

The Effects of OPEC and Economic Policy on Worldwide Real Interest Rates

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Interest rates in real, or inflation-adjusted, terms scaled record heights in the United States during the early 1980s. What has not always been appreciated, however, is that the increase in rates was a worldwide phenomenon. The global nature of the rate movement can readily be explained by the high degree of mobility that characterizes today's international capital markets. Such mobility means that, almost regardless of where they occur, policy changes or other events can in principle affect real interest rates both here and abroad. While this interconnectedness of the international economy is clear, there nonetheless remains the question of what particular factors caused the worldwide surge in real interest rates during this period.

In keeping with the conventional view, Martin Feldstein (1985) claims that expansionary U.S. fiscal policy was mainly responsible, for it pushed up foreign as well as domestic rates and also induced foreign governments to impose contractionary monetary policies to defend their currencies. A less familiar factor that may have affected real interest rates worldwide is the behavior of the Organization of Petroleum-Exporting Countries (OPEC). Following the oil price hikes of 1973-74 and 1979-80, oil exporters enjoyed enormous current account surpluses. To a considerable degree, these nations recycled their surpluses into the financial markets of the major industrialized countries, at times

supplying a major source of funds to those markets.

This study investigates the links between real interest rates and budget deficits, monetary policy, and OPEC surpluses in the seven largest industrial economies (the United States, the United Kingdom, Germany, France, Italy, Japan, and Canada) during the 1970s and early 1980s.¹ The results indicate that widening budget deficits and slowdowns in money growth were associated with higher real interest rates during those years, while increases in OPEC's surpluses were associated with lower rates. The findings also suggest that U.S. policy actions affect rates in the other six OECD countries and that policy actions by those countries as a group can have a significant impact on this nation's domestic rates. Apparently, a combination of factors—large budget deficits and tighter monetary policy both in the United States and abroad, along with a sharp drop in OPEC's surpluses—exerted upward pressure on real interest rates during the early 1980s. Thus, it is not surprising that rates reached unprecedented heights.

Before turning to a discussion of possible determinants of real interest rates, it is useful to consider how rate movements can spread rapidly through international capital markets. This integration seems evident in the broad similarities of actual movements in short-term real interest rates, which are documented for all seven industrialized countries over the period 1960-84. The statistical model used for this study, a version of the loanable funds model of

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Looking at the seven largest industrial economies, this study shows that, during the 1970s and early 1980s, widening budget deficits, straitened money growth, and a pronounced swing in OPEC's current account from surplus to deficit were linked with higher real interest rates.

interest rate determination extended to allow for the effects of OPEC surpluses and international capital mobility, as well as empirical estimates of the model, are detailed in an accompanying box (see p. 35). Throughout this article, emphasis is given to interpreting the intuitive dimensions of the results.

Integration of Financial Markets

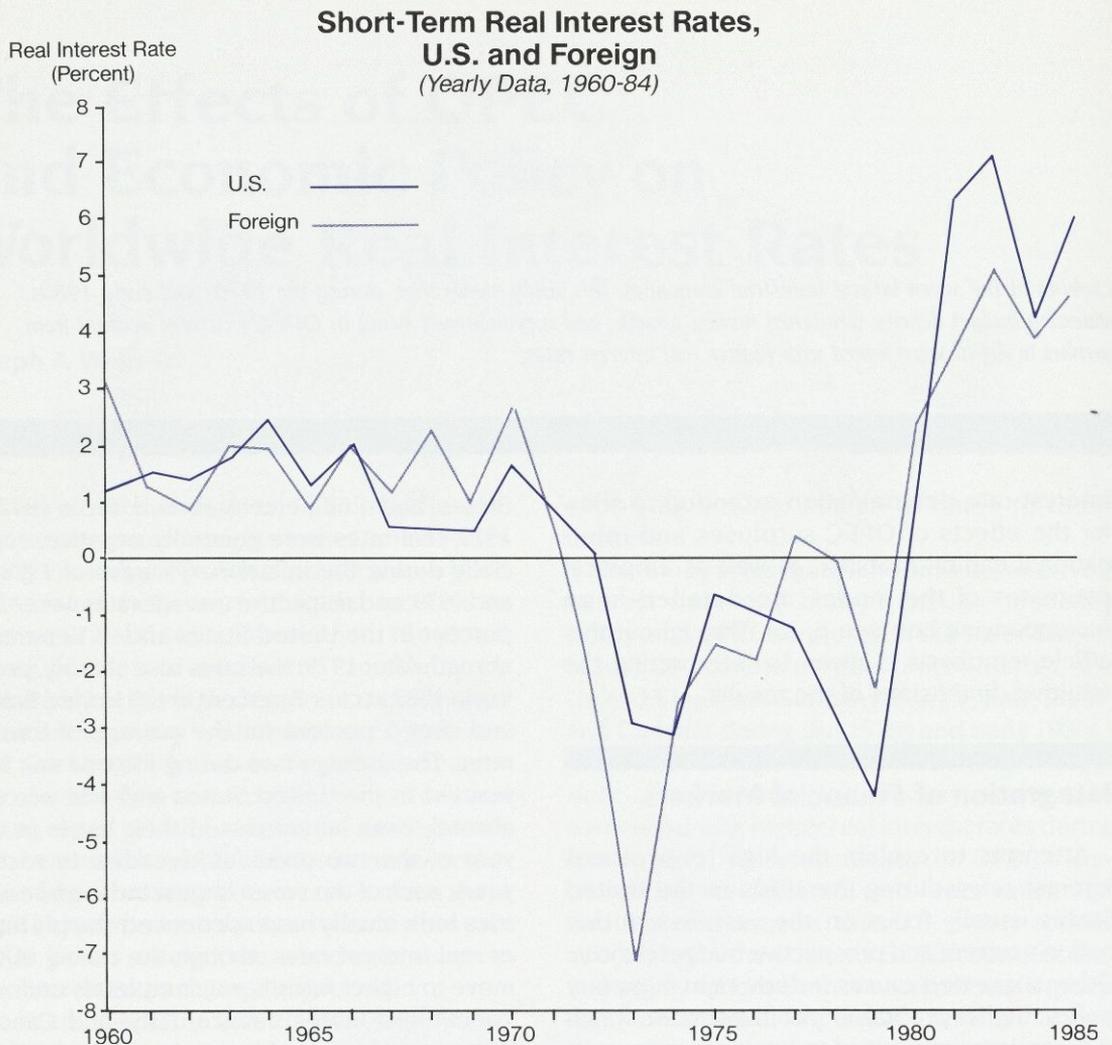
Attempts to explain the high level of real interest rates during the 1980s in the United States usually focus on the vastness of this nation's current and prospective budget deficits. Other suggested causes include tight monetary policy; higher profitability of investment, which is sometimes attributed to business tax cuts in the United States; greater uncertainty about future inflation; and deregulation of financial markets.² Unfortunately, such U.S.-centered approaches tend to ignore the international nature of the rate phenomenon.

