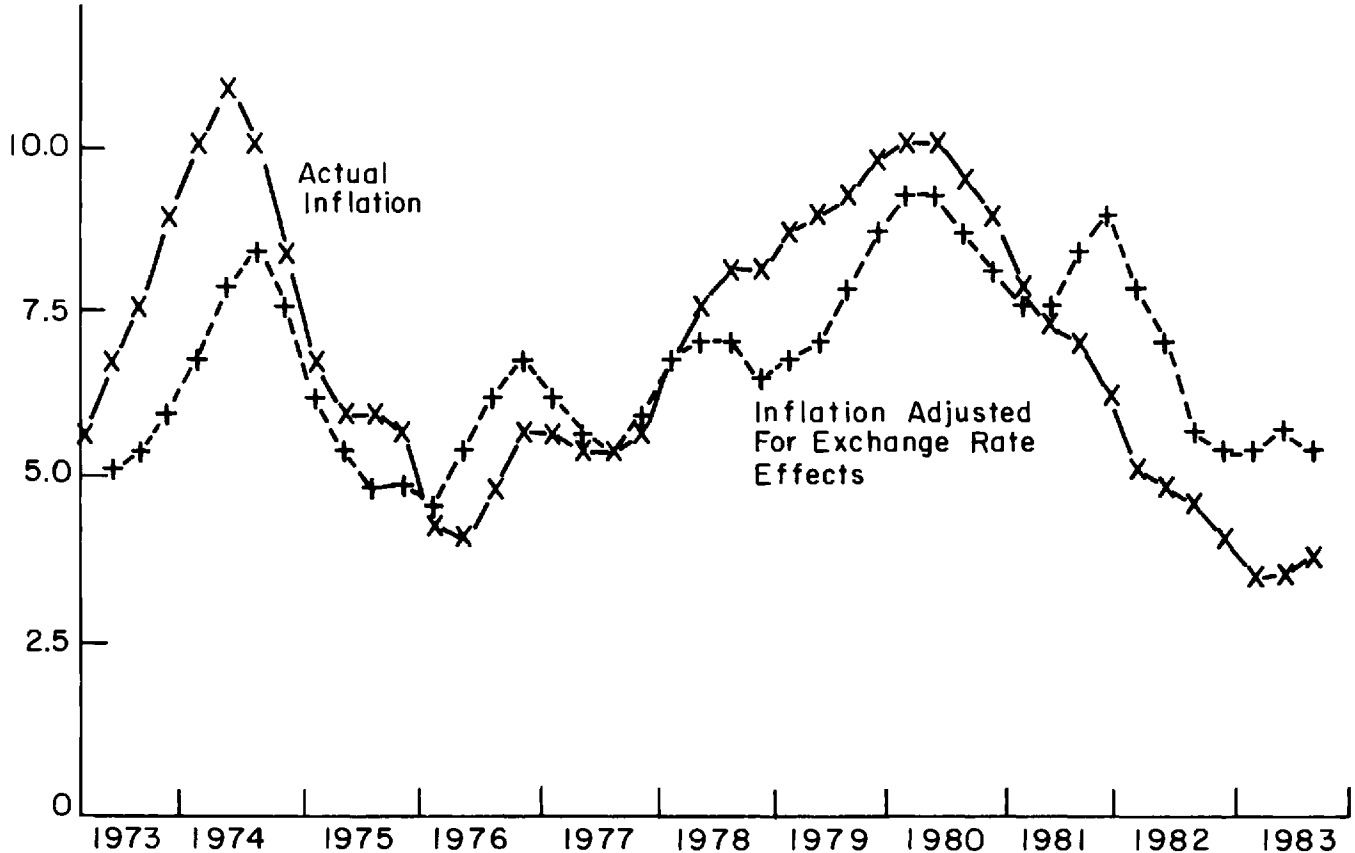

Fig. 8.4 Exchange rate effects on inflation.

8.2.3 Asset Markets

International capital mobility is a fact, but the appropriate specification of asset markets remains an open issue.[40] There are three chief questions. First, are domestic and foreign bonds perfect or imperfect substitutes? Second, should stock markets be given a prominent role in modeling international asset markets, or is the traditional money/bonds model adequate for understanding the linkages? Third, does the international redistribution of wealth through the current account play a significant role in the determination of the exchange rate and macroeconomic equilibrium? The answers to these questions help analyze the implications of sustained fiscal deficits and of long-term current account deficits—for instance, whether sustained deficits build up a "dollar overhang" that will force exchange depreciation.

We have to preface this section by noting that empirical exchange rate models perform poorly. Meese and Rogoff (1983) show that a random walk model typically predicts exchange rates as well as standard structural models, even when the forecasts of the latter are based on realized values of future explanatory variables. The exchange rate is like the stock market in that price movements are dominated by unforecastable changes; accordingly, the extraction of the systematic components of price movements is difficult in samples of the length currently available. The absence of decisive empirical evidence forces a greater reliance on theorizing, and on snippets of evidence rather than a complete empirical model, in discussing exchange rate and international economics.[41]

We start with the basic model in which foreign and domestic bonds are perfect substitutes. The domestic nominal interest rate is therefore equal to the foreign nominal rate plus the anticipated rate of depreciation:

$$i = i^* + \hat{e}. \tag{4}$$

(A $\hat{}$ over a variable denotes its proportional rate of change.) Subtracting national inflation rates from both sides gives the equivalent equation in real interest rate form:

$$r = r^* + (\hat{e} + \hat{p} - \hat{p}^*). \tag{5}$$

Real interest rates can diverge internationally so long as the real exchange rate is changing, but in long-run equilibrium real interest rates are equalized. The assumptions of perfect asset substitutability, in com-

40. See Cumby and Obstfeld 1982, Frankel 1982, Melvin 1983, chap. 13, Obstfeld 1982, and Rogoff 1983.

41. We are not certain that the situation in open economy macroeconomics is significantly different from that for the closed economy. However, discussion of that issue and its implications would take us too far afield.

bination with a specification of goods markets in which output determines demand and prices adjust slowly to excess demands and supplies, leads to the following results:[42] An increase in the money stock leads under flexible rates to an immediate depreciation of the exchange rate. The exchange rate initially overshoots its long-run equilibrium because prices are sticky, real balances increase, and output expands while the real and nominal interest rate fall. In the adjustment process following the initial overshooting, inflation is accompanied by currency appreciation as the real exchange rate returns to its long-run equilibrium value.[43]

Monetary and fiscal policy thus work in good part through the real exchange rate as well as the real interest rate channel. This was of course the fundamental insight of the Mundell/Fleming model. As Mundell (1964) noted: "It is important to notice too that budgetary policy, like monetary policy, has a different role in a flexible exchange rate system. . . . An increased budget deficit without monetary expansion would raise interest rates, attract capital, appreciate the exchange rate, and worsen the trade balance with little benefit to employment. With sufficient monetary expansion a budget deficit would be unnecessary."

8.2.4 Monetary Policy

The results of any policy change are quite sensitive to policies followed in the rest of the world. Specifically it matters whether the authorities in the rest of the world stabilize interest rates, output, or monetary aggregates. For instance, if they attempt to stabilize interest rates in the context of a foreign budget deficit, they create a monetary expansion in attempting to fight rising domestic rates.[44]

The combination of rapidly clearing assets markets and prices that adjust sluggishly implies a relation between real interest differentials and real exchange rates. In the course of adjustment to a monetary disturbance, the real exchange rate will adjust gradually to its long-run equilibrium value, $\bar{R}$. Let $R = \log(eP^*/P)$ denote the logarithm of the real exchange rate. Then the model implies that:[45]

$$R_t = (1 - a)R_{t-1} + a\bar{R}. \tag{6}$$

42. See Cardoso 1983, Dornbusch 1976, and Obstfeld and Stockman 1983.

43. Overshooting is not inevitable: if dynamics are such that output initially expands sufficiently to raise the nominal interest rate when the money stock is raised, the exchange rate will not overshoot. The presumption is though that the nominal interest rate absorbs most of the initial impact of the money shock.

