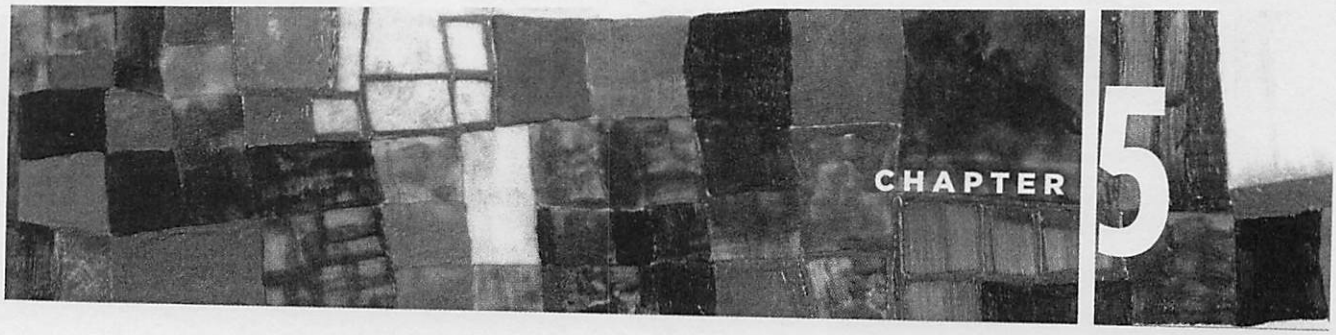


The Open Economy

No nation was ever ruined by trade.

—Benjamin Franklin

Even if you never leave your hometown, you are an active participant in the global economy. When you go to the grocery store, for instance, you might choose between apples grown locally and grapes grown in Chile. When you make a deposit into your local bank, the bank might lend those funds to your next-door neighbor or to a Japanese company building a factory outside Tokyo. Because our economy is integrated with many others around the world, consumers have more goods and services from which to choose, and savers have more opportunities to invest their wealth.

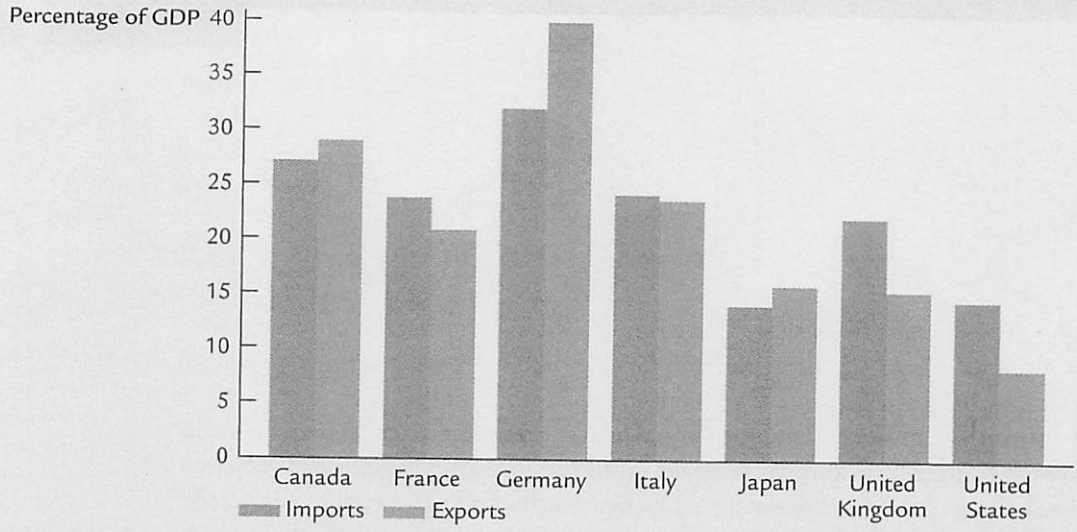
In previous chapters we simplified our analysis by assuming a closed economy. In actuality, however, most economies are open: they export goods and services abroad, they import goods and services from abroad, and they borrow and lend in world financial markets. Figure 5-1 gives some sense of the importance of these international interactions by showing imports and exports as a percentage of GDP for seven major industrial countries. As the figure shows, exports from the United States are about 8 percent of GDP and imports are about 15 percent. Trade is even more important for many other countries—in Canada and Germany, for instance, imports and exports are about a third of GDP. In these countries, international trade is central to analyzing economic developments and formulating economic policies.

This chapter begins our study of open-economy macroeconomics. We begin in Section 5-1 with questions of measurement. To understand how an open economy works, we must understand the key macroeconomic variables that measure the interactions among countries. Accounting identities reveal a key insight: the flow of goods and services across national borders is always matched by an equivalent flow of funds to finance capital accumulation.

In Section 5-2 we examine the determinants of these international flows. We develop a model of the small open economy that corresponds to our model of the closed economy in Chapter 3. The model shows the factors that determine whether a country is a borrower or a lender in world markets and how policies at home and abroad affect the flows of capital and goods.

In Section 5-3 we extend the model to discuss the prices at which a country makes exchanges in world markets. We examine what determines the price of domestic goods relative to foreign goods. We also examine what determines the

FIGURE 5-1



Imports and Exports as a Percentage of Output: 2007 While international trade is important for the United States, it is even more vital for other countries.

Source: International Monetary Fund.

rate at which the domestic currency trades for foreign currencies. Our model shows how protectionist trade policies—policies designed to protect domestic industries from foreign competition—influence the amount of international trade and the exchange rate.

5-1 The International Flows of Capital and Goods

The key macroeconomic difference between open and closed economies is that, in an open economy, a country's spending in any given year need not equal its output of goods and services. A country can spend more than it produces by borrowing from abroad, or it can spend less than it produces and lend the difference to foreigners. To understand this more fully, let's take another look at national income accounting, which we first discussed in Chapter 2.

The Role of Net Exports

Consider the expenditure on an economy's output of goods and services. In a closed economy, all output is sold domestically, and expenditure is divided into three components: consumption, investment, and government purchases. In an

open economy, some output is sold domestically and some is exported to be sold abroad. We can divide expenditure on an open economy's output Y into four components:

- C^d, consumption of domestic goods and services,
- I^d, investment in domestic goods and services,
- G^d, government purchases of domestic goods and services,
- X, exports of domestic goods and services.

The division of expenditure into these components is expressed in the identity

$$Y = C^d + I^d + G^d + X.$$

The sum of the first three terms, $C^d + I^d + G^d$, is domestic spending on domestic goods and services. The fourth term, X, is foreign spending on domestic goods and services.

A bit of manipulation can make this identity more useful. Note that domestic spending on *all* goods and services equals domestic spending on *domestic* goods and services plus domestic spending on *foreign* goods and services. Hence, total consumption C equals consumption of domestic goods and services C^d plus consumption of foreign goods and services C^f; total investment I equals investment in domestic goods and services I^d plus investment in foreign goods and services I^f; and total government purchases G equals government purchases of domestic goods and services G^d plus government purchases of foreign goods and services G^f. Thus,

$$C = C^d + C^f,$$

$$I = I^d + I^f,$$

$$G = G^d + G^f.$$

We substitute these three equations into the identity above:

$$Y = (C - C^f) + (I - I^f) + (G - G^f) + X.$$

We can rearrange to obtain

$$Y = C + I + G + X - (C^f + I^f + G^f).$$

The sum of domestic spending on foreign goods and services $(C^f + I^f + G^f)$ is expenditure on imports (IM). We can thus write the national income accounts identity as

$$Y = C + I + G + X - IM.$$

Because spending on imports is included in domestic spending $(C + I + G)$, and because goods and services imported from abroad are not part of a country's output, this equation subtracts spending on imports. Defining **net exports** to be exports minus imports $(NX = X - IM)$, the identity becomes

$$Y = C + I + G + NX.$$

This equation states that expenditure on domestic output is the sum of consumption, investment, government purchases, and net exports. This is the most common form of the national income accounts identity; it should be familiar from Chapter 2.

The national income accounts identity shows how domestic output, domestic spending, and net exports are related. In particular,

$$NX = Y - (C + I + G)$$

$$\text{Net Exports} = \text{Output} - \text{Domestic Spending}.$$

This equation shows that in an open economy, domestic spending need not equal the output of goods and services. *If output exceeds domestic spending, we export the difference: net exports are positive. If output falls short of domestic spending, we import the difference: net exports are negative.*

International Capital Flows and the Trade Balance

In an open economy, as in the closed economy we discussed in Chapter 3, financial markets and goods markets are closely related. To see the relationship, we must rewrite the national income accounts identity in terms of saving and investment. Begin with the identity

$$Y = C + I + G + NX.$$

Subtract C and G from both sides to obtain

$$Y - C - G = I + NX.$$

Recall from Chapter 3 that $Y - C - G$ is national saving S, which equals the sum of private saving, $Y - T - C$, and public saving, $T - G$, where T stands for taxes. Therefore,

$$S = I + NX.$$

Subtracting I from both sides of the equation, we can write the national income accounts identity as

$$S - I = NX.$$

This form of the national income accounts identity shows that an economy's net exports must always equal the difference between its saving and its investment.

Let's look more closely at each part of this identity. The easy part is the right-hand side, NX, the net export of goods and services. Another name for net exports is the **trade balance,** because it tells us how our trade in goods and services departs from the benchmark of equal imports and exports.

The left-hand side of the identity is the difference between domestic saving and domestic investment, $S - I$, which we'll call **net capital outflow.** (It's sometimes called *net foreign investment.*) Net capital outflow equals the amount that domestic residents are lending abroad minus the amount that foreigners are lending to us. If net capital outflow is positive, the economy's saving exceeds its

investment, and it is lending the excess to foreigners. If the net capital outflow is negative, the economy is experiencing a capital inflow: investment exceeds saving, and the economy is financing this extra investment by borrowing from abroad. Thus, net capital outflow reflects the international flow of funds to finance capital accumulation.

The national income accounts identity shows that net capital outflow always equals the trade balance. That is,

$$\text{Net Capital Outflow} = \text{Trade Balance}$$

$$S - I \quad = \quad NX.$$

If $S - I$ and NX are positive, we have a **trade surplus.** In this case, we are net lenders in world financial markets, and we are exporting more goods than we are importing. If $S - I$ and NX are negative, we have a **trade deficit.** In this case, we are net borrowers in world financial markets, and we are importing more goods than we are exporting. If $S - I$ and NX are exactly zero, we are said to have **balanced trade** because the value of imports equals the value of exports.