When the short-term *ex post* real interest rate on U.S. Treasury bills is plotted against a weighted average of similar rates in Japan, Germany, France, Italy, the United Kingdom, and Canada for the years since 1960, some striking similarities emerge (see Chart 1).³ At the risk of oversimplification, the data seem to fall into three periods. From 1960 to 1971, both of these real interest rates were always positive, fluctuating between zero and 3 percent. The average rate for the period was 1.33 percent in the United

States, and 1.68 percent abroad. From 1972 to 1979, real rates were generally negative, especially during the inflationary surges of 1973-74 and 1979, and respective average rates were -1.96 percent in the United States and -2.19 percent abroad. After 1979, real rates rose sharply, peaking in 1982 at over 7 percent in the United States and over 5 percent for the average of foreign rates. The average rate during 1981-84 was 5.88 percent in the United States and 4.33 percent abroad; both far surpassed their levels in any year of the two previous decades. In recent years, each of the seven largest industrial countries individually has experienced sharply higher real interest rates, though the timing of the move to higher rates is not completely uniform. The United States, France, Italy, and Canada first moved to record high rates around 1981, a year after Japan, Germany, and the United Kingdom.

The degree of cross-country uniformity in interest rate movements is statistically embodied in the correlation coefficient for pairs of the seven countries (see Table 1).⁴ Because of the way correlation coefficients are calculated, they must lie between plus one and minus one. A positive correlation indicates that when one variable rises, the other usually rises also; a negative correlation indicates that when one variable rises, the other usually falls. A zero correlation implies that knowing the movement of one variable provides no information about the direction of movement of the other. When large positive (or negative) correlations are present,

Chart 1.



Source: See data appendix.

knowing the movement of one variable gives a lot of information about the movement of the other; in extreme cases where the correlation equals plus or minus one, each variable can be predicted perfectly on the basis of movements in the other.

In every case the correlation between the countries' short-term real interest rates is positive, indicating that rates in each pair of countries tended to move at the same time and in the same direction during this period. Taking the United States versus each of the other six countries, the correlations range from a minimum of

0.477 (with Germany) up to 0.857 (with Italy).⁵ The large number of sizable positive correlations (14 out of 21 pair-wise correlations are larger than 0.5) corroborates the idea that interest rates in these countries are linked in some way, rather than being independent of one another.

As mentioned earlier, one connection between real interest rate movements in different countries arises from the international mobility of financial capital. To some degree, real interest rates may be determined on a global basis because large amounts of financial capital can

Table 1.
**Correlation Matrix of Short-Term
Real Interest Rates in Seven OECD Countries, 1960-84**

	U.S.	U.K.	Germany	France	Italy*	Japan	Canada
United States	1.000	.699 (.000)	.477 (.016)	.816 (.000)	.857 (.000)	.591 (.002)	.792 (.000)
United Kingdom	.699 (.000)	1.000	.398 (.049)	.646 (.001)	.724 (.003)	.436 (.029)	.623 (.001)
Germany	.477 (.016)	.398 (.049)	1.000	.584 (.002)	.387 (.172)	.093 (.658)	.453 (.023)
France	.816 (.000)	.646 (.001)	.584 (.002)	1.000	.862 (.000)	.448 (.025)	.693 (.000)
Italy*	.857 (.000)	.724 (.003)	.387 (.172)	.862 (.000)	1.000	.706 (.005)	.695 (.006)
Japan	.591 (.002)	.436 (.029)	.093 (.658)	.448 (.025)	.706 (.005)	1.000	.616 (.001)
Canada	.792 (.000)	.623 (.001)	.453 (.023)	.693 (.000)	.695 (.006)	.616 (.001)	1.000

Significance levels are given in parentheses below the correlations.

* Because of missing data, the correlations involving Italy cover only the years 1971-84.

move quickly to seek higher real returns in another country's capital market. Given this rapid funds mobility, policy changes or other events that raise real interest rates in one nation should spill over to lift rates elsewhere as well. In the extreme case of perfect capital mobility, real interest rates would presumably be equalized internationally, and all the correlations in Table 1 would be one. However, financial market integration for these seven countries was incomplete for the years 1960-84, as indicated by the number of correlations that are positive but considerably smaller than one.⁶

Another possible linkage would arise if there are common factors in the world economy that influence interest rates in all these countries simultaneously. A plausible candidate during this period is the impact of OPEC's surpluses.

Macroeconomic Determinants of Real Interest Rates

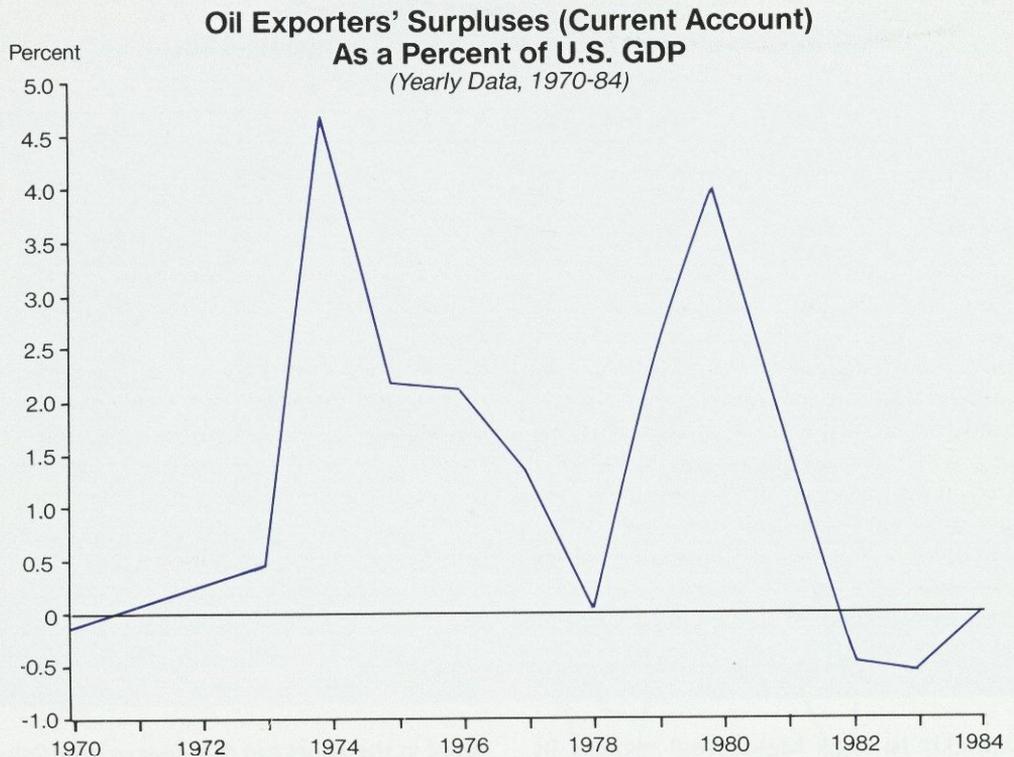
Monetary and Fiscal Policy. Conventional economic wisdom holds that monetary and fiscal policy alike can affect the real interest rate, at