44. A growing theoretical literature discusses the effects of alternative policy reaction functions and coordination mechanisms. See, for example, Canzoneri and Gray 1983 and Rogoff 1984. Empirical models too may include reaction functions; e.g., chaps. 5–7 in Darby et al. 1983.

45. See Dornbusch 1983.

Combining the equation with the relation between real interest rates in (5), $r = r^* + R$, we obtain:

$$R_t = \bar{R} - b(r - r^*), \qquad b = (1 - a)/a. \tag{7}$$

Equation (7) states that if our interest rates exceed those abroad, then the real exchange rate will be below its long-run equilibrium value. In other words, a positive real interest differential implies real appreciation. The extent of such appreciation depends on the speed of adjustment in the economy. The term b is the mean lag, which under rational expectations is a compound of the structural coefficients in the model. If the mean lag is three years, then a three-percentage-point real interest differential implies that the exchange rate deviates from its long-run equilibrium by 9%. The asymmetry in adjustment speeds between goods and assets markets thus establishes a link between tight money and significant, transitory exchange rate overvaluation.[46]

The implications of flexible exchange rates for disinflation in a sticky price world (the real world) are quite apparent: because tight monetary policy works rapidly and strongly on the exchange rate, disinflation can take place more rapidly. The Phillips curve becomes steeper under flexible exchange rates.[47]

8.2.5 Fiscal Policy

The analysis of fiscal policy under assumptions of perfect asset substitutability is straightforward: a sustained fiscal expansion raises long-run aggregate demand and therefore must bring about crowding out. The crowding out occurs through two channels. The first is a real appreciation in the expanding country owing to the relative increase in demand for that country's goods. The other is an increase in the *world* real interest rate. In a small country, crowding out will work entirely through the real exchange rate, implying that the current account deteriorates by the full amount of the fiscal expansion.

What are the implications for the exchange rate? Given the nominal money stock and full employment, higher real interest rates imply reduced real money demand and hence a higher price level in each country. For the real exchange rate to appreciate, we therefore require a nominal appreciation of the expanding country.

This analysis of the effects of a fiscal expansion is incomplete in that it does not take into account complications arising from the debt financing of the deficit in the short term and the ultimate need to raise

46. For an empirical implementation of this approach, see Driskill 1981. For further review of the empirical evidence, see Hacche 1983.

47. See Dornbusch and Krugman 1976, Buiter and Miller 1982, and the discussion of the Phillips curve above.

taxes to service the larger debt. Nor have we taken into consideration the implications of sustained current account imbalances that redistribute wealth away from the expanding country. What are the implications of these additional channels?

As noted above, the redistribution of wealth via current account imbalances will affect the goods markets because marginal spending patterns differ. Therefore demand for the expanding country's goods would decline over time, owing to redistribution; the need for real appreciation is therefore dampened. But this effect is offset to some extent by the stimulus due to deficit finance.[48]

The portfolio effects associated with debt finance remain an unsettled area of research. Once we depart from the assumption of perfect asset substitutability, we must reckon with the asset market implications of debt finance. These effects occur through two channels. First, there is a direct effect of debt finance on the relative supplies of assets. Debt finance implies that the relative supply of the expanding country's debt rises. Asset holders have to be compensated to hold an increasing fraction of their wealth in the form of the expanding country's debt either through an increased nominal interest differential or through anticipated appreciation. But it is also possible that a once and for all depreciation of the expanding country reduces the value of its debts in terms of foreign exchange, thus reducing the portfolio share and eliminating the need for higher interest rates or appreciation.[49]

The discussion is clarified in equation (8), where we present the international interest rate relation, taking into account the risk premium that results from imperfect asset substitution.[50] The equation states that the nominal interest differential equals the expected rate of depreciation plus a risk premium, K, which depends on the relative supply of domestic debt relative to world wealth and on the domestic share in world wealth.

$$(8) \qquad i = i^* + \hat{e} + K(B/e\bar{V}^*, V/e\bar{V}^*), \qquad K_1 > 0, K_2 < 0$$

where $\bar{V}^*$ is world wealth measured in terms of foreign exchange. Equation (8) shows that the exchange rate or the rate of depreciation must adjust to maintain portfolio balance in the face of a rise in the domestic bond supply, given interest rates. The possibility of exchange depre-

48. Blanchard 1983 has shown that fiscal expansion will have additional expansionary effects associated with debt issue when future taxes are discounted at more than market rates. This effect continues, though dampened, in the open economy. Unless the entire debt finance translates into current account deficits so that the rest of the world acquires all the debt, there will be some net expansion of demand from debt creation.

49. Empirical work has not clearly established that foreign and domestic bonds are imperfect substitutes. See Frankel 1982, 1983.

50. See Dornbusch 1982b for a derivation and references to the extensive literature.

ciation to clear asset markets runs counter to the analysis for the goods markets, where crowding out leads us to expect an appreciation. What then will happen? As the discussion here already makes clear, this is not an area where we expect unambiguous results.

Research on the implications of debt finance has used simulation to attempt to assess the relative importance of portfolio effects—relative asset supplies and risk premiums—and aggregate demand effects.[51] The quantitative finding that emerges is that in the long run a fiscal expansion will lead to depreciation, rather than appreciation, if the portfolio effects are relatively important. Specifically, if debt issue forces a large increase in our interest rates to maintain portfolio balance, and if demand reacts to the interest rate increase by more than full crowding out, then a real depreciation is required to restore goods market equilibrium. If, by contrast, assets are highly substitutable, then risk premiums do not play a significant role, and as a result the long run crowding out must take place via real appreciation.

In concluding the discussion of the portfolio effects of fiscal policy, we note that these effects are entirely due to the assumption that budget deficits are financed by issuing bonds denominated in terms of the expanding country's currency. The risk premium effects can be avoided by financing deficits in a way that keeps the currency composition of world outside assets unchanged. For instance, in the present circumstances, the United States would finance part of the deficit in yen and deutsche mark bonds. We also note that our analysis has not taken into account effects of fiscal policy on the stock market. These effects have not been addressed in the literature but may well turn out to be more important than the questions associated with the currency denomination of bonds.

8.2.6 Interdependence

Our discussion so far has taken as given the key foreign variables—interest rates, income, prices—that influence domestic macroeconomic equilibrium via trade in goods and assets. But of course these variables are determined jointly with those at home, and, to complicate matters, policy interdependence comes to play a role. Foreign monetary and fiscal policies respond to disturbances at home as foreign policymakers attempt to influence the movements of exchange rates, interest rates, prices, and output in a manner that optimizes their macroeconomic policy objectives. This interdependence of course influences our conclusions about the effects of monetary and fiscal policies. Tight money, for example, may not lead to appreciation if foreign governments are inflation sensitive and therefore contract their

51. See Wyplosz and Sachs 1984 and Giovannini 1982.

own money stocks in tandem with our contraction to avoid currency depreciation. In other instances "synchronized expansion" agreed upon by the governments of the major countries provides the "locomotive" for world recovery.

In view of this interdependence it is interesting to ask how closely monetary growth and discretionary fiscal policy are correlated between countries. Table 8.11 provides information on this question for the growth rates of M1 and for the discretionary fiscal policy changes.