The national income accounts identity shows that the international flow of funds to finance capital accumulation and the international flow of goods and services are two sides of the same coin. If domestic saving exceeds domestic investment, the surplus saving is used to make loans to foreigners. Foreigners require these loans because we are providing them with more goods and services than they are providing us. That is, we are running a trade surplus. If investment exceeds saving, the extra investment must be financed by borrowing from abroad. These foreign loans enable us to import more goods and services than we export. That is, we are running a trade deficit. Table 5-1 summarizes these lessons.

Note that the international flow of capital can take many forms. It is easiest to assume—as we have done so far—that when we run a trade deficit, foreigners make loans to us. This happens, for example, when the Japanese buy the debt issued by U.S. corporations or by the U.S. government. But the flow of capital can also take the form of foreigners buying domestic assets, such as when a citizen of Germany buys stock from an American on the New York Stock Exchange.

TABLE 5-1

International Flows of Goods and Capital: Summary

This table shows the three outcomes that an open economy can experience.

Trade Surplus	Balanced Trade	Trade Deficit
Exports > Imports	Exports = Imports	Exports < Imports
Net Exports > 0	Net Exports = 0	Net Exports < 0
$Y > C + I + G$	$Y = C + I + G$	$Y < C + I + G$
Saving > Investment	Saving = Investment	Saving < Investment
Net Capital Outflow > 0	Net Capital Outflow = 0	Net Capital Outflow < 0

Whether foreigners buy domestically issued debt or domestically owned assets, they obtain a claim to the future returns to domestic capital. In both cases, foreigners end up owning some of the domestic capital stock.

International Flows of Goods and Capital: An Example

The equality of net exports and net capital outflow is an identity: it must hold because of how the variables are defined and the numbers are added up. But it is easy to miss the intuition behind this important relationship. The best way to understand it is to consider an example.

Imagine that Bill Gates sells a copy of the Windows operating system to a Japanese consumer for 5,000 yen. Because Mr. Gates is a U.S. resident, the sale represents an export of the United States. Other things equal, U.S. net exports rise. What else happens to make the identity hold? It depends on what Mr. Gates does with the 5,000 yen.

Suppose Mr. Gates decides to stuff the 5,000 yen in his mattress. In this case, Mr. Gates has allocated some of his saving to an investment in the Japanese

The Irrelevance of Bilateral Trade Balances

FYI

The trade balance we have been discussing measures the difference between a nation's exports and its imports with the rest of the world. Sometimes you might hear in the media a report on a nation's trade balance with a specific other nation. This is called a *bilateral* trade balance. For example, the U.S. bilateral trade balance with China equals exports that the United States sells to China minus imports that the United States buys from China.

The overall trade balance is, as we have seen, inextricably linked to a nation's saving and investment. That is not true of a bilateral trade balance. Indeed, a nation can have large trade deficits and surpluses with specific trading partners, while having balanced trade overall.

For example, suppose the world has three countries: the United States, China, and Australia. The United States sells $100 billion in machine tools to Australia, Australia sells $100 billion in wheat to China, and China sells $100 billion in toys to the United States. In this case, the United States has a bilateral trade deficit with China, China has a bilateral trade deficit with Australia, and Australia has a bilateral trade deficit with the United States. But each of the three nations has balanced trade overall, exporting and importing $100 billion in goods.

Bilateral trade deficits receive more attention in the political arena than they deserve. This is in part because international relations are conducted country to country, so politicians and diplomats are naturally drawn to statistics measuring country-to-country economic transactions. Most economists, however, believe that bilateral trade balances are not very meaningful. From a macroeconomic standpoint, it is a nation's trade balance with all foreign nations put together that matters.

The same lesson applies to individuals as it does to nations. Your own personal trade balance is the difference between your income and your spending, and you may be concerned if these two variables are out of line. But you should not be concerned with the difference between your income and spending with a particular person or firm. Economist Robert Solow once explained the irrelevance of bilateral trade balances as follows: "I have a chronic deficit with my barber, who doesn't buy a darned thing from me." But that doesn't stop Mr. Solow from living within his means—or getting a haircut when he needs it.

economy (in the form of the Japanese currency) rather than to an investment in the U.S. economy. Thus, U.S. saving exceeds U.S. investment. The rise in U.S. net exports is matched by a rise in the U.S. net capital outflow.

If Mr. Gates wants to invest in Japan, however, he is unlikely to make currency his asset of choice. He might use the 5,000 yen to buy some stock in, say, the Sony Corporation, or he might buy a bond issued by the Japanese government. In either case, some of U.S. saving is flowing abroad. Once again, the U.S. net capital outflow exactly balances U.S. net exports.

The opposite situation occurs in Japan. When the Japanese consumer buys a copy of the Windows operating system, Japan's purchases of goods and services ($C + I + G$) rise, but there is no change in what Japan has produced (Y). The transaction reduces Japan's saving ($S = Y - C - G$) for a given level of investment (I). While the U.S. experiences a net capital outflow, Japan experiences a net capital inflow.

Now let's change the example. Suppose that instead of investing his 5,000 yen in a Japanese asset, Mr. Gates uses it to buy something made in Japan, such as a Sony Walkman MP3 player. In this case, imports into the United States rise. Together, the Windows export and the Walkman import represent balanced trade between Japan and the United States. Because exports and imports rise equally, net exports and net capital outflow are both unchanged.

A final possibility is that Mr. Gates exchanges his 5,000 yen for U.S. dollars at a local bank. But this doesn't change the situation: the bank now has to do something with the 5,000 yen. It can buy Japanese assets (a U.S. net capital outflow); it can buy a Japanese good (a U.S. import); or it can sell the yen to another American who wants to make such a transaction. If you follow the money, you can see that, in the end, U.S. net exports must equal U.S. net capital outflow.

5-2 Saving and Investment in a Small Open Economy

So far in our discussion of the international flows of goods and capital, we have rearranged accounting identities. That is, we have defined some of the variables that measure transactions in an open economy, and we have shown the links among these variables that follow from their definitions. Our next step is to develop a model that explains the behavior of these variables. We can then use the model to answer questions such as how the trade balance responds to changes in policy.

Capital Mobility and the World Interest Rate

In a moment we present a model of the international flows of capital and goods. Because the trade balance equals the net capital outflow, which in turn equals saving minus investment, our model focuses on saving and investment. To develop this model, we use some elements that should be familiar from Chapter 3, but

in contrast to the Chapter 3 model, we do not assume that the real interest rate equilibrates saving and investment. Instead, we allow the economy to run a trade deficit and borrow from other countries or to run a trade surplus and lend to other countries.

If the real interest rate does not adjust to equilibrate saving and investment in this model, what *does* determine the real interest rate? We answer this question here by considering the simple case of a **small open economy** with perfect capital mobility. By "small" we mean that this economy is a small part of the world market and thus, by itself, can have only a negligible effect on the world interest rate. By "perfect capital mobility" we mean that residents of the country have full access to world financial markets. In particular, the government does not impede international borrowing or lending.

Because of this assumption of perfect capital mobility, the interest rate in our small open economy, r, must equal the **world interest rate** r^*, the real interest rate prevailing in world financial markets:

$$r = r^*.$$

Residents of the small open economy need never borrow at any interest rate above r^*, because they can always get a loan at r^* from abroad. Similarly, residents of this economy need never lend at any interest rate below r^* because they can always earn r^* by lending abroad. Thus, the world interest rate determines the interest rate in our small open economy.

Let's discuss briefly what determines the world real interest rate. In a closed economy, the equilibrium of domestic saving and domestic investment determines the interest rate. Barring interplanetary trade, the world economy is a closed economy. Therefore, the equilibrium of world saving and world investment determines the world interest rate. Our small open economy has a negligible effect on the world real interest rate because, being a small part of the world, it has a negligible effect on world saving and world investment. Hence, our small open economy takes the world interest rate as exogenously given.

Why Assume a Small Open Economy?

The analysis in the body of this chapter assumes that the nation being studied is a small open economy. (The same approach is taken in Chapter 12, which examines short-run fluctuations in an open economy.) This assumption raises some questions.

Q: Is the United States well described by the assumption of a small open economy?

A: No, it is not, at least not completely. The United States does borrow and lend in world financial markets, and these markets exert a strong influence over the U.S. real interest rate, but it would be an exaggeration to say that the U.S. real interest rate is determined solely by world financial markets.

Q: So why are we assuming a small open economy?

A: Some nations, such as Canada and the Netherlands, are better described by the assumption of a small open economy. Yet the main reason for making this assumption is to develop understanding and intuition for the macroeconomics of

open economies. Remember from Chapter 1 that economic models are built with simplifying assumptions. An assumption need not be realistic to be useful. Assuming a small open economy simplifies the analysis greatly and, therefore, will help clarify our thinking.

Q: Can we relax this assumption and make the model more realistic?

A: Yes, we can, and we will. The appendix to this chapter (and the appendix to Chapter 12) considers the more realistic and more complicated case of a large open economy. Some instructors skip directly to this material when teaching these topics because the approach is more realistic for economies such as that of the United States. Others think that students should walk before they run and, therefore, begin with the simplifying assumption of a small open economy.

The Model

To build the model of the small open economy, we take three assumptions from Chapter 3:

- The economy's output Y is fixed by the factors of production and the production function. We write this as

$$Y = \bar{Y} = F(\bar{K}, \bar{L}).$$

- Consumption C is positively related to disposable income $Y - T$. We write the consumption function as

$$C = C(Y - T).$$

- Investment I is negatively related to the real interest rate r. We write the investment function as

$$I = I(r).$$

These are the three key parts of our model. If you do not understand these relationships, review Chapter 3 before continuing.