least in the short run of a year or two. Other factors being equal, slow growth of the money supply and large budget deficits both push real interest rates upward.

In recent years, however, the accepted view has been challenged on theoretical as well as empirical grounds. Arguing theoretically, Robert J. Barro (1974) contends that rational households would recognize that for a given course of government expenditure, a larger deficit today will require higher taxes in the future to service the debt. To maintain their individually preferred consumption paths, households would react to present changes in the deficit with offsetting changes in their patterns of saving. The net effect of this behavior would be to prevent a shift in the deficit from altering aggregate demand or real interest rates.

Empirical studies on the relationship between U.S. budget deficits and real interest rates have yielded mixed, even conflicting, results.⁷ One reason for such an outcome is that a number of different measures exist for the stance of fiscal policy. For example, the budget deficit usually reported in the press may not equal the total borrowing by the government, in

Chart 2.



Source: See data appendix.

part because the figure excludes borrowing by certain federal agencies such as the Postal Service and the Federal Home Loan Banks. In addition, many analysts adjust the deficit to try to remove the effects of cyclical fluctuations. Economic downturns tend to increase the reported deficit more or less automatically, as they cut tax revenues while boosting government spending on programs such as unemployment compensation. Economic booms have the opposite effects. Such shifts in the deficit can be interpreted not as changes in fiscal policy but as the consequences of other shocks to the economy. The "structural" or "full-employment" deficit is an adjusted measure to reflect what the actual deficit would be in the absence of cyclical fluctuations. Alternatively, some analysts adjust reported deficits to incorporate the gain to the government from inflation's effect on the real value of previously issued debt. Finally, portfolio considerations have led some authors to

focus on the level of outstanding debt relative to gross national product (GNP), rather than on the deficit figure itself, as a measure of fiscal policy.

Given the ambiguous results produced by these studies, the link between budget deficits and real interest rates remains uncertain in the case of the United States. Investigations that focus on the experience of other countries also yield mixed results. While Michael M. Hutchison and David H. Pyle (1984) report that, for the seven largest OECD countries, higher budget deficits have a significant impact in raising real interest rates, Demetrios S. Giannaros and Bharat R. Kolluri (1984) find no significant relationship between the two in the majority of the six industrialized countries they analyze.

In all the foregoing analyses, each country's budget deficit is seen as affecting only its own real interest rate. However, if world capital markets are truly integrated, then budget deficits

and other possible determinants of real interest rates in the United States may affect rates abroad, and vice versa. Within an international context, many analysts have homed in on U.S. budget deficits—for example, Martin Feldstein (1985) and William H. Branson (1985)—or a combination of loose fiscal and tight monetary policy in this country in order to explain the worldwide rise in real interest rates during the early 1980s.⁸ Unfortunately, relatively little attention has been focused on policy actions in other countries, no doubt partly because each of the other OECD countries has a substantially smaller economy than the United States. Taken as a group, though, the other major OECD countries are larger than the United States in economic size. In a world of capital mobility, this relationship suggests that their policy actions might be important determinants of real interest rates.

A few researchers who have examined policy actions in the OECD as a whole have questioned the predominant role of the U.S. budget deficit in explaining interest rate movements during the early 1980s. They point out that the expansion in the U.S. structural deficit occurred at the same time that such deficits were shrinking in some other countries, notably Japan, Germany, and Britain. Paul Atkinson and Jean-Claude Chouraqui (1985) claim that while this nation's structural deficit (including state and local governments) increased by 3.3 percent of the U.S. GNP between 1979 and 1985, the aggregate deficit for the seven biggest OECD economies (including the United States) rose by only 0.3 percent of combined GNP.⁹ Looking at the aggregate pattern of government deficits among the major countries, Olivier J. Blanchard and Lawrence H. Summers (1984) conclude that the increase was too small to explain the surge in real interest rates that occurred early in this decade.

Returning to the question of measurement, Sweder Van Wijnbergen (1985) maintains that structural deficits are not appropriate in analyzing the effects of fiscal policy on interest rates, for it is the actual deficit that must be financed in the capital markets.¹⁰ Using inflation-adjusted measures of actual budget deficits, he shows that the gaps widened considerably during the early 1980s, not only in the United States but in other major OECD countries as well. Another measure of fiscal policy, the ratio of debt to

GNP, even suggests that although U.S. fiscal policy was loose in the early 1980s, it was looser still in other major industrialized countries.¹¹

OPEC Surpluses. Another factor that may have affected real interest rates globally is OPEC's capital outflow. Twice in recent years, sharp oil price increases have been followed by enormous trade and current account surpluses for OPEC. As they were "recycled" through the international financial system, these surpluses can be looked at as having been a major source of loanable funds in the capital markets of industrialized countries. From another perspective, the funds generated by the higher price of oil can be interpreted as a major transfer of income from industrialized countries and non-oil-exporting less developed countries (LDCs) to oil exporters. If the latter save more than the oil importers, then the income transfer will raise worldwide savings and possibly lower real interest rates on a global basis.¹²

Considering the vastness of OPEC's current account surpluses in the years just following the major oil price hikes, it seems plausible that the group's marginal propensity to save indeed surpassed that of the oil importers, at least in the short run of a year or two. Over the period 1970-84, the oil exporters' surpluses underwent sizable swings (see Chart 2).¹³ Starting from a small deficit in 1970, the surplus soared after the first oil price shock, which was associated with the Arab-Israeli war of late 1973, to peak in 1974 at 4.7 percent of U.S. gross domestic product (GDP). Over the next several years, as OPEC members' spending rose in response to their higher level of income, their current account surplus dwindled, turning into a small deficit in 1978. At that point the Iranian revolution set off the second oil price shock, producing surpluses that reached 4.0 percent of U.S. GDP in 1980. Just two years later, however, the oil exporters' surplus had disappeared.