It is interesting that there is no definite change in the money growth correlations between the fixed and flexible exchange rate periods. The qualification to that statement is the interesting shift to a negative correlation for Japan under flexible rates. For fiscal policy, taking the whole period for which data are available, the correlation is relatively low. Moreover, the correlation between fiscal policy changes in the United States and a simple average of other countries in table 8.11 is only .08.

Econometric modeling of the world macroeconomy remains at an experimental stage, but such models do exist at the Federal Reserve Board, the OECD, and the Japanese Economic Planning Agency. Comparisons of the policy multipliers from these models is rendered difficult by differing assumptions about monetary and fiscal accommodation to shocks and by differences in the simulation periods. But even so it is worthwhile to compare some results. Table 8.12 shows the multipliers of the Federal Reserve's MCM model and the EPA's world economic model (WEM) for a United States fiscal expansion under flexible exchange rates.

In looking at the effects of United States policies on the foreign countries, we note that there are spillover effects under flexible exchange rates both on output and on prices. But table 8.12 also reveals that these effects are not very sizable as long as the disturbance remains small.

Table 8.11 **Correlation of Money Growth and Fiscal Policy of Major Countries with Those of the United States**

	Germany	Japan	United Kingdom
Annual M1 growth			
1959–72	.16	.07	.50
1974–82	.27	−.27	.20
Fiscal policy change			
1971–82	.11	.29	−.14

Source: IMF and OECD *Occasional Studies*, June 1978, p. 19, and *Economic Outlook*, December 1983, p. 34.

Note: For definition of discretionary fiscal policy change, see the sources.

Table 8.12 **Fiscal Multipliers from Two World Macro Models (percentage increase in real GDP in the first two years)**

	United States		Japan		Germany	
Effect on real GDP						
FRB MCM[a]	1.5	0.9	0.2	0.2	0.2	0.5
EPA WEM[b]	2.02	2.01	0.17	0.56	0.17	0.59
Effect on prices						
FRB MCM	−0.0	0.3	0.0	0.1	0.0	0.2
EPA WEM	0.57	1.38	0.11	0.36	0.04	0.20

Source: See note 55.

Note: The table shows the percentage increase in real GDP and in consumer prices owing to a sustained increase in United States real government spending equal to 1% of GDP for the first two years.

[a]Federal Reserve Board multicountry model.

[b]Japanese Economic Planning Agency world economic model.

8.3 Summary

The standard macroeconomic paradigm remains the IS-LM model augmented with a Phillips curve.[52] In this paper we have shown how the model must, for the case of the United States economy, be amended to take account of international effects and interactions. What conclusions emerge?

The only key structural equation that goes unamended is the money demand equation. Even here foreign variables are often proposed, though not persuasively.[53] In the goods and assets markets, foreign prices, foreign activity, and foreign asset yields appear as important determinants of domestic activity, prices, and interest rates. The quantitative magnitude and the stability of these relations remains a topic of research, but their existence and their importance to an understanding of the United States macroeconomy are beyond question.

International interactions exert an important effect on the way monetary and fiscal policies operate. The exchange rate system determines the extent to which asynchronized policies are possible and the channels through which they exert their effects on the economy. The Mundell/Fleming model of twenty years ago introduced these ideas, and they remain valid today. For the United States economy, policy limitations became apparent in the late 1960s when capital outflows on a large scale signaled that even a large country could not set the tone for the world economy. But under flexible exchange rates these interdependence effects have become much more dramatic. They immediately affect the

52. See Board of Governors of the Federal Reserve 1983, Amano, Sadahiro, and Sasaki 1981, and Yoshitomi 1984. For further references see, too, Larsen et al. 1983.

53. See, for example, McKinnon 1982.

key trade-off—the Phillips curve. Theory suggests and empirical evidence supports the notion that under flexible rates the Phillips curve is much steeper. A tight money policy leads to appreciation and thus allows rapid disinflation. The traditional idea, appropriate to fixed rates, is that crowding out takes place chiefly via higher interest rates' depressing interest-sensitive components of spending, particularly housing. Under flexible rates the crowding out takes place also at another margin, reduced net exports owing to appreciation.

Thinking on fiscal policy, too, must be modified. Fiscal expansion via its impact on interest rates induces currency appreciation, at least in the short run. Therefore fiscal expansion is less inflationary than the closed-economy Phillips curve suggests, but it also involves more crowding out. This is because net exports decline under the impact of appreciation.

Several unsettled areas of research require attention. One is to determine the importance of relative asset supplies for risk premiums and hence for long-run interest differentials, equilibrium real exchange rates, or both. The literature as yet gives no guidance to these issues. To make the point concretely, we do not have in domestic macroeconomics any empirical evidence that the maturity of the debt affects the term structure of interest rates. Long-term and short-term debt, for macroeconomics, are much the same. Is this also true when we ask if it makes a difference whether our United States deficits are financed in deutsche mark or United States dollar bonds? If the answer is affirmative, an entire popular range of ideas about the budget and exchange rates becomes irrelevant.

The second issue on which we know very little, indeed even less, is the open economy role of the stock market. If asset markets are important via their impact on exchange rates and hence on aggregate demand and prices, then surely the stock market must take a particularly important place because it is forward looking and because of its size relative to other asset markets.

The third issue, closely linked to the previous point, concerns the open economy linkages to investment. What is the impact of real exchange rates on investment spending, and how important are long swings in real exchange rates in affecting investment and hence productivity growth and employment? This question connects, of course, with the crowding-out issue raised above. The current view expressed in policy discussions is that there is less crowding out under flexible than under fixed exchange rates. But perhaps, taking into account the open economy channels, we get as much crowding out of investment, but with real appreciation rather than increased real interest rates as the channels and with manufacturing rather than housing as the affected sector. Such effects, if they do exist, would have significant longer-run implications for the performance of the economy.

Appendix

In this appendix we set out and briefly analyze a simple model that includes the three chief links between the domestic and international economies: the demand for goods, corresponding to Keynesian multiplier analysis; asset market linkages, emphasis on which at one time led to the claim that exchange rates are determined in the assets markets; and the supply side, which has received emphasis in the recent disinflation. The model guides our discussions in the text of the effects of exchange rate changes and foreign shocks.

The Model

The Assets Markets

There are four assets: domestic money, domestic bonds, foreign bonds, and capital. Domestic money is held entirely by domestic residents. Domestic bonds and capital may be held by foreigners as well; foreign bonds may be held by domestic residents.

Equilibrium conditions in the markets for domestic assets are:

$$\text{(A1)} \quad \frac{M_t}{P_t} = L(Y_t, R_t^B), \qquad L_1 > 0,\ L_2 < 0.$$

$$\text{(A2)} \quad \frac{B_t}{P_t} = H(Y_t, \gamma_t^B, \Pi_t, \gamma_t^K, \gamma_t^F, V_t, V_t^*), \quad H_1 < 0,\ H_2 > 0,\ H_3 \gtrless 0,\ H_4 < 0,\ H_5 < 0,\ H_6 > 0,\ H_7 > 0.$$

$$\text{(A3)} \quad q_t K_t = J(Y_t, \gamma_t^B, \Pi_t, \gamma_t^K, V_t, V_t^*), \quad J_1 \lessgtr 0,\ J_2 < 0,\ J_3 \gtrless 0,\ J_4 > 0,\ J_5 < 0,\ J_6 > 0,\ J_7 > 0.$$

