

CHAPTER 25

Interdependence and Policy Coordination

Chapter 18 showed how floating exchange rates could help insulate countries from each other's policy changes or from other disturbances. This complete insulation or independence held only under certain very special conditions, however—most importantly the absence of capital flows. This chapter will show that even with freely floating exchange rates, countries are in fact interdependent. What happens in the United States has important effects in Europe or Japan and vice versa.

The fact that the world is so interdependent leads to a new topic: international macroeconomic policy coordination. National policy makers may be able to do better by setting their policies cooperatively than they can when each acts independently.

25.1 International Transmission of Disturbances Under Floating Exchange Rates

Recall that under floating exchange rates, the overall balance of payments must sum to zero. We last considered the effect of one country's expansion on another country's economy in Chapter 18. At that point we were assuming that the net capital flow was zero. It followed that the exchange rate always adjusted automatically so as to ensure that the trade balance was zero. In a model in which the trade balance was the only channel through which one country's disturbances affected another's, floating exchange rates provided complete insulation. It was almost as if each country were a closed economy with no trade. In practice, substantial international synchronization of business cycles has continued since 1973: worldwide recession in 1974–1975, 1980 to 1982, 1991, and 2001, and worldwide recovery after each. The extent of synchronization seems, if anything, to have exceeded that during the fixed exchange rate era. This may be related in part to supply shocks or other commonly shared disturbances.

This section examines the two major routes via which disturbances can penetrate through the insulation provided by floating exchange rates. The first is the presence of capital flows, introduced in Chapters 22 and 23, which allow international transmission via the trade balance. The second consists of various effects that exchange rate changes can have on national economies *other* than the effect through the trade balance.

Transmission via Capital Flows

Even when the exchange rate adjusts so that the overall sum of the trade balance plus the capital account is zero, the existence of any kind of net capital flow implies that the trade balance is not zero. If one country goes into trade deficit, the change will be transmitted to the rest of the world as a trade surplus. The trade imbalance is financed by a flow of capital from the surplus country to the deficit country.

We now examine the two-country version of the Mundell-Fleming model of floating exchange rates introduced in Chapter 23 to show how monetary or fiscal expansion in one country is transmitted to the other. *Any* degree of capital mobility would be sufficient to establish transmission. Perfect capital mobility will be assumed here, in part because it gives a simpler model than partial capital mobility and in part because this assumption has accurately described the major industrialized countries in recent years. There will be no more modeling of the capital account as a finite flow responding to a given interest rate differential.

The foreign country is modeled analogously to the home country. Call the home country the United States and the foreign country, Europe. Figure 25.1 shows the two side by side. Recall that under perfect capital mobility, arbitrage equates the U.S. and European interest rates (omitting for now any expectation of future changes in the exchange rate): $i = i^*$. This means that the two points representing the two countries' equilibrium positions must lie on the same horizontal line. Otherwise, if one country had a higher interest rate, there would be a potentially infinite demand for its assets, with potentially infinite borrowing in the low-interest country. E and E^* represent the initial equilibrium points.

Fiscal Expansion in a Large Country

A U.S. fiscal expansion would shift the IS curve out to IS' if there were no other change in the exchange rate. However, as in Chapter 23, the large capital inflow that would be attracted by the higher interest rate at point A causes the dollar to appreciate, worsening the U.S. trade balance and shifting the IS curve back to the left. Under perfect capital mobility, the appreciation of the dollar and the backward shift of the IS curve continue until the parity condition, $i = i^*$, is restored. Previous chapters have all taken i^* as exogenously fixed, with the implication that the equilibrium is back at the starting point, E . But i^* need not be exogenous, as we will now see.

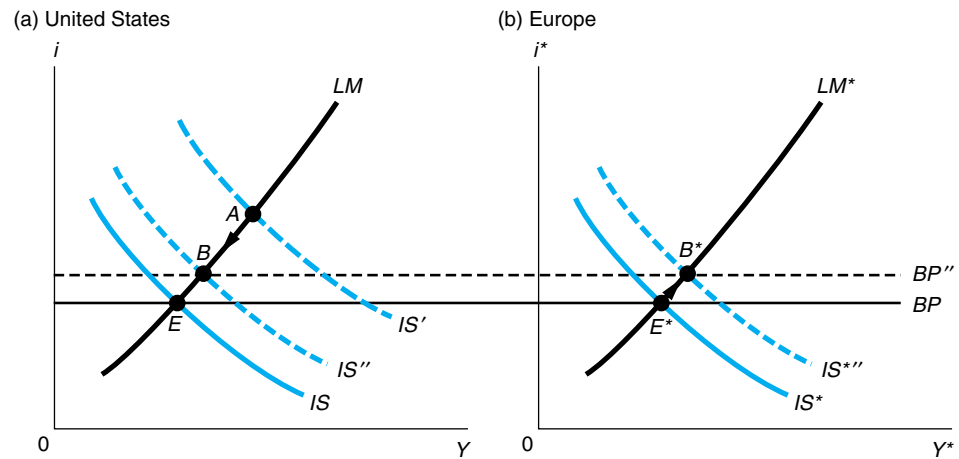
Saying that the dollar appreciates is the same as saying that the European currency, the euro, depreciates. Saying that the U.S. trade balance worsens is the same as saying that the European trade balance improves. Therefore, as the U.S. IS curve shifts left, the European IS^* curve shifts right. Intuitively, expenditure has been switched from U.S. goods to European goods. The two curves will shift until their intersections with their respective LM curves occur at the same horizontal level—at points B and B^* , respectively. Only then are interest rates equalized. Both intersections lie on the country's BP curve, as floating rates imply they must; but the curve has shifted to a higher level.

