## Questions for Review

1. By rewriting the national income accounts identity, we show in the text that

$$S - I = NX.$$

This form of the national income accounts identity shows the relationship between the international flow of funds for capital accumulation, $S - I$, and the international flow of goods and services, $NX$.

Net capital outflow refers to the $(S - I)$ part of this identity: it is the excess of domestic saving over domestic investment. In an open economy, domestic saving need not equal domestic investment, because investors can borrow and lend in world financial markets. The trade balance refers to the $(NX)$ part of the identity: it is the difference between what we export and what we import.

Thus, the national 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.

2. The *nominal exchange rate* is the relative price of the *currency* of two countries. The *real exchange rate*, sometimes called the *terms of trade*, is the relative price of the *goods* of two countries. It tells us the rate at which we can trade the goods of one country for the goods of another.

3. A cut in defense spending increases government saving and, hence, increases national saving. Investment depends on the world rate and is unaffected. Hence, the increase in saving causes the $(S - I)$ schedule to shift to the right, as in Figure 5–1. The trade balance rises, and the real exchange rate falls.
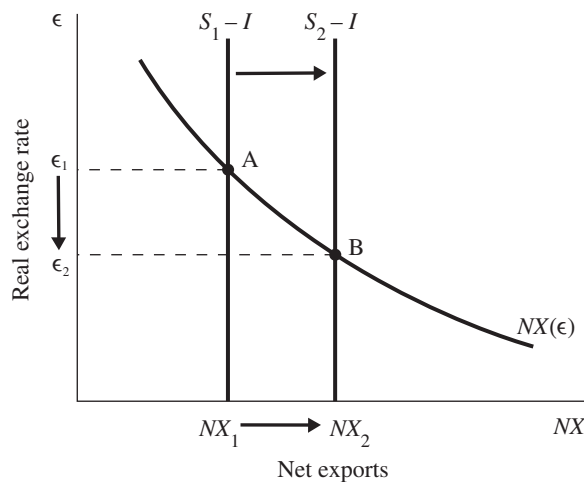


**Figure 5–1**

4. If a small open economy bans the import of Japanese DVD players, then for any given real exchange rate, imports are lower, so that net exports are higher. Hence, the net export schedule shifts out, as in Figure 5–2.
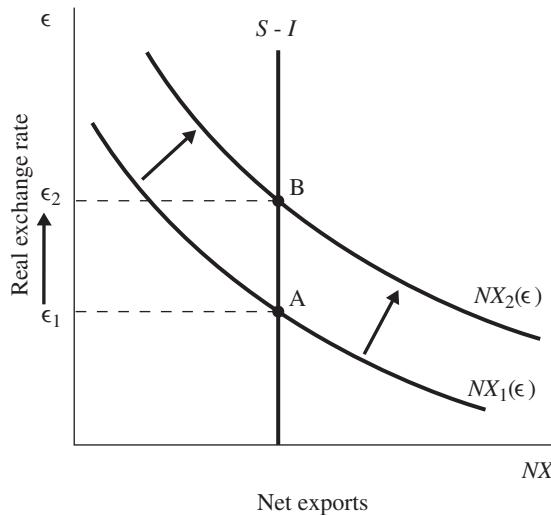


**Figure 5–2**

The protectionist policy of banning DVD players does not affect saving, investment, or the world interest rate, so the $S - I$ schedule does not change. Because protectionist policies do not alter either saving or investment in the model of this chapter, they cannot alter the trade balance. Instead, a protectionist policy drives the real exchange rate higher.

5. We can relate the real and nominal exchange rates by the expression

| Nominal Exchange Rate | = | Real Exchange Rate | × | Ratio of Price Levels |
|---|---|---|---|---|
| $e$ | = | $\epsilon$ | × | $(P^*/P)$. |

Let $P^*$ be the Mexican price level and $P$ be the Japanese price level. The nominal exchange rate $e$ is the number of Mexican pesos per Japanese yen (this is as if we take Japan to be the "domestic" country). We can express this in terms of percentage changes over time as

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

where $\pi^*$ is the Mexican inflation rate and $\pi$ is the Japanese inflation rate. If Mexican inflation is higher than Japanese inflation, then this equation tells us that a yen buys an increasing amount of pesos over time: the yen rises relative to the peso. Alternatively, viewed from the Mexican perspective, the exchange rate in terms of yen per peso falls.