Symbols are defined in table 8.A.1. The expected real returns on domestic bonds, capital (equity), and foreign bonds are given by:

$$\text{(A4)} \quad (1 + \gamma_t^B) = (1 + R_t^B)_t \left(\frac{P_t}{P_{t+1}}\right).$$

$$\text{(A5)} \quad (1 + \gamma_t^K) = \frac{F_K(K_t, Y_t) + {}_tq_{t+1}}{q_t}.$$

$$\text{(A6)} \quad (1 + \gamma_t^F) = (1 + R_t^F)_t \left(\frac{e_t P_t}{e_{t+1} P_{t+1}}\right).$$

The presubscript t indicates the expectation formed on the basis of information available at time t. In writing (A2) and (A3) as functions

Table 8.A.1 Symbols

M_t	Money stock
P_t	Price level
Y_t	Real output
R_t^B	Nominal return on domestic bonds
B_t	Stock of domestic bonds
Y_t^B	Expected real return on domestic bonds
Π_t	Expected inflation rate
γ_t^K	Expected real return on domestic equity
V_t	Wealth of domestic residents
V_t^*	Foreign wealth
q_t	Relative price of an equity claim on capital
e_t	Exchange rate
B_t^{d*}	Holdings of foreign bonds by domestic residents
B_t^d, K_t^d	Holdings of corresponding assets by domestic residents
P_t^*	Foreign price level
Y_t^d	Disposable income
G_t	Government expenditure
Y_t^*	Foreign output
P_t^m	Domestic price of material inputs
W_t	Nominal wage
δ	Rate of depreciation of capital
T_t	Real taxes minus transfers, exclusive of interest payments on government debt

not only of expected real returns but also of Π_t, the expected inflation rate, we use the first-order approximation:

$$(A4') \qquad (1 + R_t^B) = (1 + \gamma_t^B) \frac{1}{t\left(\frac{P_t}{P_{t+1}}\right)}$$

$$\approx (1 + \gamma_t^B) \frac{{}_tP_{t+1}}{P_t}$$

$$= (1 + \gamma_t^B)(1 + \Pi_t).$$

A similar approximation applies for the return on foreign bonds.

Real domestic wealth, V_t, consists of holdings of the four assets by domestic residents:

$$(A7) \qquad V_t = \frac{M_t}{P_t} + \frac{B_t^d}{P_t} + q_t K_t^d + \frac{e_t B_t^{d*}}{P_t} .$$

Because foreign residents may hold both domestic bonds and domestic equity, the amounts of these assets held by domestic residents are not usually equal to the outstanding stocks.

The assumption in (A1) is that money is held for transactions purposes, at an opportunity cost equal to the return on bonds.[54] The assets are assumed to be gross substitutes. Demand functions by domestic residents have the same general forms as $LC(\ )$, $H(\ )$, and $J(\ )$ but are not dependent on foreign wealth, V_t^*. In addition, the demand by domestic residents for foreign bonds is:

$$\text{(A8)} \quad \frac{e_t B_t^{d*}}{P_t} = G(Y_t, \gamma_t^B, \Pi_t, \gamma_t^K, \gamma_t^F, V_t), \qquad \begin{array}{l} G_1 \leqslant 0,\ G_2 < 0,\ G_3 \geqslant 0, \\ G_4 < 0,\ G_5 > 0,\ G_6 > 0. \end{array}$$

The Goods Market

We start by specifying the demand for domestic output.

$$\text{(A9)} \quad Y_t = D\left(\frac{e_t P_t^*}{P_t}, Y_t^d, G_t, V_t, q_t\right) + NX\left(\frac{e_t P_t^*}{P_t}, Y_t^d, Y_t^*, V_t\,(q, q^*, P_m/P)\right), \; D_i > 0,\ i = 1,?,$$
$$NX_1 > 0,\ NX_2 < 0,\ NX_3 > 0,\ NX_4 < 0.$$

Prices are based on costs and the level of output relative to capacity:

$$\text{(A10)} \quad P_t = C(W_t, P_t^m, e_t P_t^*, Y_t/K_t), \qquad C_1 > 0,\ C_2 > 0,\ C_3 > 0,\ C_4 \geqslant 0.$$

The function (A10) permits an interpretation as a supply function with output on increasing function of the price level and a decreasing function of the wage, materials prices, and the prices of imported inputs.[55]

Wages

Wages are predetermined, based on the level of output (and thus employment) and expected price level:

$$\text{(A11)} \quad W_t = \psi\left((Y/K)_{t-1}, {}_{t-1}(Y/K)_t, \frac{{}_{t-1}P_t}{P_t}, W_{t-1}\right), \qquad \psi_1 > 0,\ \psi_2 > 0,\ \psi_3 > 0,\ \psi_4 > 0.$$

54. The return R_t^B should therefore be thought of as applying to a short-term asset; it would be desirable to include term-structure relations in an extended version of the model.

55. We have not included cost of capital measure in (A10), though the rental rate on capital and inventory holding costs do provide a supply-side channel for interest rates to affect prices.

Accumulation Equations

The wage equation provides the first explicit dynamic equation. Asset accumulation equations add further essential dynamics.

$$K_t = (1 - \delta)K_{t-1} + I(q_{t-1}, K_{t-1}). \tag{A12}$$

$$(M_{t+1} + B_{t+1} - M_t - B_t) = P_t(G_t - T_t) + (1 + R^B_{t-1})B_t. \tag{A13}$$

$$\begin{aligned}(1 + R^f_{t-1})e_t B^{*f}_t - (1 + R^b_{t-1})(B_t - B^d_t) \\ - (1 + F_K(\,))q_t(K_t - K^d_t) + P_t NX_t \\ = e_t B^{*f}_{t+1} - (B_{t+1} - B^d_{t+1}) - q_t(K_{t+1} - K^d_{t+1}).\end{aligned} \tag{A14}$$

(A12) is the capital accumulation equation, (A13) the government budget constraint, where it is implicitly assumed that all debt is one-period, and (A14) is the balance of payments constraint.

The openness of the economy is reflected in the asset market equilibrium conditions, the goods market, and the asset accumulation equations. In the assets markets, movements in foreign interest rates, or in foreign wealth, affect United States rates of return and asset prices: foreign influences appear on both the demand and supply sides in the goods market; on the supply side, external disturbances may affect both the prices of material inputs and, directly, the costs of imported inputs. Equation (A14) describes the link between the current account and net ownership of foreign assets.

We now analyze the short- and long-run equilibriums of the model, emphasizing open-economy aspects, before turning to the dynamics of adjustment.

Short-Run Equilibrium

To start we examine short-run asset market equilibrium. We wish to obtain functions:

$$\begin{aligned}R^B_t &= R\,(X_t) \\ q_t &= q(X_t) \\ e_t/P_t &= e(X_t),\end{aligned} \tag{A15}$$

where

$$X_t = \left[M_t, B_t, K_t, P_t, Y_t, \frac{{}_tP_{t+1}}{P_t}, \frac{{}_te_{t+1}}{e_t}, \frac{{}_tq_{t+1}}{q_t}, \gamma^f_t, B^d_t, K^d_t, B^{*d}_t\right].$$

Several of the variables in X_t will themselves be determined in the full equilibrium of the model. The asset holdings, B^d_t, K^d_t, B^{*d}_t are to be understood as beginning of period stocks.

The properties of the functions in (A15) are implied by the equilibrium conditions (A1)–(A3). (A1) directly implies

$$\text{(A16)} \qquad R_t^B = R\left(\frac{M_t}{P_t}, Y_t\right), \qquad R_1 < 0, R_2 > 0.$$

We are thus making the strong assumption that money market conditions alone determine the short-term interest rate. Inclusion of wealth in the demand function for money would modify this latter conclusion without affecting the signs of the derivatives indicated in (A16).