We can now return to the accounting identity and write it as

$$NX = (Y - C - G) - I$$

$$NX = S - I.$$

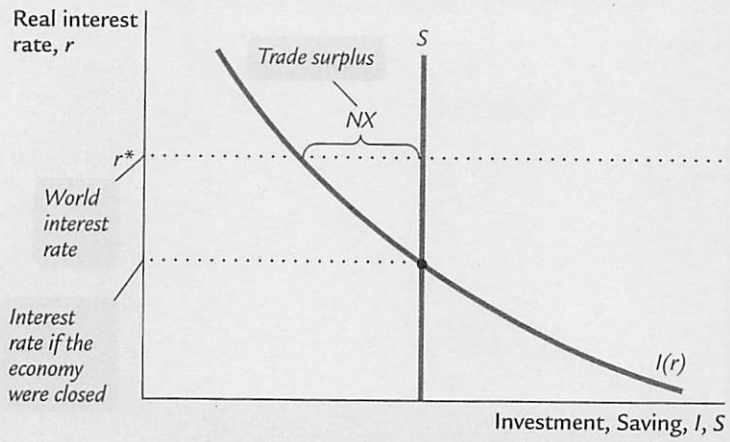
Substituting the Chapter 3 assumptions recapped above and the assumption that the interest rate equals the world interest rate, we obtain

$$NX = [\bar{Y} - C(\bar{Y} - T) - G] - I(r^*)$$

$$= \quad \bar{S} \quad - I(r^*).$$

This equation shows that the trade balance NX depends on those variables that determine saving S and investment I. Because saving depends on fiscal policy (lower government purchases G or higher taxes T raise national saving) and investment depends on the world real interest rate r^* (a higher interest rate makes some investment projects unprofitable), the trade balance depends on these variables as well.

FIGURE 5-2



Saving and Investment in a Small Open Economy In a closed economy, the real interest rate adjusts to equilibrate saving and investment. In a small open economy, the interest rate is determined in world financial markets. The difference between saving and investment determines the trade balance. Here there is a trade surplus, because at the world interest rate, saving exceeds investment.

In Chapter 3 we graphed saving and investment as in Figure 5-2. In the closed economy studied in that chapter, the real interest rate adjusts to equilibrate saving and investment—that is, the real interest rate is found where the saving and investment curves cross. In the small open economy, however, the real interest rate equals the world real interest rate. *The trade balance is determined by the difference between saving and investment at the world interest rate.*

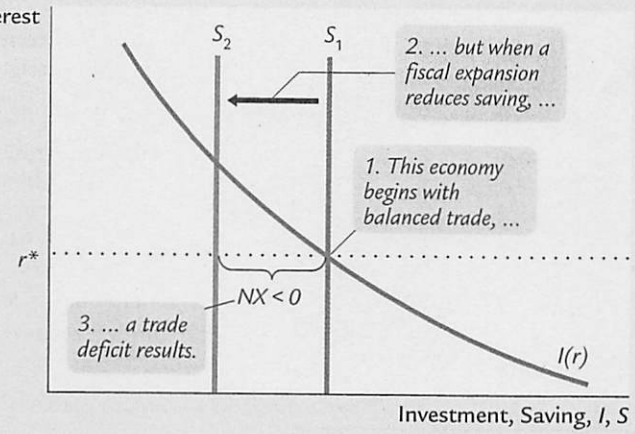
At this point, you might wonder about the mechanism that causes the trade balance to equal the net capital outflow. The determinants of the capital flows are easy to understand. When saving falls short of investment, investors borrow from abroad; when saving exceeds investment, the excess is lent to other countries. But what causes those who import and export to behave so as to ensure that the international flow of goods exactly balances this international flow of capital? For now we leave this question unanswered, but we return to it in Section 5-3 when we discuss the determination of exchange rates.

How Policies Influence the Trade Balance

Suppose that the economy begins in a position of balanced trade. That is, at the world interest rate, investment I equals saving S, and net exports NX equal zero. Let's use our model to predict the effects of government policies at home and abroad.

Fiscal Policy at Home Consider first what happens to the small open economy if the government expands domestic spending by increasing government purchases. The increase in G reduces national saving, because $S = Y - C - G$. With an unchanged world real interest rate, investment remains the same. Therefore, saving falls below investment, and some investment must now be financed by borrowing from abroad. Because $NX = S - I$, the fall in S implies a fall in NX. The economy now runs a trade deficit.

FIGURE 5-3



A Fiscal Expansion at Home in a Small Open Economy An increase in government purchases or a reduction in taxes reduces national saving and thus shifts the saving schedule to the left, from S_1 to S_2. The result is a trade deficit.

The same logic applies to a decrease in taxes. A tax cut lowers T, raises disposable income $Y - T$, stimulates consumption, and reduces national saving. (Even though some of the tax cut finds its way into private saving, public saving falls by the full amount of the tax cut; in total, saving falls.) Because $NX = S - I$, the reduction in national saving in turn lowers NX.

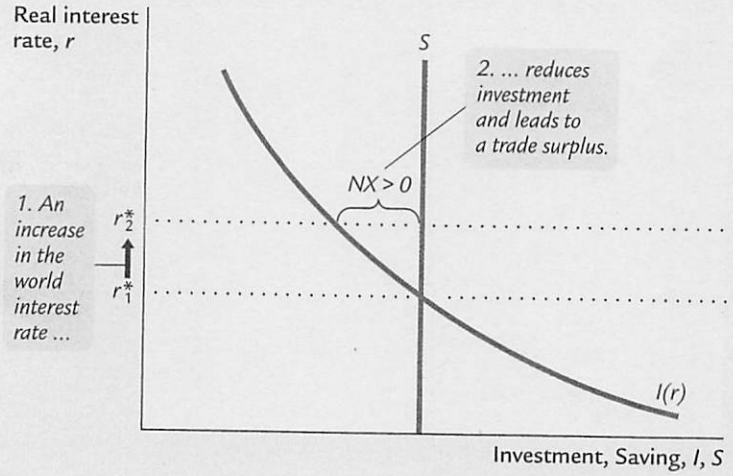
Figure 5-3 illustrates these effects. A fiscal policy change that increases private consumption C or public consumption G reduces national saving $(Y - C - G)$ and, therefore, shifts the vertical line that represents saving from S_1 to S_2. Because NX is the distance between the saving schedule and the investment schedule at the world interest rate, this shift reduces NX. *Hence, starting from balanced trade, a change in fiscal policy that reduces national saving leads to a trade deficit.*

Fiscal Policy Abroad Consider now what happens to a small open economy when foreign governments increase their government purchases. If these foreign countries are a small part of the world economy, then their fiscal change has a negligible impact on other countries. But if these foreign countries are a large part of the world economy, their increase in government purchases reduces world saving. The decrease in world saving causes the world interest rate to rise, just as we saw in our closed-economy model (remember, Earth is a closed economy).

The increase in the world interest rate raises the cost of borrowing and, thus, reduces investment in our small open economy. Because there has been no change in domestic saving, saving S now exceeds investment I, and some of our saving begins to flow abroad. Because $NX = S - I$, the reduction in I must also increase NX. Hence, reduced saving abroad leads to a trade surplus at home.

Figure 5-4 illustrates how a small open economy starting from balanced trade responds to a foreign fiscal expansion. Because the policy change is occurring abroad, the domestic saving and investment schedules remain the same. The only change is an increase in the world interest rate from r_1^* to r_2^*. The trade balance is the difference between the saving and investment schedules; because

FIGURE 5-4

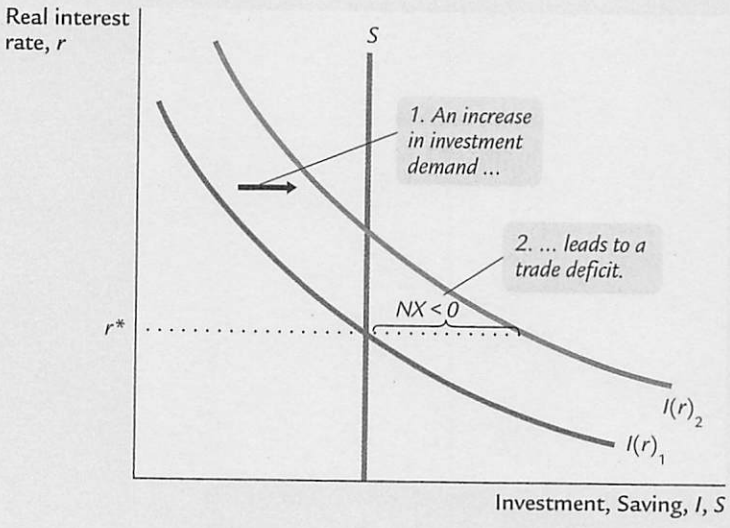


A Fiscal Expansion Abroad in a Small Open Economy A fiscal expansion in a foreign economy large enough to influence world saving and investment raises the world interest rate from r_1^* to r_2^*. The higher world interest rate reduces investment in this small open economy, causing a trade surplus.

saving exceeds investment at r_2^*, there is a trade surplus. *Hence, starting from balanced trade, an increase in the world interest rate due to a fiscal expansion abroad leads to a trade surplus.*

Shifts in Investment Demand Consider what happens to our small open economy if its investment schedule shifts outward—that is, if the demand for investment goods at every interest rate increases. This shift would occur if, for example, the government changed the tax laws to encourage investment by providing an investment tax credit. Figure 5-5 illustrates the impact of a shift in the

FIGURE 5-5



A Shift in the Investment Schedule in a Small Open Economy An outward shift in the investment schedule from $I(r)_1$ to $I(r)_2$ increases the amount of investment at the world interest rate r^*. As a result, investment now exceeds saving, which means the economy is borrowing from abroad and running a trade deficit.

investment schedule. At a given world interest rate, investment is now higher. Because saving is unchanged, some investment must now be financed by borrowing from abroad. Because capital flows into the economy to finance the increased investment, the net capital outflow is negative. Put differently, because $NX = S - I$, the increase in I implies a decrease in NX. *Hence, starting from balanced trade, an outward shift in the investment schedule causes a trade deficit.*

Evaluating Economic Policy

Our model of the open economy shows that the flow of goods and services measured by the trade balance is inextricably connected to the international flow of funds for capital accumulation. The net capital outflow is the difference between domestic saving and domestic investment. Thus, the impact of economic policies on the trade balance can always be found by examining their impact on domestic saving and domestic investment. Policies that increase investment or decrease saving tend to cause a trade deficit, and policies that decrease investment or increase saving tend to cause a trade surplus.

Our analysis of the open economy has been positive, not normative. That is, our analysis of how economic policies influence the international flows of capital and goods has not told us whether these policies are desirable. Evaluating economic policies and their impact on the open economy is a frequent topic of debate among economists and policymakers.