Figure 25.1 shows how two of the (overly strong) results derived earlier must now be modified. First, the insulation property of floating rates is undone by international

FIGURE 25.1

Fiscal Expansion in a Two-Country, Mundell-Fleming Model

Despite perfect capital mobility, the United States can drive up the interest rate because of its large presence in world capital markets. After a U.S. fiscal expansion (to A) causes the dollar to appreciate, the European IS^* curve shifts right as the IS curve in the United States shifts left. Equilibrium entails expansion both for the United States at B and Europe at B^* .



capital mobility. Through the channel of the trade balance, the fiscal expansion is transmitted positively to Europe as an increase in the demand for European output.

Furthermore, a property of fiscal expansion established in Chapter 23, that it is ineffective at raising domestic output under perfect capital mobility, is now also undone. Previously it was assumed the home country was sufficiently small in world capital markets that it could take the foreign interest rate, i^* , as given. If the country is as large as the United States, however, then it is large enough to drive up interest rates everywhere in the world simultaneously. The fiscal expansion succeeds in raising i to the extent that it also raises i^* . Thus it succeeds in raising Y to the extent that it also raises Y^* , without violating equilibrium in the financial markets. The large-country assumption restores effectiveness to fiscal policy despite perfect capital mobility.¹

The U.S. fiscal expansion that generated U.S. recovery in 1983–1984 is a perfect illustration of international transmission. As already noted, U.S. interest rates rose, attracting a capital inflow from abroad, and the dollar continued to appreciate against the European currencies and the yen. The U.S. trade deficit rose sharply, resulting in a

¹It is the assumption of capital mobility, however, that restores transmission between countries, regardless of their size. Even if the home country is small, its fiscal expansion will have a positive dollar effect on the rest of the world that, although small as a proportion of foreign GDP, is significant relative to domestic GDP. Similarly, a fiscal expansion abroad will have a positive effect on the home country that is significant relative to home GDP. The original reference is Robert Mundell, "A Reply, Capital Mobility and Size," *Canadian Journal of Economics and Political Science*, 30 (1964): 421–431.

corresponding improvement in trade balances in Europe, Japan, and almost everywhere else. The U.S. expansion thus did much to pull the rest of the world out of recession at the same time as it did so domestically.

Another example is Germany's 1990–1992 increase in spending in association with its absorption of the former East Germany. The higher spending drove up German interest rates, attracted a capital inflow, appreciated the mark, and in a short time changed a large German current-account surplus into a deficit. Germany's trade balance loss was its trading partners' gain.

The U.S. fiscal expansion that contributed to U.S. recovery after the recession of 2001 did not fit the pattern of higher interest rates and a stronger dollar. Why not? It was accompanied by a strong monetary expansion.²

Monetary Expansion in a Large Country

We next consider, in Figure 25.2, a U.S. monetary expansion. It would shift the LM curve out to LM' if there were no change in the exchange rate. However, as was explained previously, the large capital outflow induced by the lower interest rate at point A causes the dollar to depreciate. This improves the U.S. trade balance (relative to what it would be at point A) and shifts the IS curve out to the right. Under perfect capital mobility, the dollar depreciation and the outward shift of the IS curve must continue until $i = i^*$ is restored. Previously i^* was taken as exogenously fixed, with the implication that the equilibrium was all the way out to point B in Figure 23.4(d). There was very strong stimulus to output, all coming from net foreign demand. This need no longer be the case, however. Saying that the dollar depreciates is the same as saying that the euro appreciates. Saying that the U.S. trade balance improves is the same as saying the European trade balance worsens. Therefore, as the U.S. IS curve shifts right, the European IS^* curve shifts left. The two curves will shift until their intersections with their respective LM curves occur at the same horizontal level: at points B and B^* , respectively, in Figure 25.2.

As with the fiscal expansion, two of the strong results derived earlier are overturned. First, the monetary expansion is transmitted abroad. However, the transmission is now negative, or inverse: European income *falls* because of the lost net exports. As a result of lower transactions demand for money in Europe, i^* falls as well.

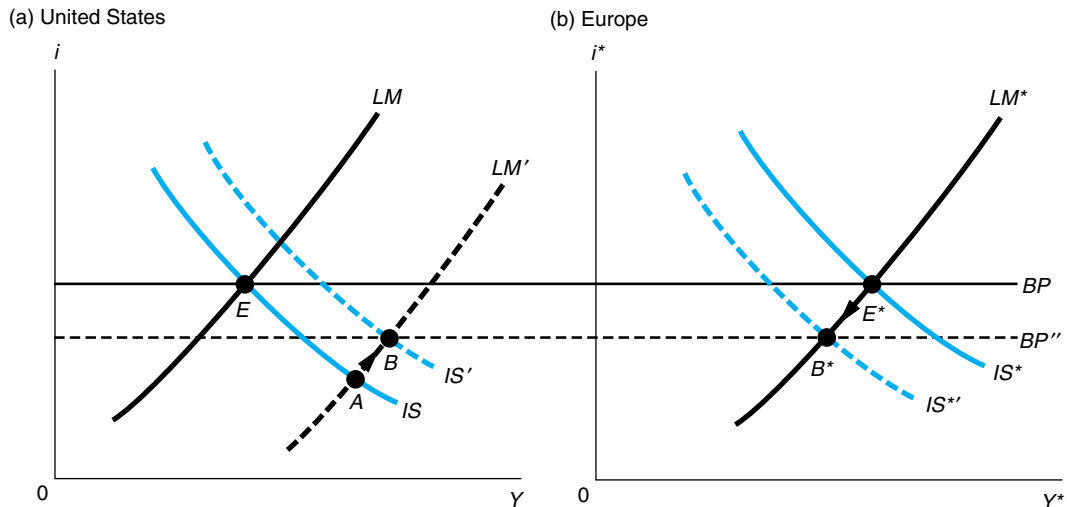
Because the U.S. monetary expansion succeeds in lowering i^* , it lowers i as well: The United States is large in world financial markets, so it can drive down interest rates everywhere simultaneously. This allows the second new finding. The monetary expansion does not cause as big a depreciation as in the small-country case of Chapter 23, so there is not as large a stimulus to net foreign demand. The lower interest rate means that some of the expansion will come from domestic demand. This is a more realistic result than when it appeared that all of the expansion had to come from a large increase in net foreign demand. The British monetary contraction that began in 1979,

²The monetized fiscal expansion of 2001 thus had more in common with the Vietnam-related expansion of the late 1960s than with Reaganomics.