The properties of the $q(\ )$ and $e(\ )$ functions are obtained using (A2) and (A3). Suppose there is an increase in the expected real return on foreign bonds, γ^f, with other variables in X_t held fixed. (Thus both the nominal and real returns on foreign bonds increase.) Figure 8.A.1 shows asset market equilibrium loci, JJ representing capital market equilibrium and HH bond market equilibrium. The JJ curve is positively sloped because an increase in q creates an excess supply of capital that is offset by the wealth effect arising from an increase in

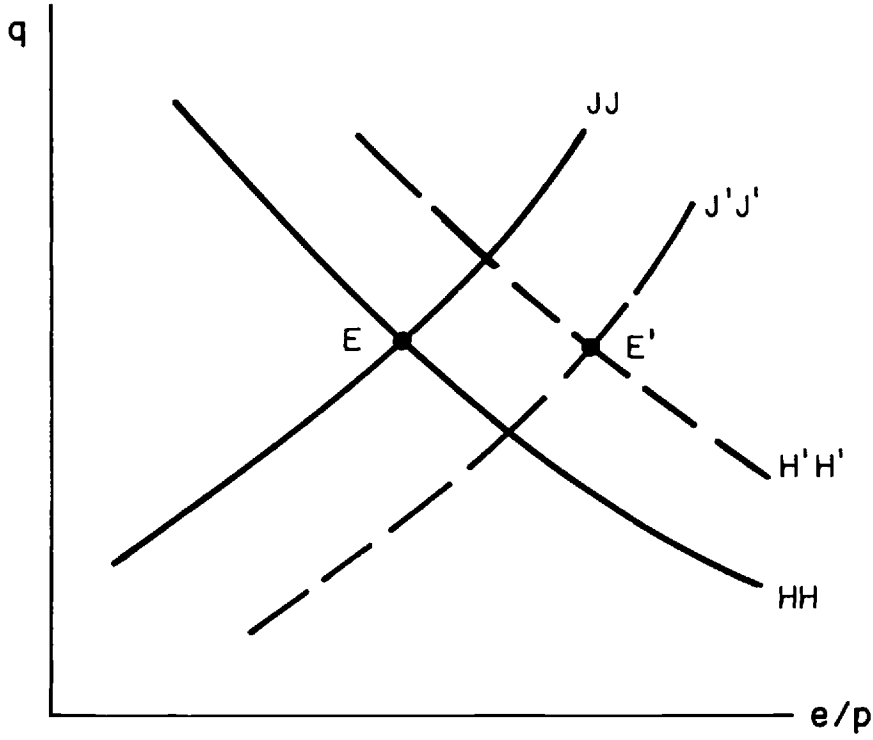

Fig. 8.A.1 Effects of an increase in the foreign interest rate.

the real exchange rate (depreciation). The HH curve slopes down because an increase in q creates excess demand for bonds through both rate of return and wealth effects, which is offset by the wealth effect of an appreciation.

An increase in the foreign interest rate creates an excess supply of both bonds and capital in the United States. The curves shift as shown in figure 8.A.1 to maintain asset market equilibrium. The real exchange rate unambiguously rises—the currency depreciates. The effects on q depend on the relative substitutability of domestic bonds and capital for foreign bonds. If the substitution is mainly between domestic and foreign bonds, then q will rise. This occurs because with the domestic interest rate given, the increase in e/P that equilibrates the bond market is large and creates excess demand in the capital market. If substitution between foreign bonds and domestic real assets is high, a rise in interest rates abroad will reduce United States stock values. An increase in the expected rate of depreciation of the dollar (i.e., a rise in ${}_te_{t+1}/e_t$) will have the same effects on the exchange rate and q as a change in the foreign interest rate.

An open market purchase, in figure 8.A.2, reduces the domestic interest rate, creating an excess demand for capital and—it can be shown—an excess supply of bonds. Equity prices rise, and the effects on the exchange rate are ambiguous. The more substitutable are bonds and capital, the more likely is it that the open market purchase causes the currency to depreciate.

The properties of the functions $q(\ )$ and $e(\ )$ in (A15), which can be derived using similar analysis, are:

(A17)
$$\frac{\partial q}{\partial M} > 0; \frac{\partial q}{\partial B} > 0; \frac{\partial q}{\partial K} < 0; \frac{\partial q}{\partial P} < 0; \frac{\partial q}{\partial Y} ?; \frac{\partial q}{\partial \frac{{}_tP_{t+1}}{P_t}},$$

$$\frac{\partial q}{\partial \frac{{}_te_{t+1}}{e_t}} \gtrless 0; \frac{\partial q}{\partial \frac{{}_tq_{t+1}}{q_t}} > 0 \quad \frac{\partial q}{\partial \gamma_t^f} \gtrless 0 \quad \frac{\partial e}{\partial M} > 0, \frac{\partial e}{\partial B} > 0, \frac{\partial e}{\partial K}$$

$$> 0, \frac{\partial e}{\partial P} < 0, \frac{\partial e}{\partial Y} ?, \frac{\partial e}{\partial \frac{{}_tP_{t+1}}{P_t}}, \frac{\partial e}{\partial \frac{{}_te_{t+1}}{e_t}} > 0; \frac{\partial e}{\partial \frac{{}_tq_{t+1}}{q_t}} > 0 \quad \frac{\partial e}{\partial \gamma_t^f} > 0.$$

Data and Definitions

1. The wage equations in table 8.5 use the following data:
   W: hourly earnings of production workers, total private nonfarm
   Wman: hourly earnings of production workers in manufacturing
   Wser: hourly earnings of production workers, services.

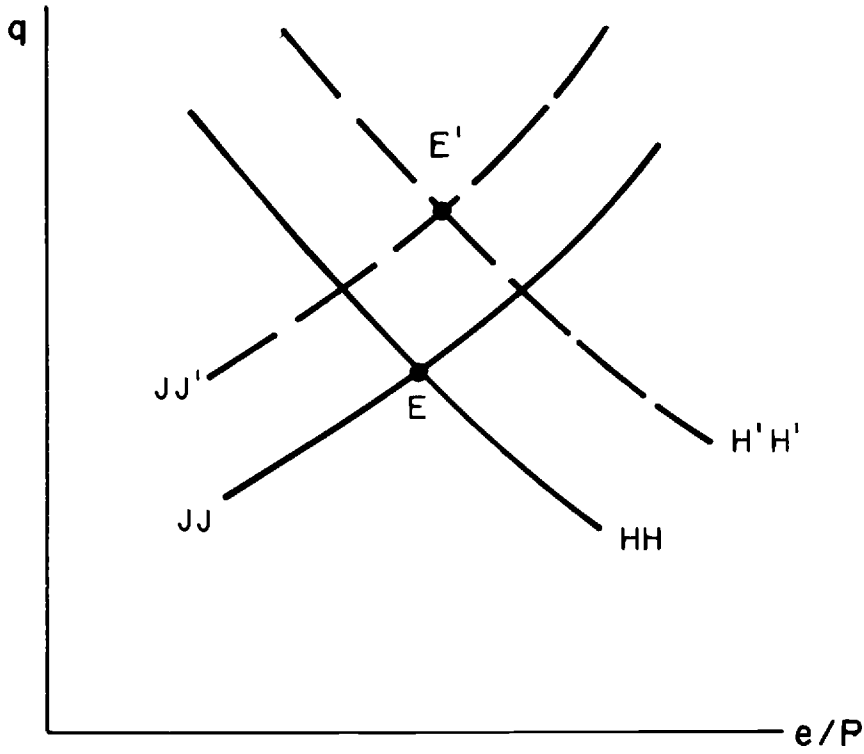

Fig. 8.A.2 Effects of an open market purchase.