When a country runs a trade deficit, policymakers must confront the question of whether it represents a national problem. Most economists view a trade deficit not as a problem in itself, but perhaps as a symptom of a problem. A trade deficit could be a reflection of low saving. In a closed economy, low saving leads to low investment and a smaller future capital stock. In an open economy, low saving leads to a trade deficit and a growing foreign debt, which eventually must be repaid. In both cases, high current consumption leads to lower future consumption, implying that future generations bear the burden of low national saving.

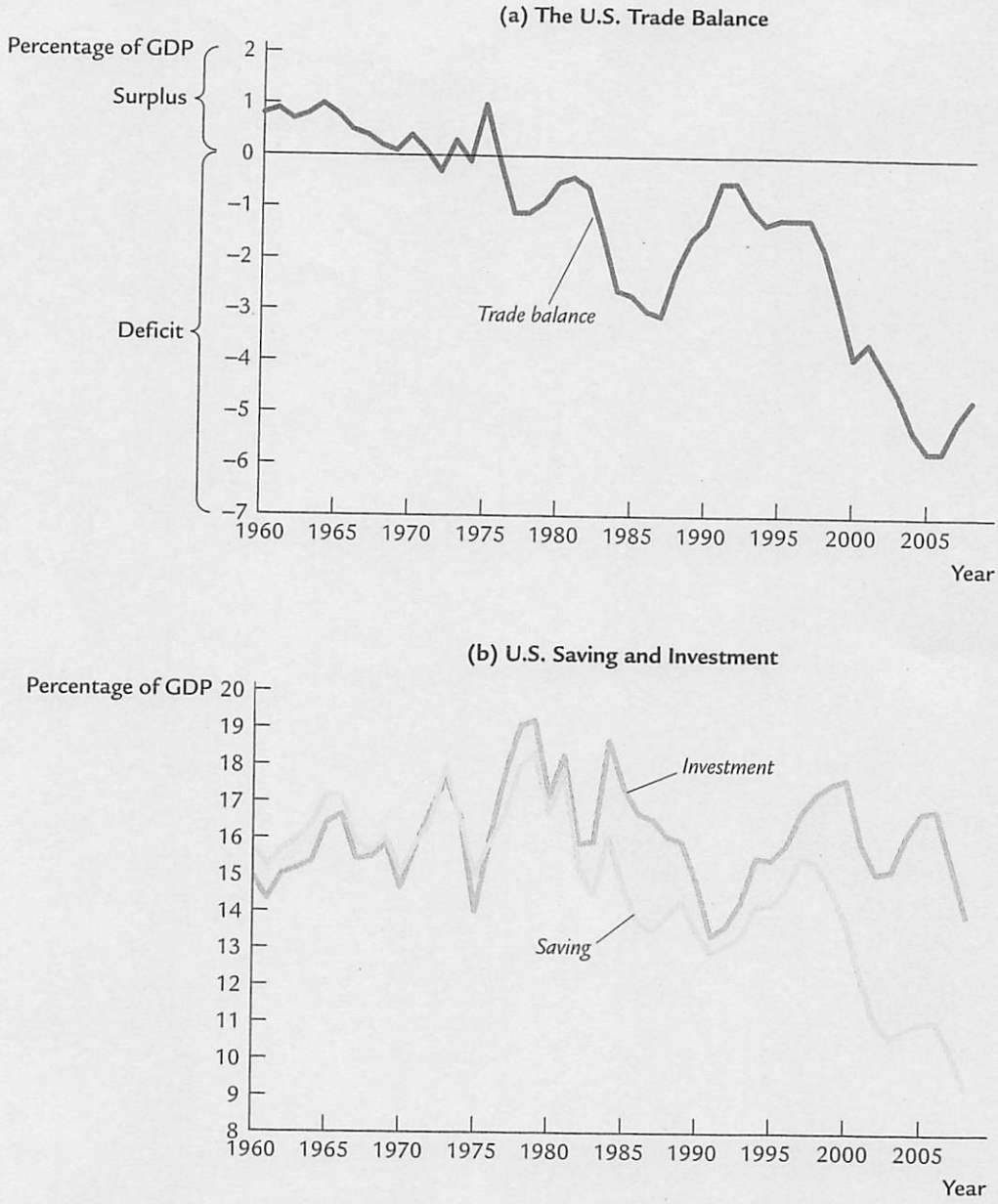
Yet trade deficits are not always a reflection of an economic malady. When poor rural economies develop into modern industrial economies, they sometimes finance their high levels of investment with foreign borrowing. In these cases, trade deficits are a sign of economic development. For example, South Korea ran large trade deficits throughout the 1970s, and it became one of the success stories of economic growth. The lesson is that one cannot judge economic performance from the trade balance alone. Instead, one must look at the underlying causes of the international flows.

CASE STUDY

The U.S. Trade Deficit

During the 1980s, 1990s, and 2000s, the United States ran large trade deficits. Panel (a) of Figure 5-6 documents this experience by showing net exports as a percentage of GDP. The exact size of the trade deficit fluctuated over time, but

FIGURE 5-6



The Trade Balance, Saving, and Investment: The U.S. Experience
Panel (a) shows the trade balance as a percentage of GDP. Positive numbers represent a surplus, and negative numbers represent a deficit. Panel (b) shows national saving and investment as a percentage of GDP since 1960. The trade balance equals saving minus investment.

Source: U.S. Department of Commerce.

it was large throughout these three decades. In 2007, the trade deficit was $708 billion, or 5.1 percent of GDP. As accounting identities require, this trade deficit had to be financed by borrowing from abroad (or, equivalently, by selling U.S. assets abroad). During this period, the United States went from being the world's largest creditor to the world's largest debtor.

What caused the U.S. trade deficit? There is no single explanation. But to understand some of the forces at work, it helps to look at national saving and domestic investment, as shown in panel (b) of the figure. Keep in mind that the trade deficit is the difference between saving and investment.

The start of the trade deficit coincided with a fall in national saving. This development can be explained by the expansionary fiscal policy in the 1980s. With the support of President Reagan, the U.S. Congress passed legislation in 1981 that substantially cut personal income taxes over the next three years. Because these tax cuts were not met with equal cuts in government spending, the federal budget went into deficit. These budget deficits were among the largest ever experienced in a period of peace and prosperity, and they continued long after Reagan left office. According to our model, such a policy should reduce national saving, thereby causing a trade deficit. And, in fact, that is exactly what happened. Because the government budget and trade balance went into deficit at roughly the same time, these shortfalls were called the *twin deficits*.

Things started to change in the 1990s, when the U.S. federal government got its fiscal house in order. The first President Bush and President Clinton both signed tax increases, while Congress kept a lid on spending. In addition to these policy changes, rapid productivity growth in the late 1990s raised incomes and, thus, further increased tax revenue. These developments moved the U.S. federal budget from deficit to surplus, which in turn caused national saving to rise.

In contrast to what our model predicts, the increase in national saving did not coincide with a shrinking trade deficit, because domestic investment rose at the same time. The likely explanation is that the boom in information technology caused an expansionary shift in the U.S. investment function. Even though fiscal policy was pushing the trade deficit toward surplus, the investment boom was an even stronger force pushing the trade balance toward deficit.

In the early 2000s, fiscal policy once again put downward pressure on national saving. With the second President Bush in the White House, tax cuts were signed into law in 2001 and 2003, while the war on terror led to substantial increases in government spending. The federal government was again running budget deficits. National saving fell to historic lows, and the trade deficit reached historic highs.

A few years later, the trade deficit started to shrink somewhat, as the economy experienced a substantial decline in housing prices (a phenomenon examined in Chapters 11 and 18). Lower housing prices lead to a substantial decline in residential investment. The trade deficit fell from 5.8 percent of GDP at its peak in 2006 to 4.7 percent in 2008.

The history of the U.S. trade deficit shows that this statistic, by itself, does not tell us much about what is happening in the economy. We have to look deeper at saving, investment, and the policies and events that cause them (and thus the trade balance) to change over time.[1] ■

CASE STUDY

Why Doesn't Capital Flow to Poor Countries?

The U.S. trade deficit discussed in the previous Case Study represents a flow of capital into the United States from the rest of the world. What countries were the source of these capital flows? Because the world is a closed economy, the capital must have been coming from those countries that were running trade surpluses. In 2008, this group included many nations that were far poorer than the United States, such as Russia, Malaysia, Venezuela, and China. In these nations, saving exceeded investment in domestic capital. These countries were sending funds abroad to countries like the United States, where investment in domestic capital exceeded saving.

From one perspective, the direction of international capital flows is a paradox. Recall our discussion of production functions in Chapter 3. There, we established that an empirically realistic production function is the Cobb–Douglas form:

$$F(K,L) = A\ K^{\alpha}L^{1-\alpha},$$

where K is capital, L is labor, A is a variable representing the state of technology, and α is a parameter that determines capital's share of total income. For this production function, the marginal product of capital is

$$MPK = \alpha\ A\ (K/L)^{\alpha-1}.$$

The marginal product of capital tells us how much extra output an extra unit of capital would produce. Because α is capital's share, it must be less than 1, so $\alpha - 1 < 0$. This means that an increase in K/L decreases MPK. In other words, holding other variables constant, the more capital a nation has, the less valuable an extra unit of capital is. This phenomenon of diminishing marginal product says that capital should be more valuable where capital is scarce.

This prediction, however, seems at odds with the international flow of capital represented by trade imbalances. Capital does not seem to flow to those nations where it should be most valuable. Instead of capital-rich countries like the United States lending to capital-poor countries, we often observe the opposite. Why is that?

One reason is that there are important differences among nations other than their accumulation of capital. Poor nations have not only lower levels of capital accumulation (represented by K/L) but also inferior production capabilities (rep-

[1] For more on this topic, see Catherine L. Mann, *Is the U.S. Trade Deficit Sustainable?* Institute for International Economics, 1999.

resented by the variable A). For example, compared to rich nations, poor nations may have less access to advanced technologies, lower levels of education (or *human capital*), or less efficient economic policies. Such differences could mean less output for given inputs of capital and labor; in the Cobb–Douglas production function, this is translated into a lower value of the parameter A. If so, then capital need not be more valuable in poor nations, even though capital is scarce.