FIGURE 25.2

Monetary Expansion in a Two-Country, Mundell-Fleming Model

After a U.S. monetary expansion (to A) causes the dollar to depreciate, the European IS^* curve shifts left as the IS curve in the United States shifts right. Equilibrium entails expansion for the United States at B but contraction for Europe at B^* .



for example, resulted in a subsequent loss of net exports as a result of the higher value of the pound, and it also resulted in a loss of domestic demand in construction and other sectors, as a result of the higher interest rates. The same was true of the U.S. monetary contraction of 1980 to 1982.

Transmission via (Nontrade) Exchange Rate Effects

Whether or not there are international capital flows, and therefore nonzero trade balances, developments in one country can be transmitted to the other country's economy if the exchange rate has effects in addition to its effect on the trade balance. To begin with, an increase in the euro/dollar exchange rate will certainly be felt in Europe as an increase in the euro prices that Europeans have to pay for imports. For there also to be an impact on European output requires some additional effect. Four possibilities are effects on saving, money demand, prices of imported inputs, and wages. All four can result from higher import prices in Europe.

The effect on European saving is the Laursen-Metzler-Harberger effect, developed in the appendix to Chapter 18. A rise in the euro/dollar rate is an adverse shift in the terms of trade for European households: It is a fall in the purchasing power of a unit of European output over a basket of consumer goods that includes imports. Europeans react as they would to any loss in real income, by reducing saving (for any given level of real income measured in *domestic* units) so as to smooth consumption over time.

The higher level of expenditure raises real output and employment in Europe. If the increase in the euro/dollar rate originated in the U.S. fiscal expansion, then the rise in European output means that transmission is positive. If it originated in a U.S. monetary contraction, then the rise in European output means that transmission is inverse. In both cases, the Laursen-Metzler-Harberger effect reinforces the same pattern of transmission that we have just seen brought about by high capital mobility.

The next three possible exchange rate effects, however, go the other way. They are each reasons why an increase in the euro/dollar rate might lower output in Europe.

First is a possible effect via the demand for money. Previous chapters have viewed P , the price level for domestically produced goods, as the appropriate variable for determining money demand. In the Mundell-Fleming model, P is fixed in the short run. Thus the exchange rate does not enter into the money-demand equation. However, the CPI could be considered the appropriate variable for determining money demand as easily as P . If imports have a weight of α in the European CPI, then a 1 percent increase in the euro/dollar rate that raises European import prices by 1 percent will raise the CPI and reduce the real money supply by α percent. Thus it will shift the LM curve to the left and have a contractionary effect on European output. If the dollar appreciation originated in a U.S. fiscal expansion, then the potential decrease in European output represents inverse transmission. If it originated in a U.S. monetary contraction, then it represents positive transmission. In either case, the effect via money demand is the opposite of the effect via the trade balance that appears in the standard Mundell-Fleming model. The contractionary effects in Europe was one of the arguments open to those Europeans who claimed that the U.S. policy mix of the early 1980s—tight money and a loose budget, resulting in a strong dollar—had adverse effects on European growth.

The effects just mentioned come via aggregate demand. There are two remaining effects, both of which come via aggregate supply rather than aggregate demand. If the price of oil or other imported inputs is set in dollars, then the increase in the euro/dollar rate will raise the price of the input for European firms. Finally, if European wages are tied or *indexed* to the European CPI, then the increase in the euro/dollar rate will raise European wages relative to the price of goods produced in Europe. Either way, European firms find that their input costs have gone up relative to the price of the goods they produce, which will cause them to cut back on output. The contractionary supply effects, like the contractionary demand effects, can reverse the transmission results of the Mundell-Fleming model. To understand aggregate supply effects fully requires a more detailed examination of the supply relationship than we have previously carried out. The next chapter is a convenient place to do it.

25.2 Econometric Models of the Interdependent World Economy

Having looked at a bewildering variety of possible routes for transmission of monetary and fiscal policy, some affecting other countries' levels of economic activity positively, some affecting them negatively, we naturally might wonder which effects are likely to dominate in practice.

Economists have built a number of econometric models of the world macroeconomy, each including the major countries or blocs of countries. Often these models are quite large in terms of the number of equations or the amount of work they require. Some of the models are built and maintained in private consulting firms that make economic forecasts for corporate clients. Some are at agencies of national governments or at multinational public institutions. Some are at universities.

The models also differ in their economic philosophies. Some are extremely Keynesian, showing little or no effect of a monetary expansion on prices. Others represent the New Classical school of thought, featuring rational expectations and frictionless determination of wages and prices. Most adopt the intermediate synthesis view taken in this text. This still allows for tremendous divergence among the models, however. Even within the same overall model specification, different estimates of parameter values can have very different implications concerning issues such as whether international transmission is positive or negative.

The models are often used in simulations to predict the effect of a given policy change, relative to some baseline predicted path for the world economy. It can be difficult to compare the results of any two models because the policy experiment being conducted may differ between the two. The simulation results from one model say that a Japanese fiscal expansion would appreciate the yen, and those from another say it would depreciate the yen. One possibility is that the models truly differ; the first, for example, incorporating a high degree of capital mobility for Japan and the second a low degree. However, another possibility is that the first simulation is considering the experiment with the M1 money supply held constant, so that the fiscal expansion pushes the interest rate far up, whereas the second is holding something else constant (the monetary base, or even the interest rate itself), with the result that a fiscal expansion automatically leads to an accompanying increase in M1.