Wage inflation is measured by the quarter-to-quarter change at an annual rate in each equation. The unemployment variables in the three equations are respectively the unemployment rate of wage and salary workers in manufacturing, the unemployment rate of wage and salary workers in finance and services, and the economywide unemployment rate of married men.

Expinf: expected inflation is measured by a geometrically distributed lag on the four-quarter inflation rate of the consumption expenditure deflator with a .15 decay factor so that expinf = $.151\log(P(-1)/P(-5)) + .85*\text{expinf}(-1)$.

Delex denotes the twelve-quarter change in the real exchange rate. The real exchange rate variable is the relative value added deflator in manufacturing reported in the International Monetary Fund *International Financial Statistics*. With R the real exchange rate, Delex = $100*\log(R/R(-12))$.

2. The inflation equation in table 8.4 shows as independent variable the quarter-to-quarter change, at an annual rate, of the fixed-weight

GNP deflator. The unemployment rate is that of married men. Real exchange depreciation is defined as above. The wage inflation variable is the four-quarter change in hourly compensation in the private nonfarm economy, Winf = 100*log(Wage/Wage(−4)). The dummy variable in the regression assumes a value of 0 for 1965–72 and 1 for 1973:1 to 1983:2.

3. The inflation equation for manufacturing uses as wage inflation the quarter-to-quarter change, at annual rates, of hourly compensation in manufacturing. The unemployment rate is that of wage and salary workers in manufacturing. The real depreciation variable is defined as above.

Comment

Stanley W. Black

The paper by Dornbusch and Fischer should perhaps be retitled "Linkages of the United States Economy to the Rest of the World," since that is its principal topic and theme. As such, it is a highly useful component of a domestically oriented volume such as this one.

The paper falls into two parts, of which the first examines whether the major linkages have changed in the postwar period or more recent floating exchange rate periods, as compared with prewar experience, using descriptive statistics. The second part, together with the appendix, provides an analytical model of the linkages and some estimates of price/wage linkages in the period 1962–83.

To my taste this organization of data first, theory second leaves something to be desired. To a novice in international economics, it might appear a bit like some of my ten-year-old daughter's cake-making operations: first we get out the ingredients, then we look for a recipe to combine them! Of course Dornbusch and Fischer are expert chefs, so they know which ingredients are called for. But the unwary reader might find it useful to peruse part 2 before reading part 1.

The paper begins with a perhaps surprising fact: business cycles in four major countries were more closely in phase during the gold standard era than in either the interwar or the postwar period. This result depends on comparing Morgenstern's measures of harmonization of "classical" business cycles in the prewar periods with Klein and Moore's measure of postwar "growth cycles," a comparison that involves the use of slightly different concepts.

Dornbusch and Fischer next turn to discussion of trade linkages, showing in table 8.1 that *on average* the United States economy has

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always been relatively closed, though it reached an autarchic extreme in the 1930s. Use of the *net* service balance here is possibly misleading because of the growth in the share of services in total trade flows. However, as the authors stress, the United States economy is open *at the margin* in the sense that trade flows, though small, fluctuate as much as other components of GNP. Figure 8.2 suggests appropriately that changes in relative prices as reflected in the real exchange rate may have led to the increased importance of traded goods in the economy in the 1970s, as shown in table 8.1.

It is interesting that Dornbusch and Fischer's discussion of trade flows looks at trade in relation to income and relative prices but not, with the exception of their treatment of the gold standard period, in relation to monetary flows. I take this as a reflection of the fact that the monetary approach to the balance of payments is not particularly relevant to explaining the composition of the United States balance of payments, especially since reserve flows have usually been an unimportant component of changes in the money supply.

The digression on the Smoot-Hawley tariff argues that a tariff that is not subject to retaliation should be expansionary on both Keynesian and monetarist grounds. This argument would be more convincing if the authors could assure us that retaliation did not occur. This point is particularly worrisome in the light of current agitation to pass legislation requiring a minimum domestic content for automobiles sold in the United States.

Moving on to the discussion of asset market linkages, we note an apparent paradox in the findings: (*a*) the correlation between United States and United Kingdom monthly treasury bill rates is higher in the floating rate period 1974–83 than during the gold standard period 1876–1914; (*b*) the standard deviation of interest rate *differentials* was lower during the gold standard period than during the floating rate period. The paradox is probably due to the inflation premium in interest rates during 1974–83, which exaggerates the correlation coefficient. It might well disappear if *real* interest rates were compared rather than nominal rates.

Part 2 of the paper begins with a model of aggregate supply and demand, spelled out more explicitly in the appendix and familiar from the authors' textbook and many other places cited in a footnote. While I have no serious problems with this rather Keynesian model, Anna Schwartz and others may find things to argue with. I take it the main purpose is to describe the linkages, which is certainly accomplished.

Tables 8.7 to 8.9 offer estimates of price and wage linkages, covering 1962–83, which includes periods of both pegged and flexible exchange rates. Several questions may be raised about these estimates. Is it

proper to enter the exchange rate as a predetermined variable when the exchange rate is floating? Did wage and price controls affect the relationship? Was it unchanged over such a long period? Table 8.10 estimates that a 10% depreciation of the dollar would eventually lead to a 2% rise in prices, significantly above the usual estimate of 1.5%. One should note that the larger effect of the exchange rate on the personal consumption deflator than on the GNP deflator is due to the exclusion of imports from domestic value added (i.e., GNP).

Part 2's discussion of asset markets seems disjointed, presenting the case of perfect substitutability in the text and the case of imperfect substitutability in the appendix. As the authors note, the empirical literature has in a sense rejected both cases, since random walk models forecast about as well as any standard structural model. Since the text maintains the assumption of perfect substitutability down to the section on fiscal policy, it would be helpful to the reader to understand that this implies risk-neutral investors.

The discussion of monetary and fiscal policy notes the role of movements in the real exchange rate as a key element in the transmission process in an open economy model. The familiar Dornbusch result that the nominal exchange rate overshoots its equilibrium value in a world of high asset substitutability is explained in the context of tight money leading to a temporarily overvalued exchange rate. The benefits to inflation control can be described as a steeper Phillips curve, but it should be noted that the gain to inflation control is only temporary, because the overvaluation is necessary.

Introduction of imperfect substitutability in the discussion of monetary policy would allow treatment of different monetary policy instruments such an open market operations or exchange market intervention, which cannot be distinguished in the perfect substitutes case. Recent work by Hansen and Hodrick (1980) and Loopesko (1983) rejects the perfect substitutes model when combined with the assumption of efficient markets.

The alternative approach leads to a model of a time-varying risk premium, as shown in the authors' equation (8). Among others, Dornbusch (1982b) and Black (1985) have decomposed the risk premium into factors involving a coefficient of risk aversion, the conditional variance of the exchange rate, and the relative supply of foreign currency assets. A substantial amount of current work is aimed at identifying causes of time-varying risk premiums.

This paper closes with some rather mystifying comments on the portfolio effects of fiscal policy. The authors state that fiscal expansion will lead to exchange rate depreciation if "portfolio effects are important." This presumably refers to imperfect substitutability and would

be no surprise in the Mundell/Fleming model with low capital mobility. Finally, they suggest that the effects of fiscal policy on the stock market may be of major importance.

There are several issues affecting monetary and fiscal policy that do not make it into part 2 of the paper and that ought to be considered by business cycle theorists. These include Meade's (1951) analysis of the role of internal and external balance targets on the formulation of monetary and fiscal policy and more recent discussion by Sachs (1980) and others of the influence of real versus nominal wage stickiness on the effectiveness of monetary and fiscal policy. But the authors have provided a service to readers of this volume by discussing the major linkages between open economies.