A second reason capital might not flow to poor nations is that property rights are often not enforced. Corruption is much more prevalent; revolutions, coups, and expropriation of wealth are more common; and governments often default on their debts. So even if capital is more valuable in poor nations, foreigners may avoid investing their wealth there simply because they are afraid of losing it. Moreover, local investors face similar incentives. Imagine that you live in a poor nation and are lucky enough to have some wealth to invest; you might well decide that putting it in a safe country like the United States is your best option, even if capital is less valuable there than in your home country.

Whichever of these two reasons is correct, the challenge for poor nations is to find ways to reverse the situation. If these nations offered the same production efficiency and legal protections as the U.S. economy, the direction of international capital flows would likely reverse. The U.S. trade deficit would become a trade surplus, and capital would flow to these emerging nations. Such a change would help the poor of the world escape poverty.[2] ■

5-3 Exchange Rates

Having examined the international flows of capital and of goods and services, we now extend the analysis by considering the prices that apply to these transactions. The *exchange rate* between two countries is the price at which residents of those countries trade with each other. In this section we first examine precisely what the exchange rate measures, and we then discuss how exchange rates are determined.

Nominal and Real Exchange Rates

Economists distinguish between two exchange rates: the nominal exchange rate and the real exchange rate. Let's discuss each in turn and see how they are related.

The Nominal Exchange Rate The **nominal exchange rate** is the relative price of the currencies of two countries. For example, if the exchange rate between the U.S. dollar and the Japanese yen is 120 yen per dollar, then you can

[2] For more on this topic, see Robert E. Lucas, "Why Doesn't Capital Flow from Rich to Poor Countries?" *American Economic Review* 80 (May 1990): 92–96.

exchange one dollar for 120 yen in world markets for foreign currency. A Japanese who wants to obtain dollars would pay 120 yen for each dollar he bought. An American who wants to obtain yen would get 120 yen for each dollar he paid. When people refer to "the exchange rate" between two countries, they usually mean the nominal exchange rate.

Notice that an exchange rate can be reported in two ways. If one dollar buys 120 yen, then one yen buys 0.00833 dollar. We can say the exchange rate is 120 yen per dollar, or we can say the exchange rate is 0.00833 dollar per yen. Because 0.00833 equals 1/120, these two ways of expressing the exchange rate are equivalent.

This book always expresses the exchange rate in units of foreign currency per dollar. With this convention, a rise in the exchange rate—say, from 120 to 125 yen per dollar—is called an *appreciation* of the dollar; a fall in the exchange rate is called a *depreciation*. When the domestic currency appreciates, it buys more of the foreign currency; when it depreciates, it buys less. An appreciation is sometimes called a *strengthening* of the currency, and a depreciation is sometimes called a *weakening* of the currency.

The Real Exchange Rate The **real exchange rate** is the relative price of the goods of two countries. That is, the real exchange rate tells us the rate at which we can trade the goods of one country for the goods of another. The real exchange rate is sometimes called the *terms of trade*.

To see the relation between the real and nominal exchange rates, consider a single good produced in many countries: cars. Suppose an American car costs $10,000 and a similar Japanese car costs 2,400,000 yen. To compare the prices of the two cars, we must convert them into a common currency. If a dollar is worth 120 yen, then the American car costs 1,200,000 yen. Comparing the price of the American car (1,200,000 yen) and the price of the Japanese car (2,400,000 yen), we conclude that the American car costs one-half of what the Japanese car costs. In other words, at current prices, we can exchange 2 American cars for 1 Japanese car.

We can summarize our calculation as follows:

$$\text{Real Exchange Rate} = \frac{(120 \text{ yen/dollar}) \times (10{,}000 \text{ dollars/American Car})}{(2{,}400{,}000 \text{ yen/Japanese Car})}$$

$$= 0.5 \frac{\text{Japanese Car}}{\text{American Car}}.$$

At these prices and this exchange rate, we obtain one-half of a Japanese car per American car. More generally, we can write this calculation as

$$\text{Real Exchange Rate} = \frac{\text{Nominal Exchange Rate} \times \text{Price of Domestic Good}}{\text{Price of Foreign Good}}.$$

The rate at which we exchange foreign and domestic goods depends on the prices of the goods in the local currencies and on the rate at which the currencies are exchanged.

This calculation of the real exchange rate for a single good suggests how we should define the real exchange rate for a broader basket of goods. Let e be the nominal exchange rate (the number of yen per dollar), P be the price level in the United States (measured in dollars), and P^* be the price level in Japan (measured in yen). Then the real exchange rate ϵ is

$$\begin{array}{ccccc} \text{Real} & & \text{Nominal} & & \text{Ratio of} \\ \text{Exchange} & = & \text{Exchange} & \times & \text{Price} \\ \text{Rate} & & \text{Rate} & & \text{Levels} \end{array}$$

$$\epsilon = e \times (P/P^*).$$

The real exchange rate between two countries is computed from the nominal exchange rate and the price levels in the two countries. *If the real exchange rate is high, foreign goods are relatively cheap, and domestic goods are relatively expensive. If the real exchange rate is low, foreign goods are relatively expensive, and domestic goods are relatively cheap.*

The Real Exchange Rate and the Trade Balance

What macroeconomic influence does the real exchange rate exert? To answer this question, remember that the real exchange rate is nothing more than a relative price. Just as the relative price of hamburgers and pizza determines which you choose for lunch, the relative price of domestic and foreign goods affects the demand for these goods.

Suppose first that the real exchange rate is low. In this case, because domestic goods are relatively cheap, domestic residents will want to purchase fewer imported goods: they will buy Fords rather than Toyotas, drink Coors rather than Heineken, and vacation in Florida rather than Italy. For the same reason, foreigners will want to buy many of our goods. As a result of both of these actions, the quantity of our net exports demanded will be high.

The opposite occurs if the real exchange rate is high. Because domestic goods are expensive relative to foreign goods, domestic residents will want to buy many imported goods, and foreigners will want to buy few of our goods. Therefore, the quantity of our net exports demanded will be low.

Drawing by Matteson; © 1988 The New Yorker Magazine, Inc.

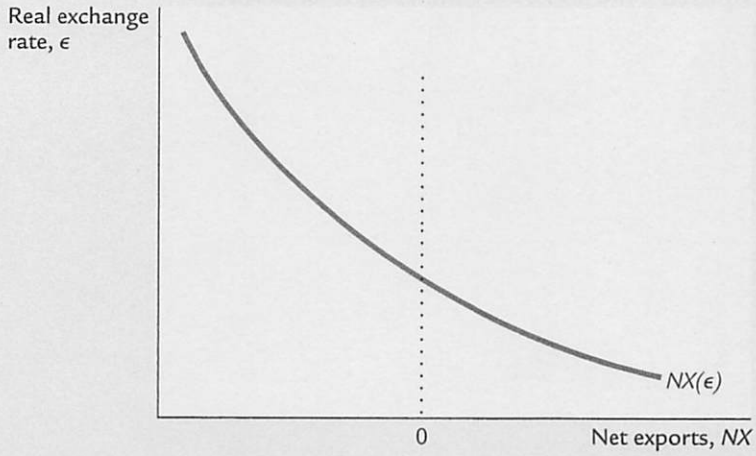
"How about Nebraska? The dollar's still strong in Nebraska."

We write this relationship between the real exchange rate and net exports as

$$NX = NX(\epsilon).$$

This equation states that net exports are a function of the real exchange rate. Figure 5-7 illustrates the negative relationship between the trade balance and the real exchange rate.

FIGURE 5-7



Net Exports and the Real Exchange Rate The figure shows the relationship between the real exchange rate and net exports: the lower the real exchange rate, the less expensive are domestic goods relative to foreign goods, and thus the greater are our net exports. Note that a portion of the horizontal axis measures negative values of *NX:* because imports can exceed exports, net exports can be less than zero.

The Determinants of the Real Exchange Rate

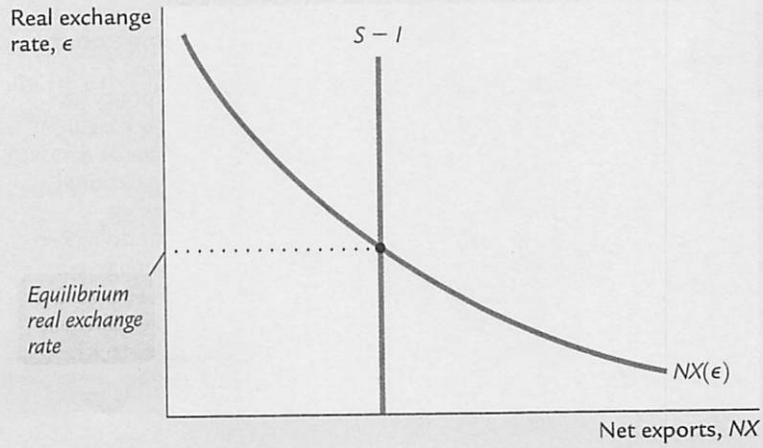
We now have all the pieces needed to construct a model that explains what factors determine the real exchange rate. In particular, we combine the relationship between net exports and the real exchange rate we just discussed with the model of the trade balance we developed earlier in the chapter. We can summarize the analysis as follows:

- The real exchange rate is related to net exports. When the real exchange rate is lower, domestic goods are less expensive relative to foreign goods, and net exports are greater.
- The trade balance (net exports) must equal the net capital outflow, which in turn equals saving minus investment. Saving is fixed by the consumption function and fiscal policy; investment is fixed by the investment function and the world interest rate.

Figure 5-8 illustrates these two conditions. The line showing the relationship between net exports and the real exchange rate slopes downward because a low real exchange rate makes domestic goods relatively inexpensive. The line representing the excess of saving over investment, $S - I$, is vertical because neither saving nor investment depends on the real exchange rate. The crossing of these two lines determines the equilibrium real exchange rate.