A project undertaken under the auspices of the Brookings Institution asked twelve leading international econometric models to perform simulations for some carefully specified macroeconomic policy experiments.³ Tables 25.1 and 25.2 show the results in the second year after a fiscal expansion and a monetary expansion, respectively. The twelve models with their abbreviations are as follow: MCM—the Federal Reserve Board's Multi-Country Model; COMPACT—the European Community Commission's model; EPA—the Japanese Economic Planning Agency's model; LINK—Project Link, which puts together the various models of national economies that had already been built in the respective countries; LIV—the Liverpool model of Patrick Minford, a new classical British economist who advised Prime Minister Margaret Thatcher; MSG—the McKibbin-Sachs Global model, which assumes rational expectation, but is otherwise somewhat Keynesian, built by Jeffrey Sachs of Columbia University and Warwick McKibbin of Australia National University; MINIMOD—a smaller approximation of the MCM, built by staff of the International Monetary Fund; VAR—estimates by

³The model simulations were presented and evaluated in Ralph Bryant, Dale Henderson, Gerald Holtham, Peter Hooper, and Steven Symansky, eds., *Empirical Macroeconomics for Interdependent Economies* (Washington, DC: Brookings Institution, 1988).

TABLE 25.1

Fiscal Policy: Simulation Effect in Second Year
of Increase in Government Expenditure (1 Percent of Output)

	<i>Y</i>	<i>CPI</i>	<i>i</i>	Currency Value	<i>CA</i>	<i>CA*</i>	<i>i*</i>	<i>CPI*</i>	<i>Y*</i>
	Effect in United States					Effect in Rest of OECD			
Fiscal Expansion in United States	(in percentage)		(Pts.)	(in percentage)	(\$B)	(\$B)	(Pts.)	(in percentage)	
MCM	+1.8	+0.4	+1.7	+2.8	-16.5	+8.9	+0.4	+0.4	+0.7
COMPACT ^a	+1.2	+0.6	+1.5	+0.6	-11.6	+6.6	+0.3	+0.2	+0.3
EPA ^b	+1.7	+0.9	+2.2	+1.9	-20.5	+9.3	+0.5	+0.3	+0.9
LINK	+1.2	+0.5	+0.2	-0.1	-6.4	+1.9	NA	-0.0	+0.1
LIV	+0.6	+0.2	+0.4	+1.0	-7.0	+3.4	+0.1	+0.6	-0.0
MSG	+0.9	-0.1	+0.9	+3.2	-21.6	+22.7	+1.0	+0.5	+0.3
MINIMOD	+1.0	+0.3	+1.1	+1.0	-8.5	+5.5	+0.2	+0.1	+0.3
OECD	+1.1	+0.6	+1.7	+0.4	-14.2	+11.4	+0.7	+0.3	+0.4
TAYLOR ^c	+0.6	+0.5	+0.3	+4.0	NA	NA	+0.2	+0.4	+0.4
WHARTON	+1.4	+0.3	+1.1	-2.1	-15.4	+5.3	+0.6	-0.1	+0.2
DRI	+2.1	+0.4	+1.6	+3.2	-22.0	+0.8	+0.4	+0.3	+0.7
	<i>Y</i>	<i>CPI</i>	<i>i</i>	Currency Value	<i>CA</i>	<i>CA*</i>	<i>i*</i>	<i>CPI*</i>	<i>Y*</i>
	Effect in Rest of OECD					Effect in United States			
Fiscal Expansion in Rest of OECD	(in percentage)		(Pts.)	(in percentage)	(\$B)	(\$B)	(Pts.)	(in percentage)	
MCM	+1.4	+0.3	+0.6	+0.3	-7.2	+7.9	+0.5	+0.2	+0.5
COMPACT ^a	+1.3	+0.8	+0.4	-0.6	-9.3	+3.0	+0.0	+0.1	+0.2
EPA ^b	+2.3	+0.7	+0.3	-0.7	-13.1	+4.7	+0.6	+0.3	+0.3
LINK	+1.2	+0.1	NA	-0.1	-6.1	+6.3	+0.0	+0.0	+0.2
LIV	+0.3	+0.8	+0.0	+3.3	-17.2	+11.9	+0.8	+3.1	-0.5
MSG	+1.1	+0.1	+1.4	+2.9	-5.3	+10.5	+1.3	+0.6	+0.4
MINIMOD	+1.6	+0.2	+0.9	+0.6	-2.2	+3.2	+0.3	+0.2	+0.1
OECD	+1.5	+0.7	+1.9	+0.9	-6.9	+3.3	+0.3	+0.2	+0.1
TAYLOR ^c	+1.6	+1.2	+0.6	+2.7	NA	NA	+0.4	+0.9	+0.6
WHARTON	+3.2	-0.8	+0.8	-2.4	-5.5	+4.7	+0.1	-0.0	+0.0

^aNon-U.S. short-term interest rate NA; long-term rate reported instead.

^bNon-U.S. current account refers to Japan, Germany, United Kingdom, and Canada.

^cCPI NA; GNP deflator reported instead.

Source: Frankel and Rockett (1988).

Christopher Sims and Robert Litterman obtained by Vector AutoRegression (a technique that uses no economic theory, but merely looks for regular patterns in the data); OECD—the Interlink model built by staff members at the Organization of Economic Cooperation and Development (an agency with a membership of thirty industrialized countries and a Secretariat in Paris); TAYLOR—a rational expectations model by John Taylor of Stanford University, an official in both the first and second Bush administrations; WHARTON—a generally Keynesian model, originally built by Nobel laureate Lawrence Klein of the University of Pennsylvania; and DRI—the model of Data Resources, Inc., Lexington, Massachusetts, a firm that sells economic forecasts to corporations and government agencies.