## Problems and Applications

1. a.   An increase in saving shifts the $(S - I)$ schedule to the right, increasing the supply of dollars available to be invested abroad, as in Figure 5–3. The increased supply of dollars causes the equilibrium real exchange rate to fall from $\epsilon_1$ to $\epsilon_2$. Because the dollar becomes less valuable, domestic goods become less expensive relative to foreign goods, so exports rise and imports fall. This means that the trade balance increases. The nominal exchange rate falls following the movement of the real exchange rate, because prices do not change in response to this shock.
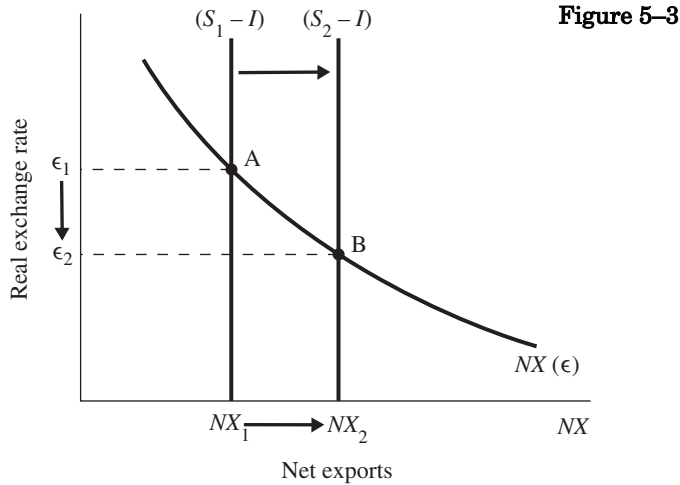


Figure 5–3

b.   The introduction of a stylish line of Toyotas that makes some consumers prefer foreign cars over domestic cars has no effect on saving or investment, but it shifts the $NX(\epsilon)$ schedule inward, as in Figure 5–4. The trade balance does not change, but the real exchange rate falls from $\epsilon_1$ to $\epsilon_2$. Because prices are not affected, the nominal exchange rate follows the real exchange rate.
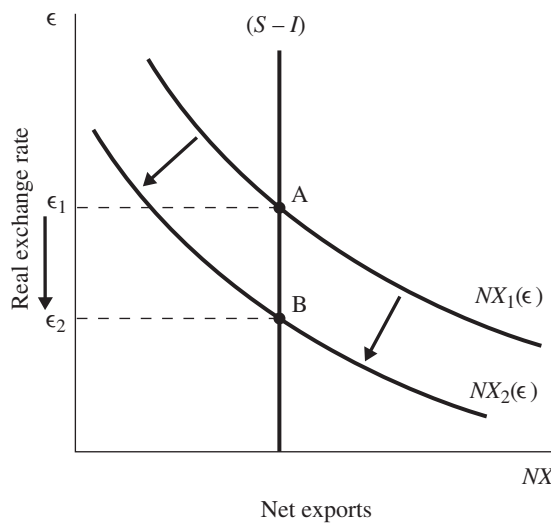


Figure 5–4

c. In the model we considered in this chapter, the introduction of ATMs has no effect on any real variables. The amounts of capital and labor determine output $Y$. The world interest rate $r^*$ determines investment $I(r^*)$. The difference between domestic saving and domestic investment $(S - I)$ determines net exports. Finally, the intersection of the $NX(\epsilon)$ schedule and the $(S - I)$ schedule determines the real exchange rate, as in Figure 5–5.



**Figure 5–5**
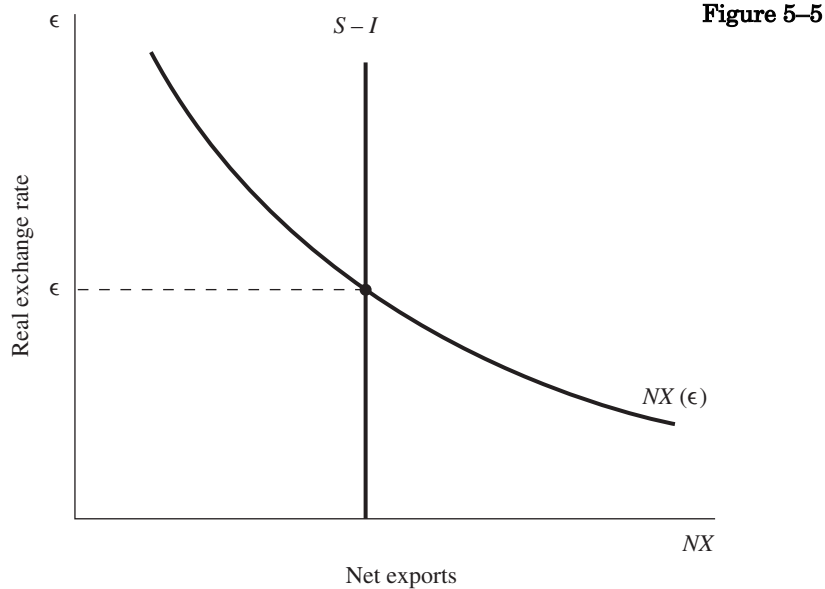
The introduction of ATMs, by reducing money demand, does affect the nominal exchange rate through its effect on the domestic price level. The price level adjusts to equilibrate the demand and supply of real balances, so that

$$M/P = (M/P)^d.$$

If $M$ is fixed, then a fall in $(M/P)^d$ causes an increase in the price level: this reduces the supply of real balances $M/P$ and restores equilibrium in the money market.

Now recall the formula for the nominal exchange rate:

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

We know that the real exchange rate $\epsilon$ remains constant, and we assume that the foreign price level $P^*$ is fixed. When the domestic price level $P$ increases, the nominal exchange rate $e$ depreciates.