Figure 5-8 looks like an ordinary supply-and-demand diagram. In fact, you can think of this diagram as representing the supply and demand for foreign-currency exchange. The vertical line, $S - I$, represents the net capital outflow and thus the supply of dollars to be exchanged into foreign currency and invested abroad. The downward-sloping line, $NX(\epsilon)$, represents the net demand for dollars coming from

FIGURE 5-8



How the Real Exchange Rate Is Determined The real exchange rate is determined by the intersection of the vertical line representing saving minus investment and the downward-sloping net-exports schedule. At this intersection, the quantity of dollars supplied for the flow of capital abroad equals the quantity of dollars demanded for the net export of goods and services.

foreigners who want dollars to buy our goods. *At the equilibrium real exchange rate, the supply of dollars available from the net capital outflow balances the demand for dollars by foreigners buying our net exports.*

How Policies Influence the Real Exchange Rate

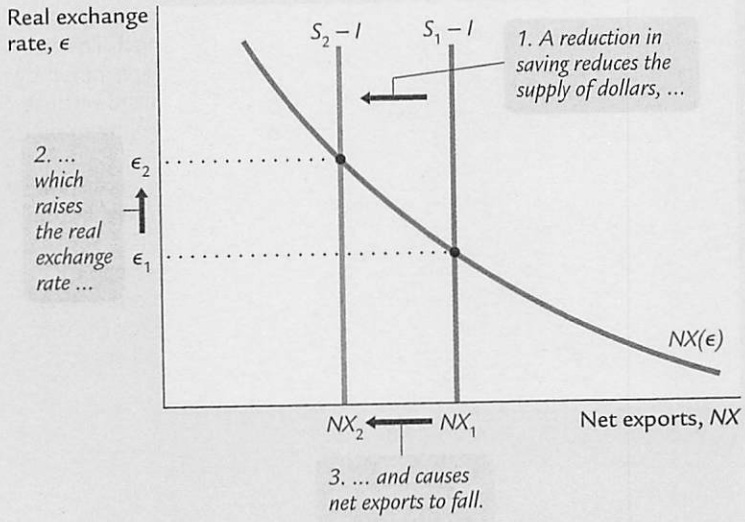
We can use this model to show how the changes in economic policy we discussed earlier affect the real exchange rate.

Fiscal Policy at Home What happens to the real exchange rate if the government reduces national saving by increasing government purchases or cutting taxes? As we discussed earlier, this reduction in saving lowers $S - I$ and thus NX. That is, the reduction in saving causes a trade deficit.

Figure 5-9 shows how the equilibrium real exchange rate adjusts to ensure that NX falls. The change in policy shifts the vertical $S - I$ line to the left, lowering the supply of dollars to be invested abroad. The lower supply causes the equilibrium real exchange rate to rise from ϵ_1 to ϵ_2—that is, the dollar becomes more valuable. Because of the rise in the value of the dollar, domestic goods become more expensive relative to foreign goods, which causes exports to fall and imports to rise. The change in exports and the change in imports both act to reduce net exports.

Fiscal Policy Abroad What happens to the real exchange rate if foreign governments increase government purchases or cut taxes? This change in fiscal policy reduces world saving and raises the world interest rate. The increase in the world interest rate reduces domestic investment I, which

FIGURE 5-9

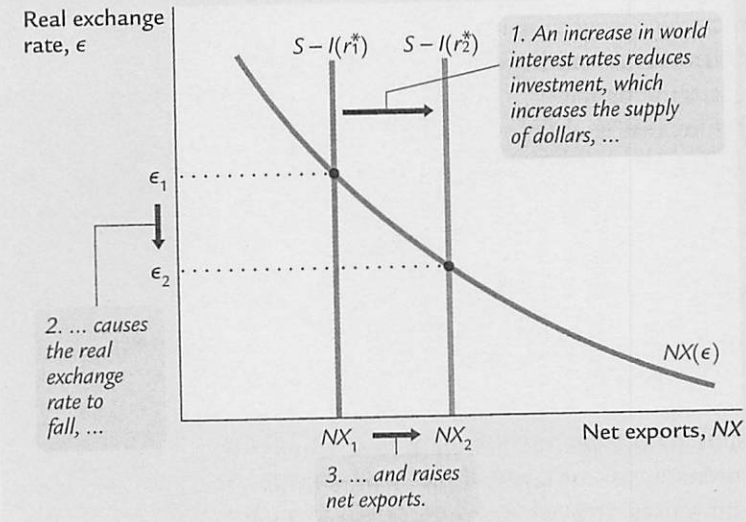


The Impact of Expansionary Fiscal Policy at Home on the Real Exchange Rate
Expansionary fiscal policy at home, such as an increase in government purchases or a cut in taxes, reduces national saving. The fall in saving reduces the supply of dollars to be exchanged into foreign currency, from $S_1 - I$ to $S_2 - I$. This shift raises the equilibrium real exchange rate from ϵ_1 to ϵ_2.

raises $S - I$ and thus NX. That is, the increase in the world interest rate causes a trade surplus.

Figure 5-10 shows that this change in policy shifts the vertical $S - I$ line to the right, raising the supply of dollars to be invested abroad. The equilibrium real

FIGURE 5-10



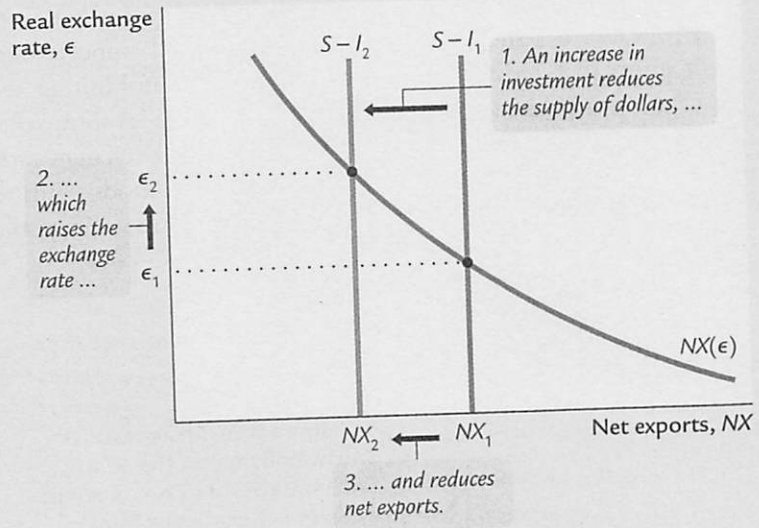
The Impact of Expansionary Fiscal Policy Abroad on the Real Exchange Rate
Expansionary fiscal policy abroad reduces world saving and raises the world interest rate from r_1^* to r_2^*. The increase in the world interest rate reduces investment at home, which in turn raises the supply of dollars to be exchanged into foreign currencies. As a result, the equilibrium real exchange rate falls from ϵ_1 to ϵ_2.

exchange rate falls. That is, the dollar becomes less valuable, and domestic goods become less expensive relative to foreign goods.

Shifts in Investment Demand What happens to the real exchange rate if investment demand at home increases, perhaps because Congress passes an investment tax credit? At the given world interest rate, the increase in investment demand leads to higher investment. A higher value of I means lower values of $S - I$ and NX. That is, the increase in investment demand causes a trade deficit.

Figure 5-11 shows that the increase in investment demand shifts the vertical $S - I$ line to the left, reducing the supply of dollars to be invested abroad. The

FIGURE 5-11



The Impact of an Increase in Investment Demand on the Real Exchange Rate An increase in investment demand raises the quantity of domestic investment from I_1 to I_2. As a result, the supply of dollars to be exchanged into foreign currencies falls from $S - I_1$ to $S - I_2$. This fall in supply raises the equilibrium real exchange rate from ϵ_1 to ϵ_2.

equilibrium real exchange rate rises. Hence, when the investment tax credit makes investing in the United States more attractive, it also increases the value of the U.S. dollars necessary to make these investments. When the dollar appreciates, domestic goods become more expensive relative to foreign goods, and net exports fall.

The Effects of Trade Policies

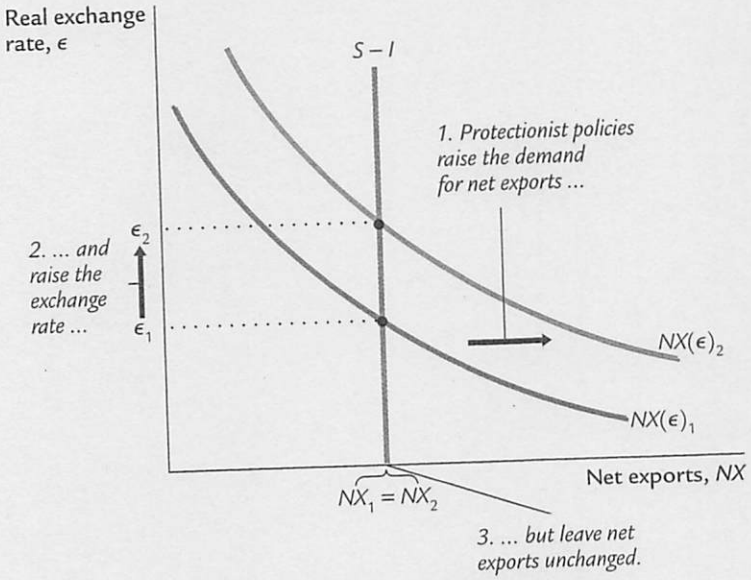
Now that we have a model that explains the trade balance and the real exchange rate, we have the tools to examine the macroeconomic effects of trade policies. Trade policies, broadly defined, are policies designed to influence directly the

amount of goods and services exported or imported. Most often, trade policies take the form of protecting domestic industries from foreign competition—either by placing a tax on foreign imports (a tariff) or restricting the amount of goods and services that can be imported (a quota).

As an example of a protectionist trade policy, consider what would happen if the government prohibited the import of foreign cars. For any given real exchange rate, imports would now be lower, implying that net exports (exports minus imports) would be higher. Thus, the net-exports schedule shifts outward, as in Figure 5-12. To see the effects of the policy, we compare the old equilibrium and the new equilibrium. In the new equilibrium, the real exchange rate is higher, and net exports are unchanged. Despite the shift in the net-exports schedule, the equilibrium level of net exports remains the same, because the protectionist policy does not alter either saving or investment.