Relative to worldwide savings, OPEC's current account surplus may have been too small to affect global interest rates significantly. At its peak, OPEC's surplus was about 6 percent of gross savings in the OECD countries. Nonetheless, results of econometric analysis by Jo Anna Gray and Peter Hooper (1983) suggest that the second OPEC shock may have accounted for somewhat more than half the rise in short-term real rates between mid-1979 and mid-1981 and

Table 2.
**Correlations between OPEC's Current Account Surplus
and Short-Term Real Interest Rates in Seven OECD Countries**

	U.S.	U.K.	Germany	France	Italy	Japan	Canada
Correlation	-.471	-.536	-.027	-.525	-.575	.102	-.388
Significance Level	(.076)	(.040)	(.924)	(.044)	(.032)	(.717)	(.153)

Note: To adjust for inflation and growth, OPEC's current account surplus was expressed as a percentage of U.S. nominal GDP. Annual data for the period 1970-84 were used for all countries except Italy; in that case, the sample period was 1971-84.

that it contributed to maintaining high rates at least through 1982.¹⁴ Another meaningful measure is to compare OPEC's surplus with the U.S. budget deficit. From 1980 to 1982, OPEC's surplus declined by 4.6 percent of U.S. nominal GDP while our domestic budget deficit grew by a relatively small 1.8 percent of GDP.

Correlation coefficients indicate that high surpluses for oil exporters were associated with low real interest rates during the period 1970-84 (see Table 2). All of the correlations for the seven leading OECD countries are negative, as would be expected if oil exporters' surpluses raised the supply of loanable funds, thereby pushing down real interest rates. The United Kingdom, France, and Italy all have correlations larger (in absolute value) than 0.5, and the U.S. correlation is nearly that large; only the German and Japanese interest rates show little correlation with OPEC's surpluses.

It seems clear that both budget deficits and OPEC surpluses had some bearing on real interest rates worldwide and that integrated capital markets provided a medium for the spread of rate movements. The model that is detailed in the accompanying box takes all these factors into account (see p. 35).

Interpreting the Model's Results

The regression results from the model used in this study indicate that a number of factors—particularly budget deficits at home and abroad, monetary policy at home and abroad, and the

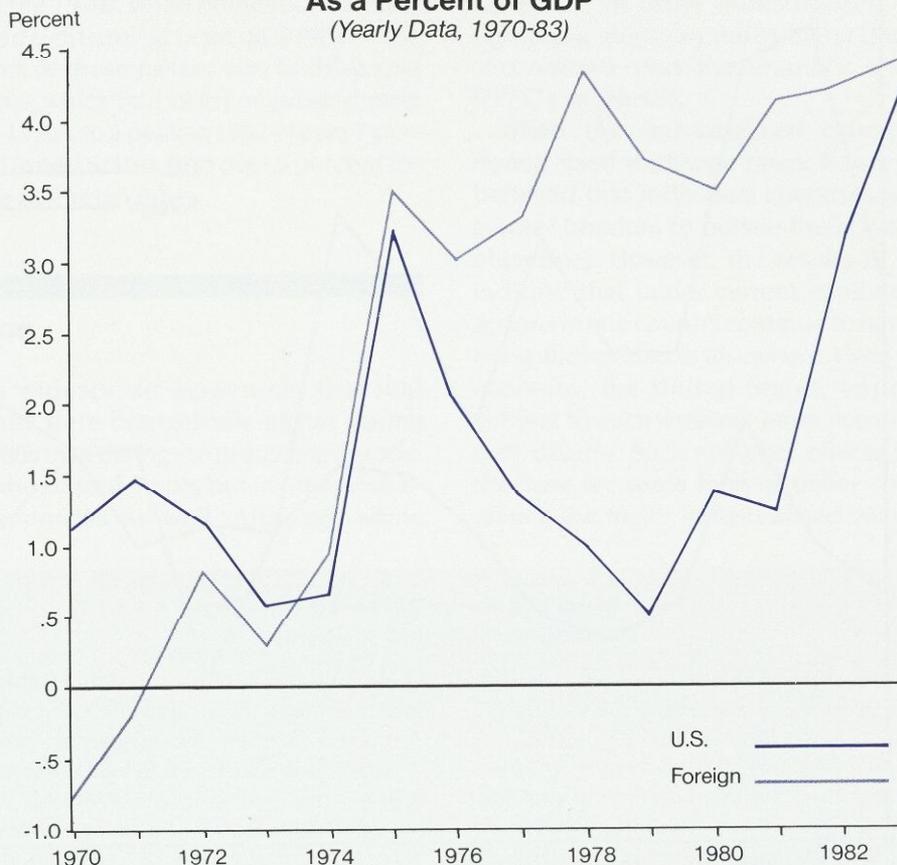
size of OPEC's surplus—all help to determine real interest rates in each country. These explanatory factors changed considerably over the years of the sample (1971-83), thereby providing insight into the causes of the dramatic swings in real interest rates since the early 1970s.¹⁵

In the case of the budget deficit, a time plot of the central government budget deficit for the United States as well as a weighted average deficit for the other six countries reveals the growing size and frequency of our domestic budget deficits in recent years (see Chart 3). Note that, within the model, the budget deficit was not adjusted for cyclical or price effects. Using this measure, the U.S. deficit exceeded 1 percent of GDP during only two years of the 1960s, whereas it did so in seven years of the last decade and every year of the 1980s.

Budget deficits in the other six countries have also been large in recent years.¹⁶ For the period from 1960 into the early 1970s, the weighted average usually shows a small surplus. In 1975, however, the weighted average deficit soared to over 3 percent of these countries' nominal GDP. Moreover, their average deficit remained at or above 3 percent of GDP during each of the ensuing years of the sample period. It is important to note that the increase in the weighted average deficit for the six foreign countries is not attributable to larger deficits in just one or two countries.¹⁷ All six foreign countries had sharply larger budget deficits in 1975 and ensuing years than previously. Though surplus years were fairly common for many countries during the 1960s, none had even a single year of budget surplus after 1974.

Chart 3.

**Central Government Budget Deficits
As a Percent of GDP**
(Yearly Data, 1970-83)



Source: See data appendix.