The Results for Fiscal Policy

Table 25.1 summarizes the effects of a fiscal expansion, an increase in government spending equal to 1 percent of income, according to eleven models in the simulations. The variables shown are output, the consumer price index, the short-term interest rate, the exchange rate, and the current account. The first five columns show the variables in the region originating the fiscal expansion, the last four columns the foreign region.

As expected, the models all show a positive effect on output. The numbers in the first column can be read as fiscal multipliers.⁴ They are mostly in the range of 1 to 2. Almost all the models show increases in the price level and the interest rate, from which follows some crowding-out of interest-sensitive sectors such as construction.

The main ambiguity in theory, as we saw in Section 23.1, is whether the fiscal expansion causes the currency to appreciate: whether capital mobility is sufficiently high that the capital inflow attracted by higher interest rates is more than enough to finance the increased imports resulting from higher income. However, the eleven models in Table 25.1 show relatively little disagreement in practice. All but two show an appreciation of the dollar when the United States is the country initiating the fiscal expansion. This would not have been the case in the 1960s; it reflects the high degree of capital mobility that has evolved.⁵

In almost all the models, the simulations show that fiscal expansion is transmitted positively to the foreign region. This is not surprising because the current account worsens in the originating region and thus improves in the foreign region. The positive transmission does indicate, however, that the three possible contractionary effects of a currency depreciation (the ones studied in Section 25.1, via money demand, wages, or imported-input prices) either are not operating, or at least are not operating strongly enough to outweigh the increase in net export demand falling on the goods of the foreign region.

The Results of Monetary Policy

Table 25.2 summarizes the effects of a monetary expansion equal to 4 percent of the money supply (phased in over the first year). The simulations show more conflict among the models than do the results of a fiscal expansion. They all agree that the monetary expansion drives down the interest rate and thereby stimulates domestic income, and they generally agree that it depreciates the currency. Yet they divide almost evenly on the question of whether the domestic trade balance improves, causing the foreign trade balance to worsen and foreign income to decrease. That is, they disagree on whether international transmission is inverse.⁶

⁴Because $(\Delta Y/Y)/(\Delta G/Y)$ is the same as $\Delta Y/\Delta G$.

⁵When the fiscal expansion originates in other countries, the appreciation of their currency is not as great as when the fiscal expansion originates in the United States. Indeed, there are four models that indicate a depreciation of the foreign currencies against the dollar. This largely reflects a belief that Japan and Europe are not as open financially as the United States (and perhaps also that the *LM* curve is steeper in the United States, so that interest rates tend to rise more easily than in the rest of the world).

⁶The Mundell-Fleming model says that this inverse transmission should occur. As we saw in the preceding chapter, the lower interest rate that results from a monetary expansion leads to a net capital outflow, which corresponds to a current-account deficit abroad. However, the introduction of expectations into investors' asset preferences, as in Chapter 27, can reverse this effect.

TABLE 25.2

Monetary Policy: Simulation Effect in Second Year
of Increase in Money Supply (4 percent)^a

	<i>Y</i>	<i>CPI</i>	<i>i</i>	Currency Value	<i>CA</i>	<i>CA*</i>	<i>i*</i>	<i>CPI*</i>	<i>Y*</i>
Effect in United States					Effect in Rest of OECD				
Monetary Expansion in United States	(in percentage)			(Pts.)	(in percentage)	(\$B)	(\$B)	(Pts.)	(in percentage)
MCM	+1.5	+0.4	-2.2	-6.0	-3.1	-3.5	-0.5	-0.6	-0.7
COMPACT ^b	+1.0	+0.8	-2.4	-4.0	-2.8	+1.2	-0.5	-0.4	+0.2
EPA ^c	+1.2	+1.0	-2.2	-6.4	-1.6	-10.1	-0.6	-0.5	-0.4
LINK	+1.0	-0.4	-1.4	-2.3	-5.9	+1.5	NA	-0.1	+0.1
LIV	+0.1	+3.7	-0.3	-3.9	-13.0	+0.1	-0.1	-0.0	-0.0
MSG	+0.3	+1.5	-0.8	-2.0	+2.6	-4.4	-1.2	-0.7	+0.4
MINIMOD	+1.0	+0.8	-1.8	-5.7	+2.8	-4.7	-0.1	-0.2	-0.2
VAR ^d	+3.0	+0.4	-1.9	-22.9	+4.9	+5.1	+0.3	+0.1	+0.4
OECD	+1.6	+0.7	-0.8	-2.6	-8.4	+3.1	-0.1	-0.1	+0.3
TAYLOR ^d	+0.6	+1.2	-0.4	-4.9	NA	NA	-0.1	-0.2	-0.2
WHARTON	+0.7	+0.0	-2.1	-1.0	-5.1	+5.3	-1.3	-0.1	+0.4
DRI	+1.8	+0.4	-2.3	-14.6	-1.4	+14.5	-1.1	-1.3	-0.6
	<i>Y</i>	<i>CPI</i>	<i>i</i>	Currency Value	<i>CA</i>	<i>CA*</i>	<i>i*</i>	<i>CPI*</i>	<i>Y*</i>
Effect in Rest of OECD					Effect in United States				
Monetary Expansion in Rest of OECD	(in percentage)			(Pts.)	(in percentage)	(\$B)	(\$B)	(Pts.)	(in percentage)
MCM	+1.5	+0.6	-2.1	-5.4	+3.5	+0.1	-0.2	-0.2	-0.0
COMPACT ^b	+0.8	+1.0	-1.0	-2.3	-5.2	+1.9	+0.0	+0.1	+0.1
EPA ^c	+0.0	+0.0	-0.1	-0.1	-0.1	+0.1	-0.0	-0.0	+0.0
LINK ^c	+0.8	-0.6	NA	-2.3	-1.4	+3.5	+0.0	-0.0	+0.1
LIV	+0.4	+2.8	-0.9	-8.4	+7.1	-8.2	-1.1	-3.4	+1.6
MSG	+0.2	+1.5	-0.7	-1.4	-15.9	+12.0	-1.2	-0.6	+0.3
MINIMOD	+0.8	+0.2	-1.8	-4.8	+3.6	-1.4	-0.6	-0.5	-0.3
VAR ^b	+0.7	-0.5	-3.0	-5.5	+5.2	-10.0	+0.6	-0.7	+1.2
OECD	+0.8	+0.3	-1.3	-2.1	-1.6	+2.3	-0.2	+0.1	+0.1
TAYLOR ^b	+0.8	+0.7	-0.3	-3.5	NA	NA	-0.2	-0.5	-0.1
WHARTON	+0.2	-0.1	-0.8	+0.2	+2.6	+0.5	+0.0	+0.0	+0.0

^aThe increase in the money supply is phased in over four quarters.