This analysis shows that protectionist trade policies do not affect the trade balance. This surprising conclusion is often overlooked in the popular debate over trade policies. Because a trade deficit reflects an excess of imports over exports, one might guess that reducing imports—such as by prohibiting the import of foreign cars—would reduce a trade deficit. Yet our model shows that protectionist policies lead only to an appreciation of the real exchange rate. The increase in the price of domestic goods relative to foreign goods tends to lower net exports by stimulating imports and depressing exports. Thus, the

FIGURE 5-12



The Impact of Protectionist Trade Policies on the Real Exchange Rate A protectionist trade policy, such as a ban on imported cars, shifts the net-exports schedule from $NX(\epsilon)_1$ to $NX(\epsilon)_2$, which raises the real exchange rate from ϵ_1 to ϵ_2. Notice that, despite the shift in the net-exports schedule, the equilibrium level of net exports is unchanged.

appreciation offsets the increase in net exports that is directly attributable to the trade restriction.

Although protectionist trade policies do not alter the trade balance, they do affect the amount of trade. As we have seen, because the real exchange rate appreciates, the goods and services we produce become more expensive relative to foreign goods and services. We therefore export less in the new equilibrium. Because net exports are unchanged, we must import less as well. (The appreciation of the exchange rate does stimulate imports to some extent, but this only partly offsets the decrease in imports due to the trade restriction.) Thus, protectionist policies reduce both the quantity of imports and the quantity of exports.

This fall in the total amount of trade is the reason economists almost always oppose protectionist policies. International trade benefits all countries by allowing each country to specialize in what it produces best and by providing each country with a greater variety of goods and services. Protectionist policies diminish these gains from trade. Although these policies benefit certain groups within society—for example, a ban on imported cars helps domestic car producers—society on average is worse off when policies reduce the amount of international trade.

The Determinants of the Nominal Exchange Rate

Having seen what determines the real exchange rate, we now turn our attention to the nominal exchange rate—the rate at which the currencies of two countries trade. Recall the relationship between the real and the nominal exchange rate:

$$\begin{array}{ccccc} \text{Real} & & \text{Nominal} & & \text{Ratio of} \\ \text{Exchange} & = & \text{Exchange} & \times & \text{Price} \\ \text{Rate} & & \text{Rate} & & \text{Levels} \end{array}$$

$$\epsilon = e \times (P/P^*).$$

We can write the nominal exchange rate as

$$e = \epsilon \times (P^*/P).$$

This equation shows that the nominal exchange rate depends on the real exchange rate and the price levels in the two countries. Given the value of the real exchange rate, if the domestic price level P rises, then the nominal exchange rate e will fall: because a dollar is worth less, a dollar will buy fewer yen. However, if the Japanese price level P^* rises, then the nominal exchange rate will increase: because the yen is worth less, a dollar will buy more yen.

It is instructive to consider changes in exchange rates over time. The exchange rate equation can be written

$$\%\ \text{Change in } e = \%\ \text{Change in } \epsilon + \%\ \text{Change in } P^* - \%\ \text{Change in } P.$$

The percentage change in ϵ is the change in the real exchange rate. The percentage change in P is the domestic inflation rate π, and the percentage change in P^* is the foreign country's inflation rate π^*. Thus, the percentage change in the nominal exchange rate is

$$\%\text{ Change in } e = \%\text{ Change in } \epsilon + (\pi^* - \pi)$$

$$\begin{matrix}\text{Percentage Change in} \\ \text{Nominal Exchange Rate}\end{matrix} = \begin{matrix}\text{Percentage Change in} \\ \text{Real Exchange Rate}\end{matrix} + \begin{matrix}\text{Difference in} \\ \text{Inflation Rates.}\end{matrix}$$

This equation states that the percentage change in the nominal exchange rate between the currencies of two countries equals the percentage change in the real exchange rate plus the difference in their inflation rates. *If a country has a high rate of inflation relative to the United States, a dollar will buy an increasing amount of the foreign currency over time. If a country has a low rate of inflation relative to the United States, a dollar will buy a decreasing amount of the foreign currency over time.*

This analysis shows how monetary policy affects the nominal exchange rate. We know from Chapter 4 that high growth in the money supply leads to high inflation. Here, we have just seen that one consequence of high inflation is a depreciating currency: high π implies falling e. In other words, just as growth in the amount of money raises the price of goods measured in terms of money, it also tends to raise the price of foreign currencies measured in terms of the domestic currency.

CASE STUDY

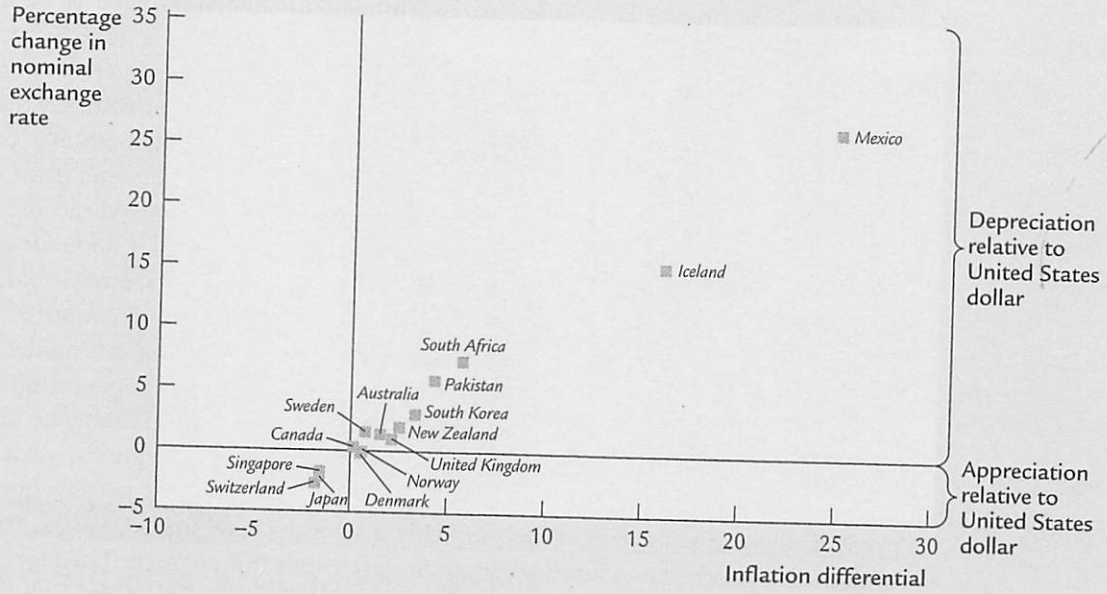
Inflation and Nominal Exchange Rate

If we look at data on exchange rates and price levels of different countries, we quickly see the importance of inflation for explaining changes in the nominal exchange rate. The most dramatic examples come from periods of very high inflation. For example, the price level in Mexico rose by 2,300 percent from 1983 to 1988. Because of this inflation, the number of pesos a person could buy with a U.S. dollar rose from 144 in 1983 to 2,281 in 1988.

The same relationship holds true for countries with more moderate inflation. Figure 5-13 is a scatterplot showing the relationship between inflation and the exchange rate for 15 countries. On the horizontal axis is the difference between each country's average inflation rate and the average inflation rate of the United States ($\pi^* - \pi$). On the vertical axis is the average percentage change in the exchange rate between each country's currency and the U.S. dollar (percentage change in e). The positive relationship between these two variables is clear in this figure. Countries with relatively high inflation tend to have depreciating currencies (you can buy more of them with your dollars over time), and countries with relatively low inflation tend to have appreciating currencies (you can buy less of them with your dollars over time).

As an example, consider the exchange rate between Swiss francs and U.S. dollars. Both Switzerland and the United States have experienced inflation over the past thirty years, so both the franc and the dollar buy fewer goods than they once

FIGURE 5-13



Inflation Differentials and the Exchange Rate This scatterplot shows the relationship between inflation and the nominal exchange rate. The horizontal axis shows the country's average inflation rate minus the U.S. average inflation rate over the period 1972–2007. The vertical axis is the average percentage change in the country's exchange rate (per U.S. dollar) over that period. This figure shows that countries with relatively high inflation tend to have depreciating currencies and that countries with relatively low inflation tend to have appreciating currencies.

Source: International Monetary Fund.

did. But, as Figure 5-13 shows, inflation in Switzerland has been lower than inflation in the United States. This means that the value of the franc has fallen less than the value of the dollar. Therefore, the number of Swiss francs you can buy with a U.S. dollar has been falling over time. ■

The Special Case of Purchasing-Power Parity

A famous hypothesis in economics, called the *law of one price,* states that the same good cannot sell for different prices in different locations at the same time. If a bushel of wheat sold for less in New York than in Chicago, it would be profitable to buy wheat in New York and then sell it in Chicago. This profit opportunity would become quickly apparent to astute arbitrageurs—people who specialize in "buying low" in one market and "selling high" in another. As the arbitrageurs took advantage of this opportunity, they would increase the demand for wheat in New York and increase the supply of wheat in Chicago. Their

actions would drive the price up in New York and down in Chicago, thereby ensuring that prices are equalized in the two markets.

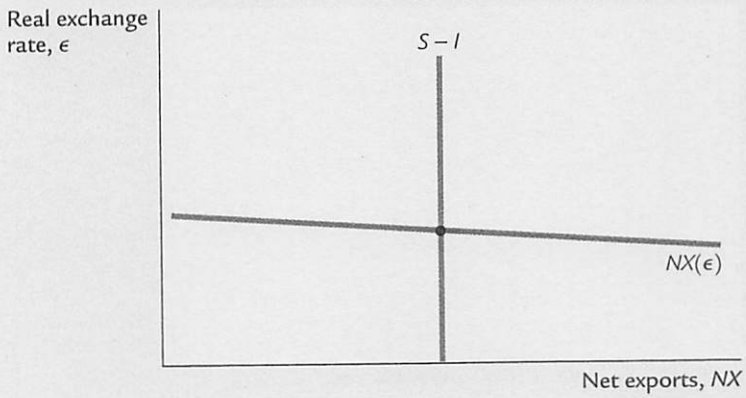
The law of one price applied to the international marketplace is called **purchasing-power parity.** It states that if international arbitrage is possible, then a dollar (or any other currency) must have the same purchasing power in every country. The argument goes as follows. If a dollar could buy more wheat domestically than abroad, there would be opportunities to profit by buying wheat domestically and selling it abroad. Profit-seeking arbitrageurs would drive up the domestic price of wheat relative to the foreign price. Similarly, if a dollar could buy more wheat abroad than domestically, the arbitrageurs would buy wheat abroad and sell it domestically, driving down the domestic price relative to the foreign price. Thus, profit-seeking by international arbitrageurs causes wheat prices to be the same in all countries.