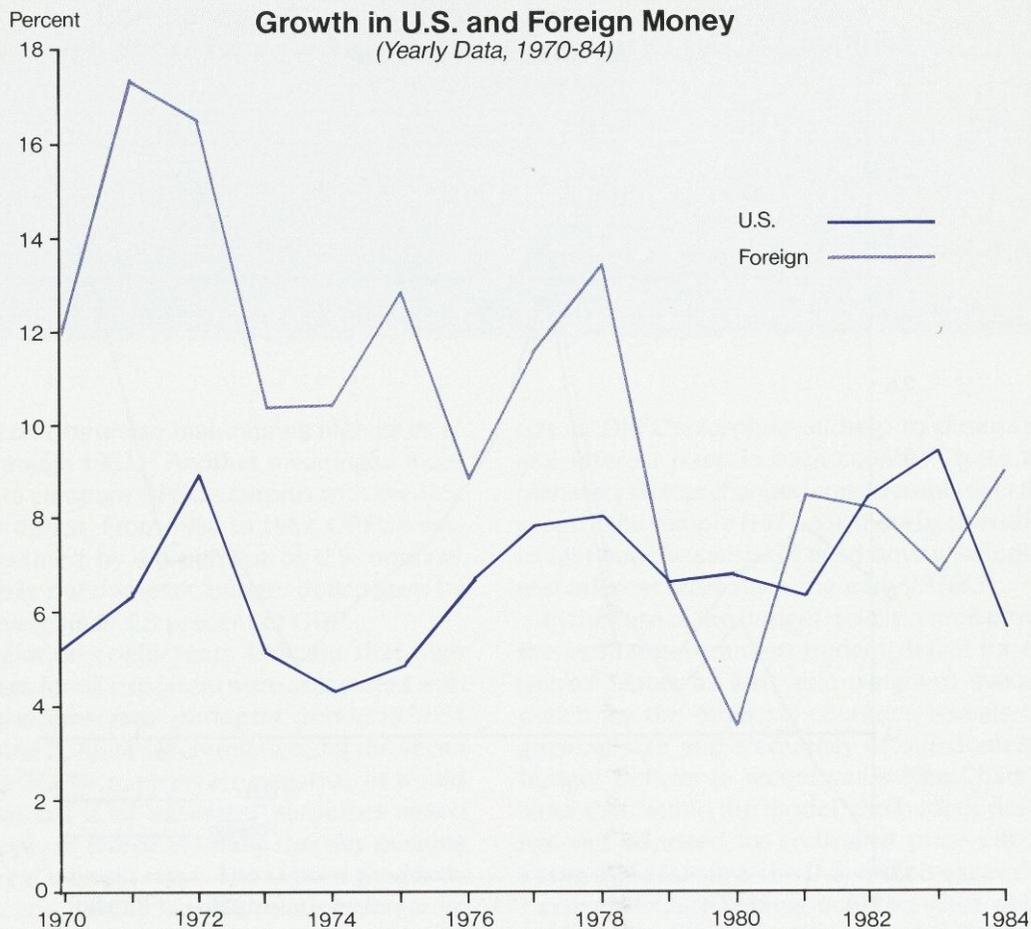
Monetary growth has also fluctuated considerably over the sample period. (See Chart 4, a time plot of annual M1 growth in the United States, as well as a weighted average of growth rates for analogous monetary aggregates in the other six countries.) In the early 1970s, U.S. money growth picked up in the aftermath of the mild recession of 1970. At the same time, money growth soared dramatically abroad, especially in 1971-72, probably as a by-product of the attempts of foreign central banks to stave off the decline of the dollar during the breakup of the Bretton Woods system. This upsurge in money growth helps explain the sharp decline in real interest rates that occurred in 1972 and 1973, particularly considering that other explanatory

variables such as budget deficits and OPEC's surplus showed little change in those years.

As for the OPEC surpluses, the first oil price shock of late 1973 resulted in massive payments surpluses for oil exporters. The level reached 4.7 percent of U.S. nominal GDP in 1974 and stayed above 2 percent through 1976. Since these surpluses were largely invested in the financial markets of the seven countries in this study's sample, they may have helped keep real interest rates down during these years.

By 1977, OPEC's surpluses were fading away, while foreign budget deficits, which had soared in the recession year of 1975, remained much larger than in the 1960s. Nevertheless, fairly low real interest rates persisted both in the United

Chart 4.



Source: See data appendix.

States and abroad, probably because of another round of rapid money growth in the industrialized countries. As in the early 1970s, speedy money growth outside the United States may have been a by-product of the attempts by foreign central banks to slow the depreciation of the dollar.

In early 1979, the Iranian revolution set off another round of oil price hikes. As a result, the external surplus of the oil exporters rose dramatically in that year, by over 2 percent of U.S. nominal GDP, and peaked in 1980. Meanwhile, in order to fight inflation, central banks tightened monetary policy markedly, particularly outside the United States: average foreign money growth fell from 13.3 percent in 1978 to

only 3.4 percent in 1980. In this environment, real interest rates plummeted in 1979 but rose the following year to the highest levels since the early 1970s.

In the last three years of the sample period (1981-83), a number of factors combined to push real interest rates to record levels. During that time, both the U.S. and the average foreign real interest rate exceeded levels attained in the preceding two decades. One factor spurring rates was the sharp increase in the U.S. budget deficit, which reached a record level of 4.3 percent of nominal GDP in 1983. Although budget deficits rose more modestly abroad, their average exceeded 4 percent of foreign GDP for each year from 1981 to 1983. Meanwhile, from 1980 to 1982,

OPEC's current account swung from a huge surplus to a sizable deficit, declining by 4.5 percent of U.S. nominal GDP. Finally, monetary growth outside the United States remained well below the rates of the 1970s, while domestic monetary policy stayed tight until at least mid-1982.¹⁸ The overall effect of these factors was to drive real interest rates, which had been negative during most of the 1970s, to a peak in 1982 of over 7 percent in the United States, and over 5 percent for the average of foreign rates.

Conclusion

There is widespread agreement that real interest rates were dramatically higher during the early 1980s than during the preceding decade, not just in the United States but in other industrialized countries as well. Although some

attribute the worldwide surge in real interest rates almost exclusively to rising U.S. budget deficits, this article presents evidence of other contributing factors. Among them are loose fiscal policy in other industrialized countries, tightening monetary policy in the United States and abroad, plus the dramatic shrinkage of OPEC's surpluses.