^bNon-U.S. short-term interest rate NA; long-term rate reported instead.

^cNon-U.S. current account is Japan, Germany, United Kingdom, and Canada.

^dCPI NA; GNP deflator reported instead.

^eAppreciation of non-U.S. currency NA; depreciation of dollar reported instead.

Source: Frankel and Rockett (1988).

Many of the models say that the higher imports drawn in by higher income are more than enough to offset the effect of the exchange rate on the trade balance, with the result that the expansion is transmitted positively, rather than negatively, to the foreign region. In large part this comes from observing the effect in the second year after the change in policy. The full effect of the exchange rate on the trade balance is not

felt until the third year or later. However, it is possible to sum up the results of all the models by saying that under floating exchange rates, one country's monetary expansion appears to have only small effects on other countries' incomes because the income and exchange rate effects on the trade balance roughly cancel each other out.

25.3 International Macroeconomic Policy Coordination

We have examined a wide variety of channels whereby policy changes in one country have effects in other countries. Policy makers have become increasingly aware of this interdependence of their national economies.

The Institutions of International Cooperation

A number of institutions have been established to facilitate discussion of economic issues that concern all countries and to facilitate coordination of their policies. The IMF conducts "surveillance" of the policies of the major industrialized countries, although its influence on them is inevitably far less than on the poorer, indebted countries who have little choice but to listen to the fund's advice. Each year the OECD sponsors meetings of cabinet ministers from its member countries, supported by regular meetings of the Economic Policy Committee and Working Party 3, in addition to a plethora of other meetings of specialists from the member countries dealing with particular economic sectors. Central bankers from the Group of Ten industrialized countries meet regularly, often in association with the Bank for International Settlements.⁷

In 1975, at the suggestion of French president Valéry Giscard d'Estaing, the heads of states of large industrialized economies met at Rambouillet, France. The purpose on that occasion was to ratify politically the movement from fixed exchange rates to floating exchange rates, which market forces had imposed on the world monetary system a few years earlier. The summit meetings have continued each year since then, bringing together leaders from the group of seven largest industrialized countries, known as the G-7: the United States, Japan, Germany, France, the United Kingdom, Italy, and Canada. The most substantive G-7 summit meeting took place in Bonn, Germany, in 1978. There Japan and Germany agreed to the U.S. plan for joint expansion, according to which the three countries would be the "locomotives" pulling the world economy out of the stagnation that had followed the 1974 oil shock. The U.S. motive behind the locomotive theory was the fear that if the United States continued to expand on its own, it would suffer an enlarged trade deficit.

In recent years, the earlier spirit of informal discussion has been lost and the summit meetings have become mammoth media events. (The group was expanded to include Russia in 1997, so it is now the G-8.) Beginning in September 1985, the focus shifted—for the purpose of serious economic policy-making—to the regular meetings

⁷The BIS was originally set up after World War I to facilitate the reparations payments that appeared in the discussion of the transfer problem in Chapter 17. From its headquarters in Basel, Switzerland, the BIS continues to function as the central bankers' exclusive club.

of the finance ministers. The occasion then was a meeting that took place at the Plaza Hotel in New York and produced the Plaza Accord, under which the United States agreed to cooperate in bringing down the value of the dollar. The finance ministers meet regularly to discuss the macroeconomic and financial interactions of their economies.

The Theory of Gains from International Policy Coordination

How should all these meetings and institutions be viewed? Are the meetings just media events, opportunities for the heads of state to escape domestic political difficulties and be seen on television looking statesmanlike? Are the institutions simply overpaid bureaucracies whose principal mission is the sampling of continental cuisine? Although sometimes it might seem that way, there are some good arguments in favor of international cooperation.

There is an elegant theory of the economic gains from international macroeconomic policy coordination: Two or more countries will in general be better able to attain their economic objectives if they set their policies jointly than if they set them independently. The alternative, in which each country independently sets its own policies, taking the policies of the others as given, is called the noncooperative equilibrium, also termed the Nash equilibrium.

There are a number of ways in which spillover effects among countries can render the noncooperative equilibrium unsatisfactory. Each defines a “game” between national policy makers.

The game that comes up most often, particularly when the world is in recession because of inadequate demand, could be called “exporting unemployment.” Consider the United States and Europe. Each must decide whether or not to follow expansionary demand policies. Table 25.3 shows the four possible outcomes. If Europe has a trade balance objective, it will be reluctant to expand, for fear that the United States will be less expansionary and leave Europe with a trade deficit. Similarly, the United States will be reluctant to expand, for fear that Europe will be less expansionary and leave the United States with a trade deficit. The result is that each country will hold back its level of demand in an effort to improve its trade balance at its neighbor’s expense. This policy is self-defeating when the countries try it simultaneously, plunging the world into a recession where everyone loses. This noncooperative equilibrium occurs in the first cell of the table.

The solution to the exporting unemployment problem is the “locomotive strategy”: Both countries should agree to expand simultaneously, whether by means of fis-

TABLE 25.3
The Game of “Exporting Unemployment”

	United States Contracts	United States Expands
Europe Contracts	Recession in both countries; $TB = 0$	TB favors Europe
Europe Expands	TB favors United States	Boom in both countries; $TB = 0$

cal policy or by some combination of fiscal and monetary policy, so that output is higher everywhere with no change in the trade balance.⁸ This is the logic behind the policy package adopted at the Bonn summit of 1978.