We can interpret the doctrine of purchasing-power parity using our model of the real exchange rate. The quick action of these international arbitrageurs implies that net exports are highly sensitive to small movements in the real exchange rate. A small decrease in the price of domestic goods relative to foreign goods—that is, a small decrease in the real exchange rate—causes arbitrageurs to buy goods domestically and sell them abroad. Similarly, a small increase in the relative price of domestic goods causes arbitrageurs to import goods from abroad. Therefore, as in Figure 5-14, the net-exports schedule is very flat at the real exchange rate that equalizes purchasing power among countries: any small movement in the real exchange rate leads to a large change in net exports. This extreme sensitivity of net exports guarantees that the equilibrium real exchange rate is always close to the level that ensures purchasing-power parity.

Purchasing-power parity has two important implications. First, because the net-exports schedule is flat, changes in saving or investment do not influence the real or nominal exchange rate. Second, because the real exchange rate is fixed, all changes in the nominal exchange rate result from changes in price levels.

Is this doctrine of purchasing-power parity realistic? Most economists believe that, despite its appealing logic, purchasing-power parity does not provide a com-

FIGURE 5-14



Purchasing-Power Parity The law of one price applied to the international marketplace suggests that net exports are highly sensitive to small movements in the real exchange rate. This high sensitivity is reflected here with a very flat net-exports schedule.

pletely accurate description of the world. First, many goods are not easily traded. A haircut can be more expensive in Tokyo than in New York, yet there is no room for international arbitrage because it is impossible to transport haircuts. Second, even tradable goods are not always perfect substitutes. Some consumers prefer Toyotas, and others prefer Fords. Thus, the relative price of Toyotas and Fords can vary to some extent without leaving any profit opportunities. For these reasons, real exchange rates do in fact vary over time.

Although the doctrine of purchasing-power parity does not describe the world perfectly, it does provide a reason why movement in the real exchange rate will be limited. There is much validity to its underlying logic: the farther the real exchange rate drifts from the level predicted by purchasing-power parity, the greater the incentive for individuals to engage in international arbitrage in goods. We cannot rely on purchasing-power parity to eliminate all changes in the real exchange rate, but this doctrine does provide a reason to expect that fluctuations in the real exchange rate will typically be small or temporary.[3]

CASE STUDY

The Big Mac Around the World

The doctrine of purchasing-power parity says that after we adjust for exchange rates, we should find that goods sell for the same price everywhere. Conversely, it says that the exchange rate between two currencies should depend on the price levels in the two countries.

To see how well this doctrine works, *The Economist,* an international newsmagazine, regularly collects data on the price of a good sold in many countries: the McDonald's Big Mac hamburger. According to purchasing-power parity, the price of a Big Mac should be closely related to the country's nominal exchange rate. The higher the price of a Big Mac in the local currency, the higher the exchange rate (measured in units of local currency per U.S. dollar) should be.

Table 5-2 presents the international prices in 2008, when a Big Mac sold for $3.57 in the United States (this was the average price in New York, San Francisco, Chicago, and Atlanta). With these data we can use the doctrine of purchasing-power parity to predict nominal exchange rates. For example, because a Big Mac cost 32 pesos in Mexico, we would predict that the exchange rate between the dollar and the peso was 32/3.57, or around 8.96, pesos per dollar. At this exchange rate, a Big Mac would have cost the same in Mexico and the United States.

Table 5-2 shows the predicted and actual exchange rates for 32 countries, ranked by the predicted exchange rate. You can see that the evidence on purchasing-power parity is mixed. As the last two columns show, the actual and predicted exchange rates are usually in the same ballpark. Our theory predicts, for

[3] To learn more about purchasing-power parity, see Kenneth A. Froot and Kenneth Rogoff, "Perspectives on PPP and Long-Run Real Exchange Rates," in Gene M. Grossman and Kenneth Rogoff, eds., *Handbook of International Economics,* vol. 3 (Amsterdam: North-Holland, 1995).

TABLE 5-2

Big Mac Prices and the Exchange Rate: An Application of Purchasing-Power Parity

Country	Currency	Price of a Big Mac	Exchange Rate (per US dollar)	
			Predicted	Actual
Indonesia	Rupiah	18700.00	5238	9152
South Korea	Won	3200.00	896	1018
Chile	Peso	1550.00	434	494
Hungary	Forint	670.00	188	144
Japan	Yen	280.00	78.4	106.8
Taiwan	Dollar	75.00	21.0	30.4
Czech Republic	Koruna	66.10	18.5	14.5
Thailand	Baht	62.00	17.4	33.4
Russia	Rouble	59.00	16.5	23.2
Norway	Kroner	40.00	11.2	5.08
Sweden	Krona	38.00	10.6	5.96
Mexico	Peso	32.00	8.96	10.20
Denmark	Krone	28.00	7.84	4.70
South Africa	Rand	16.90	4.75	7.56
Hong Kong	Dollar	13.30	3.73	7.80
Egypt	Pound	13.00	3.64	5.31
China	Yuan	12.50	3.50	6.83
Argentina	Peso	11.00	3.08	3.02
Saudi Arabia	Riyal	10.00	2.80	3.75
UAE	Dirhams	10.00	2.80	3.67
Brazil	Real	7.50	2.10	1.58
Poland	Zloty	7.00	1.96	2.03
Switzerland	Franc	6.50	1.82	1.02
Malaysia	Ringgit	5.50	1.54	3.20
Turkey	Lire	5.15	1.44	1.19
New Zealand	Dollar	4.90	1.37	1.32
Canada	Dollar	4.09	1.15	1.00
Singapore	Dollar	3.95	1.11	1.35
United States	Dollar	3.57	1.00	1.00
Australia	Dollar	3.45	0.97	1.03
Euro Area	Euro	3.37	0.94	0.63
United Kingdom	Pound	2.29	0.64	0.50

Note: The predicted exchange rate is the exchange rate that would make the price of a Big Mac in that country equal to its price in the United States.
Source: The Economist, July 24, 2008.

instance, that a U.S. dollar should buy the greatest number of Indonesian rupiahs and fewest British pounds, and this turns out to be true. In the case of Mexico, the predicted exchange rate of 8.96 pesos per dollar is close to the actual

exchange rate of 10.2. Yet the theory's predictions are far from exact and, in many cases, are off by 30 percent or more. Hence, although the theory of purchasing-power parity provides a rough guide to the level of exchange rates, it does not explain exchange rates completely. ■

5-4 Conclusion: The United States as a Large Open Economy

In this chapter we have seen how a small open economy works. We have examined the determinants of the international flow of funds for capital accumulation and the international flow of goods and services. We have also examined the determinants of a country's real and nominal exchange rates. Our analysis shows how various policies—monetary policies, fiscal policies, and trade policies—affect the trade balance and the exchange rate.

The economy we have studied is "small" in the sense that its interest rate is fixed by world financial markets. That is, we have assumed that this economy does not affect the world interest rate and that the economy can borrow and lend at the world interest rate in unlimited amounts. This assumption contrasts with the assumption we made when we studied the closed economy in Chapter 3. In the closed economy, the domestic interest rate equilibrates domestic saving and domestic investment, implying that policies that influence saving or investment alter the equilibrium interest rate.

Which of these analyses should we apply to an economy such as that of the United States? The answer is a little of both. The United States is neither so large nor so isolated that it is immune to developments occurring abroad. The large trade deficits of the 1980s, 1990s, and 2000s show the importance of international financial markets for funding U.S. investment. Hence, the closed-economy analysis of Chapter 3 cannot by itself fully explain the impact of policies on the U.S. economy.

Yet the U.S. economy is not so small and so open that the analysis of this chapter applies perfectly either. First, the United States is large enough that it can influence world financial markets. For example, large U.S. budget deficits were often blamed for the high real interest rates that prevailed throughout the world in the 1980s. Second, capital may not be perfectly mobile across countries. If individuals prefer holding their wealth in domestic rather than foreign assets, funds for capital accumulation will not flow freely to equate interest rates in all countries. For these two reasons, we cannot directly apply our model of the small open economy to the United States.

When analyzing policy for a country such as the United States, we need to combine the closed-economy logic of Chapter 3 and the small-open-economy logic of this chapter. The appendix to this chapter builds a model of an economy between these two extremes. In this intermediate case, there is international borrowing and lending, but the interest rate is not fixed by world financial markets. Instead, the more the economy borrows from abroad, the higher the interest rate it must offer foreign investors. The results, not surprisingly, are a mixture of the two polar cases we have already examined.

Consider, for example, a reduction in national saving due to a fiscal expansion. As in the closed economy, this policy raises the real interest rate and crowds out domestic investment. As in the small open economy, it also reduces the net capital outflow, leading to a trade deficit and an appreciation of the exchange rate. Hence, although the model of the small open economy examined here does not precisely describe an economy such as that of the United States, it does provide approximately the right answer to how policies affect the trade balance and the exchange rate.

Summary

1. Net exports are the difference between exports and imports. They are equal to the difference between what we produce and what we demand for consumption, investment, and government purchases.
2. The net capital outflow is the excess of domestic saving over domestic investment. The trade balance is the amount received for our net exports of goods and services. The national income accounts identity shows that the net capital outflow always equals the trade balance.
3. The impact of any policy on the trade balance can be determined by examining its impact on saving and investment. Policies that raise saving or lower investment lead to a trade surplus, and policies that lower saving or raise investment lead to a trade deficit.
4. The nominal exchange rate is the rate at which people trade the currency of one country for the currency of another country. The real exchange rate is the rate at which people trade the goods produced by the two countries. The real exchange rate equals the nominal exchange rate multiplied by the ratio of the price levels in the two countries.
5. Because the real exchange rate is the price of domestic goods relative to foreign goods, an appreciation of the real exchange rate tends to reduce net exports. The equilibrium real exchange rate is the rate at which the quantity of net exports demanded equals the net capital outflow.
6. The nominal exchange rate is determined by the real exchange rate and the price levels in the two countries. Other things equal, a high rate of inflation leads to a depreciating currency.

KEY CONCEPTS

Net exports
Trade balance
Net capital outflow
Trade surplus and trade deficit
Balanced trade
Small open economy
World interest rate
Nominal exchange rate
Real exchange rate
Purchasing-power parity