When the industrialized countries abandoned fixed exchange rates, it was commonly believed that individual countries would have greater freedom to pursue their own economic objectives. However, the results in this paper indicate that under current conditions, policy actions in one country continue to have substantial spillover effects elsewhere. Even the largest economy, the United States, appears to be subject to such external influences to a significant degree. Such spillover effects strengthen the case for some form of policy coordination among the major industrialized countries.

A Loanable Funds Model of Interest Rate Determination

The Model. To investigate further the relationship between budget deficits, oil exporters' surpluses, and short-term real interest rates, the framework of Michael M. Hutchison and David H. Pyle (1984), who related the real short-term interest rate in each country to local factors such as the respective budget deficit, can be extended by adding two factors representing conditions in the outside world:

$$r_{it} = f(B_{it}, Z_{it}, OPEC_t, XRR_{it}, e_{it}), \quad (1)$$

where r_{it} is the real interest rate in country i during time period t ; B_{it} is the fiscal budget deficit of country i in period t , expressed as a percentage of its GDP (it is not adjusted for cyclical or price effects); Z_{it} is a vector of other local influences on country i 's real interest rate; $OPEC_t$ measures the aggregate net foreign lending of the oil-exporting countries as a percentage of U.S. nominal GDP; XRR_{it} is a weighted average of real interest rates in countries other than country i ; e_{it} is the error term.

Equation (1) specifies the real interest rate in country i to be a function f of external influences ($OPEC_t$ and XRR_{it}) as well as local factors (B_{it} and Z_{it}).¹ Just as the local budget deficit represents a demand for loanable funds in each country, OPEC's surplus represents a source of funds for them all.²

The average external real interest rate for each country (XRR_{it}) is included to capture the impact on country i 's interest rate of partial capital mobility; if rates outside country i rise, perhaps because of monetary or fiscal policy changes by those other countries, then capital flows will tend to pull rates up in country i as well.

The vector Z_{it} represents all local variables (other than B_{it}) that affect r_{it} . If equation (1) is estimated in a regression framework, it is particularly important that Z_{it} include any "true" explanatory variables that are correlated with B_{it} , $OPEC_t$, or XRR_{it} ; otherwise, the coefficients on B_{it} , $OPEC_t$, and XRR_{it} are likely to be biased.³ Following Hutchison and Pyle, two variables are included in Z_{it} : money growth (DM_{it}) and the unemployment rate (U_{it}). Each country's money growth is incorporated as a measure of monetary policy, which may have some influence over its real interest rate, especially the short-term rates considered here. An increase in money growth is presumably associated with an increase in the supply of credit and, hence, with lower real interest rates. The unemployment rate is included in Z_{it} as a way of adjusting for possible cyclical movements in real interest rates caused by cyclical movements in private credit demand and supply.⁴

continued on next page

continued from page 35

As noted earlier, some investigators prefer to use structural or cyclically adjusted budget deficits to try to eliminate this bias. However, Blanchard and Summers (1984) and Atkinson and Chouraqui (1985) suggest that structural deficits in the OECD as a whole did not rise enough to explain the worldwide surge in real interest rates during the early 1980s. Moreover, data on cyclically adjusted deficits in these seven countries in Robert Eisner (1986) are inconsistent with the idea that cyclically adjusted deficits contributed to the dramatic rise in short-term real interest rates in the early 1980s. Eisner's data for the United States show increasing cyclically adjusted surpluses in 1981 and 1982, while a weighted average of his data for the other six countries in my sample shows steadily declining deficits from 1979 through 1982. Eisner's estimates of deficits after adjustment for both price and cyclical effects show similar patterns during these years.

For empirical estimation, equation (1) was specified in a linear form, as follows:

$$r_{it} = a_i + a_1 B_{it} + a_2 DM_{it} + a_3 U_{it} + a_4 OPEC_t + a_5 XRR_{it} + e_{it} \quad (2)$$

where the a 's are coefficients. The specification in (2) requires that the estimated responsiveness of r_{it} to B_{it} , DM_{it} , U_{it} , and $OPEC_t$ be the same for all seven countries.⁵

The standard view of the effects of budget deficits and money growth would suggest that the estimated coefficient a_1 should be positive while a_2 should be negative. If OPEC's surplus increases world savings and pushes down real interest rates, the coefficient a_4 should be negative. Partial capital mobility would imply that if real rates rise in one or more countries, then rates should be pulled up in the other countries as well; hence a_5 should be positive.⁶

Empirical Results. Variants of equation (2) were estimated using Zellner's seemingly unrelated equations technique with annual data for the seven largest OECD countries: the United States, Japan, West Germany, the United Kingdom, France, Italy, and Canada.⁷ Annual data are used because more frequent data are not readily available for every variable in all these countries. Moreover, quarterly or monthly data seem more likely to be distorted by minor differences in timing between bond sales, government expenditures or receipts, OPEC lending, or changes in monetary policy, on the one hand, and the dates when market participants incorporate new information about the

economic situation in their expectations, on the other. The estimation results are presented in Table 3. Because of data limitations, the sample period in Table 3 covers only 13 years, 1971-83.⁸

The measurement of the real interest rate merits special attention. Survey data on inflationary expectations, such as the Livingston data for the United States, are not readily available for most of the OECD countries. (The Livingston data consist of averages of U.S. inflation forecasts made by a number of economists and other financial market participants who are surveyed twice a year by Joseph Livingston, a financial reporter.) Instead, an *ex post* measure of inflation was created by calculating quarter-to-quarter annualized percentage changes in the consumer price index for each country. These inflation rates were then subtracted from quarterly data on short-term nominal interest rates, and then averaged over each calendar year to obtain annual data on the real short-term interest rate in each country.⁹

The first three columns of Table 3 contain the results using only the local explanatory variables for each country, as in Hutchison and Pyle. If the budget deficit is the only explanatory variable (column 1), its estimated coefficient is both positive, which indicates that a larger deficit raises real interest rates, and sizable; the estimated coefficient of 0.780 implies that if the budget deficit increases by 1 percent of GDP, then the short-term real interest rate rises by 78 basis points. When local money growth is added (column 2), the coefficient on the budget deficit shrinks somewhat but remains significant; as expected, the estimated coefficient on money growth is negative, indicating that faster money growth tends to lower short-term real interest rates.

When the local unemployment rate is added as well (column 3), its coefficient is positive and significant; the positive sign is consistent with the hypothesis that real interest rates are lower during business upswings than during recessions because private savings expands more during upswings than does private demand for credit. More importantly, the inclusion of the unemployment rate has a considerable effect on the budget deficit's estimated coefficient: the coefficient shrinks drastically and becomes insignificant.