A particular variety of the exporting unemployment game, called “competitive depreciation,” arises when fiscal policy is the tool used and exchange rates are floating. Then each country has an especially strong temptation to contract because a fiscal contraction will lower interest rates, cause its currency to depreciate, and provide further improvement in its trade balance at its neighbor’s expense. In the 1930s each country devalued in a (vain) attempt to gain a trade advantage against the other. (Recall “beggar-thy-neighbor” policies.)

Other games are possible as well. Under a system of floating exchange rates, one possibility is the game of “competitive appreciation” (the opposite of the competitive depreciation game). It is illustrated in Table 25.4. This game depends on the assumption that each country has as its ultimate objective, in addition to high output, low inflation as measured by the CPI. It can, of course, be difficult to attain both of these objectives simultaneously. There is a trick, however, whereby a country can attain both objectives. It can keep the overall CPI stable, even if output is growing rapidly and thereby putting upward pressure on the prices of domestically produced goods. The trick is to appreciate the currency—for example, through a combination of tight monetary policy and loose fiscal policy that drives up interest rates and makes the country’s assets attractive to international investors. The point is that the strong currency will reduce the price of *imports*, when expressed in domestic currency. To the extent that imports have a share in the CPI, the overall inflation rate can be kept down, even if the prices of *domestic* goods are rising. Some economists have attributed such a motive to the U.S. government’s adoption of its 1980s policy mix of tight money and loose fiscal policy.⁹

Notice, however, that this trick can only be brought about at the expense of the country’s neighbors—by exporting inflation. If the first country experiences an appreciation and downward pressure on its CPI, then its neighbors are experiencing depreciation and upward pressure on their CPIs. The noncooperative equilibrium appears again in the first cell of Table 25.4. Both countries are keeping interest rates high in unsuccessful attempts to appreciate their currency. The result is worldwide recession. The cooperative solution is that both agree simultaneously to lower interest rates. Then they can attain stronger economies with no adverse effect on their exchange rates or CPIs.

A more permanent solution to problems of competitive appreciation or depreciation would be for the countries to agree to a system of fixed exchange rates. Then the leaders do not have to get together to negotiate over specific macroeconomic policies. Perceptions that competitive devaluation had helped prolong the Great Depression of the 1930s were a major reason why the delegates to the Bretton Woods conference of 1944 chose a system of fixed exchange rates for the postwar international monetary

⁸The supplement to this chapter presents the more complete analysis of the exporting unemployment game that is relevant when each country has a continuous range of macroeconomic expansion or contraction options from which to choose, as opposed to the simple choice presented in Table 25.3 (expand vs. contract).

⁹Jeffrey Sachs, “The Dollar and Policy Mix: 1985,” *Brookings Papers on Economic Activity*, 1 (1985): 117–186.

TABLE 25.4**The Game of “Competitive Appreciation”**

	United States Raises Interest Rate, i	United States Lowers Interest Rate, i
Europe Raises i^*	Recession in both: no change in exchange rate or CPI	Dollar depreciates: U.S. import prices and CPI go up; European CPI goes down
Europe Lowers i^*	Dollar appreciates: U.S. CPI goes down; European CPI goes up	Boom in both countries: no change in exchange rate or CPI

system. In the language of the Articles of Agreement of the International Monetary Fund, the members agreed to refrain from manipulating their exchange rates to seek “unfair advantage.”

Obstacles to Successful Coordination

If international policy coordination was really as easy as Tables 25.3 and 25.4 make it appear, it might seem odd that agreements do not take place more often than they do. A number of obstacles make coordination difficult in practice. Even if the setting is as simple as we have laid out, there is first of all the problem of dividing the gains from cooperation between the two countries. In any game there is the possibility that both parties will bargain “tough,” with the result that the potential gains are lost to both. Then there is the issue of enforcement of the agreement. The United States, knowing that Europe has set its money supply at the level agreed on, may be tempted to reduce its own money supply because that will move it to higher levels of economic welfare. Of course, if the bargain were explicit, this deviation from the agreement would constitute cheating. The gains would be at most short run; when Europe realizes that America has broken the agreement, it too will change its policy settings, causing a return to the non-cooperative state. Even if no automatic penalty is built in for cheating, America will be discouraged from breaking the agreement if it is concerned that it would acquire an undesirable reputation as an untrustworthy party in potential future agreements.

A different difficulty arises from the fact that in the games described so far, policy makers are maximizing their objectives only period by period. If coordination constitutes joint expansion, as in the locomotive game, then this will raise inflation in the current period. If the current period is the only one that matters, then the policy makers will already have factored in the inflation correctly when mapping out their policy preferences. However, the expansion will also raise expected inflation in the next period, so workers will demand higher wages and there will be a higher level of actual inflation in the future for any given level of output, as we see in Chapter 26. In such circumstances, coordinating period by period may actually be harmful in the long run.¹⁰

¹⁰The damage to inflation-fighting credibility is offered as an argument why countries might be better off renouncing coordination altogether, in Kenneth Rogoff, “International Macroeconomic Policy Coordination May Be Counterproductive,” *Journal of International Economics*, 18 (May 1985): 199–217.