Comment

Anna J. Schwartz

Let me begin by noting an error of omission and one of commission that I find in the paper. The error of omission is the absence of a money supply function. Dornbusch and Fischer state that if monetary authorities "attempt to stabilize interest rates in the context of a foreign budget deficit, they create a monetary expansion in attempting to fight rising domestic interest rates." That is the only reference to a disturbance that may arise on the supply of money side. Again, in summing up, they refer to the ways an IS-LM model must be modified to take account of international effects and interactions. They state that the only key structural equation that goes unamended is the money demand equation. If the money demand equation is the only key equation that goes unamended, why is there no amended money supply equation in the event authorities react to foreign influences in setting the target for the instrument they use in determining the money stock growth rate? The authors may respond that it is the United States economy only that they are examining, and United States monetary authorities do not react to foreign influences. That certainly has not been true of the whole period since 1962 that the second part of the paper focuses on. In any event the subject of foreign influences on the supply of money deserves discussion.

The error of commission I find in the paper is the assessment of the role of the exchange rate. Dornbusch and Fischer state, "The exchange rate must play a part in explaining United States inflation and in assessing the impact of policy changes on the price level." The exchange rate does not "explain" inflation. It is a necessary adjustment to in-

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flation that originates in monetary actions. I shall take up this issue at a subsequent point. My comments deal with selected aspects of the paper.

Trends and Cycles

Although the first part of the paper covers trends and cycles in the external linkages, by NBER traditional standards, there is not much on cycles. The following points occur to me.

1. The measure of openness of the United States economy in table 8.1, shown in the column of tariff proceeds as a percentage of total imports of dutiable and nondutiable goods, is dubious, as the authors indicate, but not only because a tariff that excludes all imports would have no weight in an index of this type. More important, in recent years it is not the tariff but quantitative trade restraints that are the most important barriers to openness. How to express the quantitative effect of such restraints when there is no measure of the volume of trade that does *not* take place is an intractable problem.

With respect to the exchange rate regime, fixed exchange rates under the pre–World War I gold standard implied openness to foreign disturbances. It was the rejection of this condition and the consequences for domestic economic activity that led in the interwar period to the conceptions that dominated the creation of the Bretton Woods system. Fixed but adjustable exchange rates would be the new order, but international payments imbalances would not be required to affect domestic monetary policy. Although liberalization of trade would be encouraged, capital controls were acceptable. The Bretton Woods system broke down, and we now have a system with supposedly market-determined exchange rates that are periodically managed by the industrialized countries; some relaxation of capital controls among the industrialized countries, but an increasing incidence of a varied lot of protectionist measures adopted by both industrialized and developing countries; and monetary growth rates that many central banks determine by reference to foreign interest rates and exchange rate changes. Openness seems to me a concept that defies measurement.

2. Dornbusch and Fischer note that asset market linkages in the pre–World War I and interwar economies were less tight than simple accounts of the gold standard imply. I agree that the evidence does not support the instantaneous arbitrage in goods and asset markets that the doctrinaire monetary approach to the balance of payments espouses. On the other hand, I believe that debunking the linkages under the pre–World War I gold standard can be carried too far. The main reason for this belief is that the gold standard would have broken down if the countries that formally adhered to it in fact did not intend to maintain fixed exchange rates and convertibility of the domestic cur-

rency. That rules of the gold standard were flouted from time to time merely confirms that there was leeway to delay the required response. The proof is that the gold standard did not break down before World War I. So I would not agree that pre–World War I central banks "frequently sterilized gold flows." They sometimes did for periods of limited duration that did not compromise the integrity of the standard. Sterilization clearly became more generalized during the interwar period.

In this connection, the discussion in the paper of Morgenstern's findings on asset market linkages should be tempered by reference to George Borts's criticism of both Morgenstern's methodology and his data.

3. The authors argue that the effects of the Smoot-Hawley tariff of June 1930 have been substantially exaggerated. There are two views on this issue. Frank Taussig regarded the tariff as futile and the marginal increase in duties over the Fordney-McCumber tariff of 1922 as not much more damaging. The opposite view that Allan Meltzer has expressed shows that the two-year period of the slow legislative progress to enactment of the Smoot-Hawley bill enabled our trading partners to retaliate immediately on its passage. World economic welfare clearly was adversely affected. This argument and Gottfried Haberler's stress on the intensification of the world depression as a result of the imposition of the tariff and the retaliatory measures that followed seem to me valid.

Dornbusch and Fischer cite the fact that the quantity of United States imports rose smartly in 1922–23 despite the imposition of the Fordney-McCumber tariff, thanks to business expansion. Although the quantity of exports declined, that did not interrupt the expansion. The quantity both of imports and of exports declined in 1931–33 following Smoot-Hawley, but the decline in import values was much steeper than that in import quantities. The authors contend that had there been sensible macroeconomic policy after 1930, the connection that Meltzer finds between the tariff, declines in exports of agricultural goods, and bank failures in agricultural regions would not have resulted in a great depression. Moreover, even a generous allowance for a multiplier effect of the tariff-based decline in exports would account for only 3% of the 15% decline in United States real GNP between 1929 and 1931. I am in general agreement with this view, although the effects in the rest of the world probably were more severe. I do not, however, understand the statement in the paper, "In addition to the tariff, net exports were, of course, affected by the extensive competitive depreciation on the part of foreign countries." What "competitive depreciations"? Is this a reference to Britain's abandonment of gold in 1931? To the depreciation in 1936 following the United States depreciation in 1933–34? Were these "competitive"?

Open Economy Linkages

In part 2 of the paper, Dornbusch and Fischer trace open economy linkages in the goods market, between the goods market and factor prices, in asset markets, and in monetary and fiscal policies. The models presented are Keynesian. For example, the equation for the goods market equilibrium is strictly demand determined. There is no reference to the possibility that supply reacts to price changes, particularly if the changes are unexpected. The notion of transmission through a multiplier effect of foreign purchases of home goods that leads to an increase in output and employment in my view encourages the drift to protectionism. We know from the current recovery in this country that it is feasible to achieve a strong growth rate of real GNP with a balance of trade deficit. As the authors note, Darby and Stockman find very weak multiplier effects in their international model. In a Saint Louis–type equation for GNP, the evidence presented by Batten and Hafer also suggests that accounting for export activity is not statistically important for the Untied States. So emphasis on the linkages between foreign trade and aggregate demand seem to me overdrawn. International linkages are also identified in the terms for wealth and disposable income that affect the world real interest rate, but the paper admittedly does not define their impact on the aggregate demand for United States goods. A final channel mentioned is the wealth effect of "persistent international capital movements, for instance, arising from persistent public sector deficits." I shall refer to the channel in a different context later on.

The markup price equation is the basis for theorizing about the effects of a rise in import prices and materials on aggregate demand and supply: a direct route through the effects of import prices on domestic markups and on costs and thus prices, and indirect routes through the effects on wage settlements in industries involved in the international economy and the effect of demand pressures from abroad on domestic prices.

Nine quarterly regressions for 1962–83 are presented to test the theoretical impacts of the external sector on domestic inflation based on the markup equation, sets of three regressions each with the dependent variable the rate of change first of the GNP deflator, second of the personal consumption deflator, and third of wages, not otherwise identified. According to the results, exchange rate changes, the rate of change of hourly wage rates and of output per hour in manufacturing, and the rate of change of the price of oil and gas can explain about 80% of the variance of the deflators. In the regressions on the rate of change of wages, exchange rate changes, the log of unemployment for married men and expected inflation can explain about 50% of the variance of wages. The most significant variable is the expected inflation

rate. Dornbusch and Fischer conclude that exchange rate changes have relatively quick direct effects on prices and a slower-working indirect effect on wages.