The fourth column of Table 3 contains the results when a dummy variable for years after 1980 is added, as in Vito Tanzi (1985), to check for a possible shift in interest rate behavior at that time.¹⁰ The coefficient on the dummy variable is positive and highly significant, indicating that real interest rates rose after 1980 in these seven coun-

Table 3.
Real Interest Rate Equations
Estimated Subject to Cross-Country Parameter Restrictions
(Sample Period, 1971-83)

	(1)	(2)	(3)	(4)	(5)	(6)
Local Budget Deficit	0.780 (5.24)	0.509 (3.84)	0.057 (0.29)	0.518 (4.18)	0.323 (2.83)	0.222 (2.34)
Local Money Growth		-0.272 (-8.05)	-0.187 (-3.71)	-0.185 (-5.36)	-0.266 (-8.63)	-0.298 (-11.81)
Local Unemployment			0.661 (4.31)	-0.098 (-0.64)	-0.169 (-1.18)	-0.096 (-0.81)
DUMMY				4.198 (5.57)	0.816 (1.57)	
OPEC's Capital Outflow					-0.227 (-3.06)	-0.256 (-4.25)
Average External Real Interest Rate						
U.S. Equation					0.871 (5.60)	0.965 (5.40)
U.K. Equation					1.242 (4.19)	1.314 (4.49)
German Equation					0.211 (1.67)	0.331 (2.72)
French Equation					0.524 (4.58)	0.654 (4.69)
Italian Equation					0.870 (4.13)	0.873 (4.07)
Japanese Equation					0.714 (1.77)	0.522 (1.37)
Canadian Equation					0.751 (5.00)	0.885 (5.73)
Weighted R ² for the System	0.249	0.504	0.346	0.518	0.887	0.943

Note: Approximate t-statistics are given in parentheses below the coefficients. The weighted R² for the system corresponds to the approximate F-test on all non-intercept parameters in each system of equations estimated. The variable DUMMY takes the value zero for the years 1971-80, and one for the years 1981-83.

tries in a manner not explained by the other variables included in this equation. Observe that including the dummy variable restores the significance of the coefficient on the budget deficit. Moreover, the coefficient on the dummy variable is quite large; it indicates that, in these seven countries, there was a rise of over 4 percentage points in real interest rates after 1980 that is attributable to the dummy variable and not to changes in the local budget deficit, money supply, or unemployment.

The last two columns of Table 3 contain the results when the external variables are included as additional explanatory variables. Column 5 also

includes the dummy variable, while column 6 omits it. OPEC's capital outflow has a significant negative coefficient in both equations. The negative sign of its coefficient is consistent with the hypothesis that an increase in OPEC's capital outflow tends to lower real interest rates in the industrialized countries.

All of the countries show a substantive response to external interest rates, even after taking account of local monetary and fiscal policy, as well as OPEC's surplus. Most of the estimated coefficients on the average external real interest rate are sizable and significant. Even the United States,

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whose money market might be expected to be relatively immune to foreign influence because of the large size of the nation's economy, has a large coefficient on the external real rate.¹¹ Because the average external interest rate for any country is determined in part by other countries' fiscal and monetary policies, the sizable coefficients on the average external interest rate imply that foreign fiscal and monetary policies have some impact on real U.S. interest rates, and U.S. policies have some impact on foreign rates as well.

Adding the external variables results in a considerable shrinkage in both the size and significance of the coefficient on the dummy variable, as

shown by a comparison of columns 4 and 5. Indeed, it is no longer significant at conventional levels. Accordingly, the influence of the external variables provides at least a partial explanation for the otherwise unexplained rise in real interest rates after 1980 reported by Tanzi and me.

The coefficients on the local budget deficit and money growth were relatively unaffected by adding the external variables; both remained significant and of the expected sign. The coefficient on unemployment changes sign and becomes insignificant when the dummy variable or the external variables are included; this is not too disturbing, because the sign of this coefficient is uncertain on a priori grounds.¹²

Notes

¹It is implicitly assumed that governments finance their budget deficits by selling bonds in their own capital markets, not in foreign capital markets. While there has been some cross-border borrowing by these seven governments, it has generally been small relative to their domestic borrowing.

²In principle, it would be desirable to use data on the inflow of funds from OPEC to each country separately, rather than the aggregate OPEC surplus; however, such data are not readily available.

³A coefficient is said to be biased if the expected value of its estimate is not equal to the "true" value of the coefficient.

⁴The sign of the coefficient on unemployment is uncertain. During a business upswing, private demand for funds expands, but private savings (household savings and corporate retained earnings), which is a source of funds, also expands. The coefficient on unemployment should be positive if the changes in private savings predominate, and negative if the changes in private credit demand predominate.

⁵The specification in equation (2) allows each country to have its own coefficient on the external real interest rate (XRR_{it}) and intercept term. It is possible to estimate equation (2) without requiring the parameters $a_1 - a_4$ to be the same for all the countries; however, with so few data points available for each country, most of the parameter estimates are very imprecise in that case. Hutchison and Pyle similarly impose equality of parameters for all seven countries.

⁶In the case of perfect capital mobility, the real interest rate would presumably be identical in each country; in that case, r_{it} would be exactly equal to XRR_{it} , implying $a_5 = 1$. However, Table 1 shows that while rates in different countries show considerable positive correlation, they are not perfectly correlated.

⁷This technique, which is also known as joint generalized least-squares, is discussed in many econometrics texts; for an example, see Theil (1971), chapter 7.

⁸This sample period overlaps the 1973-82 period used by Hutchison and Pyle. To save space, the estimated constant terms have been omitted from the table; they are available from the author upon request.

⁹To measure inflation, Hutchison and Pyle use line 64x of *International Financial Statistics*, which gives year-over-year data. My procedure should give a much closer matching in terms of timing between the nominal interest rate data and the inflation rate data.

¹⁰Using a dummy variable analysis, Tanzi reported that there was a major shift upward (by about 4 percentage points) in U.S. short-term real interest rates after 1980; this increase was not explained by his measures of fiscal or monetary policy. The results for the relationship between fiscal policy and interest rates in Tanzi (1985 and 1987) as modified in response to Spiro (1987) were mixed; increased deficits (either unadjusted or cyclically adjusted) appeared to lower interest rates contemporaneously, the opposite of the conventional view, but increases in the level of public debt appeared to raise interest rates.