A final obstacle to successful macroeconomic policy coordination arises from uncertainty. So far we have assumed that policy makers know precisely (1) what their proper objectives are (for example, what weight should be placed on full employment versus inflation); (2) where their economies are relative to the target optimums (the baseline forecast); and (3) what effect given changes in the policy instruments will have on the economy (the size of the multipliers in the correct model of the world macroeconomy). In reality, however, policy makers are uncertain about each of the three. The third kind of uncertainty is illustrated in Table 25.2 by the disagreement among the major econometric models as to the effects of monetary policy. All three kinds of uncertainty make it difficult for each country in the bargaining process to know even what policy changes it should *want* its partners to make. A number of pessimistic conclusions emerge. Given differing perceptions, the policy makers may not be able to agree on a coordination package. Even if they do agree, the effects may be different from those anticipated.¹¹

The standard German view of the joint expansion agreed on at the 1978 Bonn summit is that it turned out to have been undesirable because by the end of the decade the priority had shifted back to fighting inflation. One possible way to understand this view is to see it as an example of uncertainty about the baseline position of the economy relative to the optimum: The 1979 oil price increase associated with the fall of the shah of Iran moved the world economy to a more inflationary position than had been anticipated at the time of the summit meeting. Another way to understand it is to see it as an example of disagreement over the correct model. In the model that the United States has in mind, a monetary expansion can raise output and employment, whereas in the Germans' model, monetary expansion simply goes into prices. Conflicting perceptions as to how the economy works make international coordination difficult, as much today as in 1978.

Thus the gains from international coordination are not as automatic as is suggested by the simple model illustrated here. The potential gains are still there, however. There are also other, more broadly defined arguments in favor of cooperation that include, for example, the exchange of information among countries. Sometimes the international meetings help give the individual countries the clarity of vision, sense of purpose, and political momentum needed to accomplish tasks (like cutting budget deficits) that some leaders in the individual governments considered to be in their individual national interests all along but were unable to accomplish in isolation.

It is inevitable that national leaders will, to an increasing extent, have to work together, particularly in time of crisis. It is good that policy makers maintain steady contact and do not wait for a crisis to become acquainted.

¹¹Jeffrey Frankel and Katharine Rockett, "International Macroeconomic Policy Coordination. When Policy-Makers Do Not Agree on the True Model," *American Economic Review* (June 1988): 318–340. Furthermore, even if the effects of coordination are as anticipated, the gains are generally estimated to be small, as was first shown in Gilles Oudiz and Jeffrey Sachs, "Macroeconomic Policy Coordination Among the Industrial Economies," *Brookings Papers on Economic Activity*, 1 (1984): 1–64. The reason is that the magnitude of international transmission effects is estimated to be relatively small.

25.4 Summary

This chapter showed that even with freely floating exchange rates, countries are interdependent. Only a small country can afford to ignore the effects its policy changes have on its trading partner because for a large country some of the effects bounce back. This chapter extended the Mundell-Fleming model of Chapter 23 to large countries and considered other extensions as well. The most important channel of transmission between countries is the trade balance. Wherever there are net capital flows, there are nonzero trade balances. There are also other possible channels of transmission. Econometric models suggest that the overall effect of a fiscal expansion in one country is the obvious one: There is an increase in demand for the net exports of the other country. Thus the expansion is transmitted positively. The overall transmission effect of a monetary expansion appears to be small, however, because the income and exchange rate effects on the trade balance tend to cancel each other out.

The fact that the world is interdependent leads to the topic of international macroeconomic policy coordination. National policy makers may be able to do better by setting their policies cooperatively than they can in the (Nash) noncooperative equilibrium, where each acts independently. For example, in a worldwide recession, with each country afraid to expand its economy on its own for fear of a deterioration of its trade balance, there can be gains from a general agreement to expand cooperatively.

CHAPTER PROBLEMS

1. The country of Bretagne holds its real money supply, M/P , constant, but the rest of the world undertakes a monetary expansion that drives down interest rates in Bretagne as well. Which is greater: the stimulus to its economy from lower interest rates or the loss of demand (net exports) when its currency appreciates against the rest of the world? I.e., does Y rise or fall? (*Hint*: Consider the money market equilibrium condition.)
2. When the country of Euphoria adopts a combination of easy fiscal and tight monetary policy, and exchange rates are flexible, is a foreign country suffering from unemployment likely to be pleased with the consequences? A foreign country suffering from inflation? A foreign country with a large external debt denominated in the currency of Euphoria?

Extra Credit

3. This problem concerns interdependence and the coordination of fiscal policy between two countries: Melanzane and Rigatoni. The country of Melanzane has two target variables: the domestic price level, p , and the exchange rate, s , valued in Melanzane-per-Rigatoni currency units (because the country wants to stabilize the two components of the CPI: domestic prices and import prices), both in log form. These target variables are affected both by the government spending of Melanzane, g_M as a percentage of

GDP, and the government spending of its trading partner, Rigatoni, g_R as a percentage of GDP.

$$p = A + Cg_M + Fg_R$$

$$s = B + D(g_R - g_M)$$

- a. In a standard Mundell-Fleming model, on what would the sign of D depend? What do most multicountry econometric models say about the signs of C , D , and F ?
- b. Assume that Melanzane wishes to reduce both s and p to zero. This could be the aftermath of an increase in oil prices that has raised A and B above zero. Solve for the optimal combination of g_M and g_R that would be preferred by Melanzane if it had its first choice. Assume that the signs of C , F , and D are as in (a). What is the sign of $(g_M - g_R)$, that is, would Melanzane prefer that it cut spending more or that Rigatoni cut spending more? Why? Show the optimal point for Melanzane on a graph analogous to that in the chapter supplement.
- c. If Melanzane seeks to minimize a quadratic loss function

$$L = p^2 + \omega s^2$$

where ω is the weight placed on the exchange rate objective, derive its reaction function, giving g_M as a function of g_R . How will Melanzane react to a fiscal contraction by Rigatoni, if exchange rate effects are not very important (i.e., if D and ω are low), and why? If they (D and ω) are high?

- d. Assume that Rigatoni has a similar objective function, with its prices determined analogously. Indicate on a graph what optimal combination of g_M and g_R would be preferred by Rigatoni, and its reaction function. Describe the Nash noncooperative equilibrium. What sort of cooperative bargain would raise economic welfare and why?

SUGGESTIONS FOR FURTHER READING

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