I believe the results of the regressions reflect how some of a necessary adjustment was worked out. The regressions do not explain why an adjustment was necessary. A price level equation can of course be obtained by equating nominal money supply and demand and solving for the price level. By opening to view the monetary source of the price rise, such an equation will demonstrate that an adjustment is necessary.

In considering the asset market, Dornbusch and Fischer indicate that answers to the questions whether domestic and foreign bonds are perfect or imperfect substitutes, whether the stock market should be accorded a role, and whether the redistribution of wealth through the current account is important for the determination of the exchange rate and macroeconomic equilibrium help analyze the implications of sustained fiscal deficits and of long-term current account deficits. The conclusion is that under flexible rates, with perfect substitutability an increase in the money stock leads to overshooting of the exchange rate because prices are sticky, real balances increase, and output expands while the real and nominal interest rates fall. The ensuing inflation returns the real exchange rate to its long-run equilibrium value. Thus monetary and fiscal policy affect the real exchange rate as well as the real interest rate channel.

Whether overshooting would in fact occur depends on whether inflationary expectations come into play when the money stock is increased. Dornbusch and Fischer agree that overshooting is not inevitable if output expands initially to raise the nominal interest rate. I would put it differently. There may be no output effects given inflationary expectations but simply higher nominal interest rates.

The asymmetry in adjustment speeds between goods and asset markets, they argue, establishes a link between tight money and significant transitory exchange rate overvaluation. Since tight money works rapidly and strongly on the exchange rate, disinflation therefore can take place more rapidly.

I do not see the close connection between money growth rates and real exchange rates in 1982 and 1983. During the four quarters of 1982 real exchange rates rose 13%. M1 rose 8.5%. Was that tight money? In the first quarter of 1983, the real exchange rate fell 3.5% while money growth accelerated from the fourth quarter 1982 annual rate of 9.9 to the first quarter 1983 annual rate of 14.3. The deceleration of money growth in the second quarter of 1983 of one-half a percentage point was accompanied by an increase in the real exchange rate of 2.9%.

To affirm a close connection between money growth rates and the exchange rate during this period, one has to appeal to the appreciation

of the exchange rate as proof that double-digit money growth rates are not excessive. This is Martin Feldstein's dubious argument in the 1984 annual report of the Council of Economic Advisors: "The fact that the price of the dollar in foreign exchange markets remained high throughout 1983 is a clear signal that the market had confidence in the Federal Reserve and that the money growth rate was not excessive" (p. 62). That remains to be seen.

Turning to fiscal policy, Dornbusch and Fischer assume that sustained fiscal expansion raises long-run aggregate demand. I presume they mean budget deficits. Unless monetized, in my view, deficits have no such effect. If financed by borrowing, deficits will bring about crowding out.

While the crowding-out effect in the goods market is said to lead to appreciation, clearing asset markets in the case of debt finance requires depreciation to maintain portfolio balance. Whether appreciation or depreciation will result, the paper says, depends on the relative importance of portfolio effects versus aggregate demand effects. It seems clear that typically portfolio effects dominate, since budget deficits have usually accompanied depreciating currencies, another reason I do not believe that deficits raise aggregate demand. Dornbusch and Fischer conclude that the risk premiums in financing budget deficits by issuing bonds in the expanding country's currency can be avoided by financing in the currency of other countries so that the currency composition of world outside assets remains unchanged. I note that empirically the model of diversification has not worked very well.

Conclusion

I would like to conclude by reporting a view of the relation between fiscal and foreign sector deficits that Jan Tumlir presented at a recent Shadow Open Market Committee meeting. He noted a decline in the global savings ratio attributable to unprecedented fiscal deficits in both industrial and developing countries and the swing from a large current account surplus to a deficit of the OPEC group. Countries are competing for the limited supply of world savings. While the savings ratio in Japan is 30% of GNP, in the United States it currently is only 15%–16%. Japan, faced with intense trade discrimination abroad, cannot find investment opportunities at home to absorb its national savings. In the United States, on the other hand, investment opportunities are growing so rapidly that domestic savings cannot finance them without inflation. The United States therefore turns to foreign sources of savings. The only way to borrow capital abroad is through a current account deficit.

Tumlir remarked that the role of the real exchange rate in hurting United States exporters has been exaggerated. Despite the high exchange rate of the dollar, cyclical conditions abroad, and increased competition for export orders in the rest of the world, United States total real exports during the initial twelve-month period following the

business cycle trough in November 1982 rose at a somewhat higher rate than they did in the comparable periods following the troughs of March 1975 and July 1980. Only United States real exports to oil-exporting LDCs are currently depressed. At the same time, the exchange rate helps keep domestic prices more competitive. In any event, exchange rate changes are not an independent contribution to inflation or deflation but an integral part of the mechanism by which inflation or deflation develops from the original monetary impulse.

Tumlir ended his remarks by noting possible outcomes given the current account deficit that provides the foreign capital in the absence of adequate savings to finance all attractive United States investment opportunities. Under free trade, the industries most affected by the import competition would be those with the least attractive investment opportunities. Their shrinkage would be irreversible when the investment cycle ran its course or fiscal deficits ended. When a government grants protection to selected industries, however, investment prospects improve in these industries. Industries with more promising prospects then face intensified competition from abroad, since the imports through which it would have been most economical to transfer the capital from abroad are restrained. The more promising prospects in the unprotected industries will deteriorate, and resources will be shifted to the protected industries.

The implication I draw from Tumlir's analysis is that the problem is not the current account deficit or the strong dollar. The problem is the world's low savings ratio, which fiscal deficits exacerbate. As for the level of the real interest rate, it is clearly positive now after years of negative real rates. Whether real rates are regarded as above their equilibrium level depends on an estimate of inflationary expectations. I doubt that averaging the last three years of actual inflation is an adequate measure of United States and world market expectations. We shall do more to restore real rates to whatever their equilibrium level is by eliminating once and for all the recurrence of variable and rising inflation rates.

Discussion Summary

Robert Gordon took issue with the large total effect of exchange rates on wages and prices found by the authors. He noted that the effect was much greater than he had found previously and that, in retrospect, even his coefficients had overstated the impact of exchange rate appreciation on inflation in 1981–83. He felt their finding was due to their arbitrary specification of inflation expectations and their failure to allow

price markups to depend on domestic demand or to attribute some of the acceleration of inflation in 1974 to the lifting of wage and price controls.

Robert Eisner and Geoffrey Moore both expressed concern that the authors had examined the role of foreign variables on the GNP price deflator, which, they argued, would fall when import prices rose, ceteris paribus. Moore noted that the gross domestic purchases deflator did not have this defect and, in addition, was more comprehensive than the deflator for consumers' expenditure.

Allan Meltzer elaborated on his analysis of the effects of tariffs on the domestic economy. He noted that the Fordney-McCumber tariff was harder to dismiss as a contributor to the 1923 recession than was the Smoot-Hawley tariff in the Great Depression. He noted that the retaliation to the Smoot-Hawley tariff may, however, have exacerbated the Great Depression through its impact on agricultural land prices and income, and hence on bank failures in agricultural areas.

Stanley Fischer doubted that the strong impact of exchange rates on output was due to the authors' omission of a variable to capture the relaxation of price controls in 1974, since the lags in the estimated equation were too short to allow price controls to work in the manner Gordon suggested, but he did concede that the price expectations term estimated was possibly misleading. Rudiger Dornbusch noted that agricultural prices in the rest of the world fell by more than those in the United States in the Great Depression. Thus United States agricultural tariffs kept domestic prices higher than world prices and could not have caused land prices to fall by more than they would have without tariffs.

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