¹¹It might be argued that the coefficient on the external interest rate in the U.S. equation is biased upward because of a simultaneity problem if the large U.S. economy has a major impact on interest rates elsewhere. Presumably this problem is much less severe for the smaller countries in the sample. An instrumental variables approach to the external interest rate in the U.S. equation of the system yielded an estimated coefficient of 0.806, modestly smaller than the estimates in Table 3.

¹²See the discussion in note 4 above.

Data Appendix

Nominal interest rates and consumer prices for each country were obtained from the IMF's *International Financial Statistics* (IFS). For the United States, the United Kingdom, and Canada, short-term nominal interest rates were taken from line 60c (the Treasury bill rate); for the other countries, line 60b (the call money rate) was used. Data on consumer prices were taken from line 64. Because of the prospective nature of the nominal interest rate data, quarterly *ex post* real interest rates were calculated by subtracting from each quarter's nominal interest rate the annualized percentage change in the CPI from that quarter to the next. Annual data on real interest rates were obtained by averaging the quarterly numbers just described.

Budget deficits for the countries studied were obtained from the Organization for Economic Cooperation and Development's (OECD) National Accounts, Detailed Tables; numbers for Net Lending were used. Budget deficits were scaled by dividing by nominal GDP figures, which were obtained from IFS, line 99b.

Annual data on the aggregate current account surplus of oil-exporting countries (OPEC's Capital Outflow) were obtained from the IFS Yearbook for IFS area 999.

Nominal money growth in each country was derived by taking percentage changes of annual data from line 34 of IFS.

Data on standardized unemployment rates were obtained from the OECD.

The average external real interest rate for each country is a weighted average of real interest rates in the other six countries. The weights are based on each country's share of the aggregate GDP for the group in the year 1978, which is roughly in the middle of the sample period. Each country's nominal GDP for 1978 (from IFS) was translated into U.S. dollars using the average exchange rate from IFS for that year. The resulting shares of aggregate GDP were as follows: United States, 42.7 percent; United Kingdom, 6.35 percent; Germany, 12.80 percent; France, 9.49 percent; Italy, 5.24 percent; Japan, 19.27 percent; and Canada, 4.15 percent.

Notes

- ¹These seven countries are members of the Organization for Economic Cooperation and Development (OECD), a loosely organized group of industrialized countries in Europe, North America, and the Pacific which tries to promote better economic performance in its member countries.
- ²See Blanchard and Summers (1984) and Atkinson and Chouraqui (1985).
- ³The *ex post* real interest rate is computed with the benefit of hindsight, using the rate of inflation which actually occurred. In some cases, economists use the *ex ante* rate instead; it is defined as the nominal interest rate minus the expected (or anticipated) rate of inflation. No adjustment for taxes was made in calculating the *ex post* rates. Because of missing data, Italy is not included in the average for foreign countries prior to 1971. The weights used in the averaging procedure are based on each country's GDP. For further details, see the Data Appendix.
- ⁴Here, as in Chart 1, annual averages of quarterly real rates were used. Because of missing data for Italy, the time period for its correlations was limited to 1971 to 1984.
- ⁵Moreover, all six of the correlations involving the United States are statistically significant at the .05 level. Most of the correlations involving pairs of foreign countries are significant as well, with the exceptions of the correlation between Germany and Italy and the correlation between Germany and Japan.
- ⁶Cumby and Mishkin (1986) reach similar conclusions about the degree of international linkage in real rates between the United States and Europe. Also see Cumby and Obstfeld (1984).
- ⁷Plosser (1982), Canto and Rapp (1982), Hoelscher (1983), Makin (1983), Mascaro and Meltzer (1983), Dewald (1983), Motley (1983), and Evans (1985) report no significant link between U.S. budget deficits and interest rates, while de Leeuw and Holloway (1983), Barth, Iden, and Russek (1984-85), and Hoelscher (1986) find support for the conventional view.
- ⁸See Blanchard and Dornbusch (1984) or the comments by Blinder and Nordhaus following Blanchard and Summers (1984).
- ⁹See Atkinson and Chouraqui (1985), p. 16.
- ¹⁰Motley (1983) makes a similar argument in his discussion of the U.S. experience. An opposing view would be that the structural deficit is the appropriate gauge of fiscal policy, and that discrepancies between the actual and the structural deficit may represent the effects of monetary policy or other shocks to the economy.
- ¹¹See De Grauwe and Fratianni (1983), pp. 73-74, and Chouraqui, Jones, and Montador (1986), pp. 107-11.
- ¹²Canzoneri and Gray (1982) and Gray and Hooper (1983) provide theoretical analyses showing that, if the marginal propensity to save is higher in OPEC than in other countries, then a negative correlation between OPEC's current account surplus and real interest rates can result. Also see Bruno and Sachs (1985).
- An alternative interpretation of the impact of OPEC is that rises in oil and other raw materials prices during the 1970s cut the profitability and demand for real capital, because raw materials and capital are complementary factors of production. The decline in profitability and resulting fall in real investment also dragged down the real rate of interest. See Wilcox (1983).
- ¹³In the chart, OPEC's current account surpluses are expressed as percentages of U.S. nominal GDP, in order to adjust for inflation and growth. Data on the current account surpluses of the oil-exporting countries were obtained from the IMF's *International Financial Statistics*, area 999. The IMF definition of "Oil Exporting Country" differs slightly from the official membership of OPEC; the IMF includes Oman, which is not a member of OPEC, while excluding Ecuador and Gabon, which are members. Nevertheless, for the sake of brevity the acronym "OPEC" will be used in the remainder of the paper to refer to the oil-exporting nations.
- ¹⁴In the simulation, real interest rates bottom out and begin to rise in mid-1979, two quarters before the peak of OPEC's surplus, because income (hence savings) is falling in the industrialized countries in response to the shock. OPEC's surplus declines after the first quarter of 1980, thus contributing to further increases in real interest rates.
- ¹⁵Bruno and Sachs (1985, pp. 8-12) provide a similar chronology of policy actions during this period, but focus more heavily on the evolution of unemployment and productivity in the United States and abroad.
- ¹⁶Because of missing data, Japan and Italy are not included in the weighted average of foreign deficits for years prior to 1970. Note that the diagram covers only years since 1970 in order to make the time patterns of this period more discernible.
- ¹⁷Data on the deficits in each of the foreign countries are available from the author on request.
- ¹⁸In mid-1982, the Federal Reserve appears to have loosened policy, probably in response to the continuing U.S. recession and Mexico's near-default on its external debt.

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