2. a.   National saving is the amount of output that is not purchased for current consumption by households or the government. We know output and government spending, and the consumption function allows us to solve for consumption. Hence, national saving is given by:

$$S = Y - C - G$$
$$= 5{,}000 - (250 + 0.75(5{,}000 - 1{,}000)) - 1{,}000$$
$$= 750.$$

Investment depends negatively on the interest rate, which equals the world rate $r^*$ of 5. Thus,

$$I = 1{,}000 - 50 \times 5$$
$$= 750.$$

Net exports equals the difference between saving and investment. Thus,

$$NX = S - I$$
$$= 750 - 750$$
$$= 0.$$

Having solved for net exports, we can now find the exchange rate that clears the foreign-exchange market:

$$NX = 500 - 500 \times \varepsilon$$
$$0 = 500 - 500 \times \varepsilon$$
$$\varepsilon = 1.$$

b.   Doing the same analysis with the new value of government spending we find:

$$S = Y - C - G$$
$$= 5{,}000 - (250 + 0.75(5{,}000 - 1{,}000)) - 1{,}250$$
$$= 500$$

$$I = 1{,}000 - 50 \times 5$$
$$= 750$$

$$NX = S - I$$
$$= 500 - 750$$
$$= -250$$

$$NX = 500 - 500 \times \varepsilon$$

$$-250 = 500 - 500 \times \varepsilon$$

$$\varepsilon = 1.5.$$

The increase in government spending reduces national saving, but with an unchanged world real interest rate, investment remains the same. Therefore, domestic investment now exceeds domestic saving, so some of this investment must be financed by borrowing from abroad. This capital inflow is accomplished by reducing net exports, which requires that the currency appreciate.

c.   Repeating the same steps with the new interest rate,

$$S = Y - C - G$$
$$= 5{,}000 - (250 + 0.75(5{,}000 - 1{,}000)) - 1{,}000$$
$$= 750$$

$$I = 1{,}000 - 50 \times 10$$
$$= 500$$

$$NX = S - I$$
$$= 750 - 500$$
$$= 250$$

$$NX = 500 - 500 \times \varepsilon$$

$$250 = 500 - 500 \times \varepsilon$$

$$\varepsilon = 0.5.$$

Saving is unchanged from part (a), but the higher world interest rate lowers investment. This capital outflow is accomplished by running a trade surplus, which requires that the currency depreciate.

3.   a.   When Leverett's exports become less popular, its domestic saving $Y - C - G$ does not change. This is because we assume that $Y$ is determined by the amount of capital and labor, consumption depends only on disposable income, and government spending is a fixed exogenous variable. Investment also does not change, since investment depends on the interest rate, and Leverett is a small open economy that takes the world interest rate as given. Because neither saving nor investment changes, net exports, which equal $S - I$, do not change either. This is shown in Figure 5–6 as the unmoving $S - I$ curve.

The decreased popularity of Leverett's exports leads to a shift inward of the net exports curve, as shown in Figure 5–6. At the new equilibrium, net exports are unchanged but the currency has depreciated.
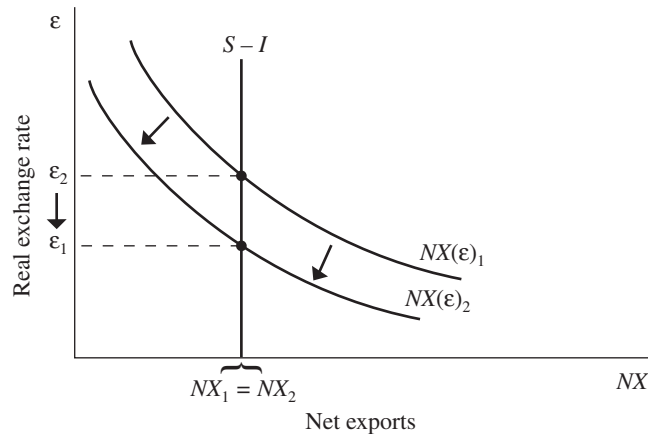


**Figure 5–6**

Even though Leverett's exports are less popular, its trade balance has remained the same. The reason for this is that the depreciated currency provides a stimulus to net exports, which overcomes the unpopularity of its exports by making them cheaper.

    b.    Leverett's currency now buys less foreign currency, so traveling abroad is more expensive. This is an example of the fact that imports (including foreign travel) have become more expensive—as required to keep net exports unchanged in the face of decreased demand for exports.

    c.    If the government reduces taxes, then disposable income and consumption rise. Hence, saving falls so that net exports also fall. In Figure 5-6, the $S - I$ curve shifts to the left, lowering net exports until the exchange rate is again equal to its initial value. This fall in net exports puts upward pressure on the exchange rate that offsets the decreased world demand. Investment and the interest rate would be unaffected by this policy since Leverett takes the world interest rate as given.

4.   Governor Bernanke's statement is consistent with the models in the chapter. Suppose we consider the United States as a small open economy, for example. The increase in the global supply of saving pushes the global interest rate down, which encourages U.S. investment. If we assume that this is primarily non-U.S. saving, then for the United States, the saving curve doesn't shift but we get a movement along the investment curve from point A to point B in Figure 5–7. The interest rate falls, and the trade deficit rises ($S$-$I$ falls).
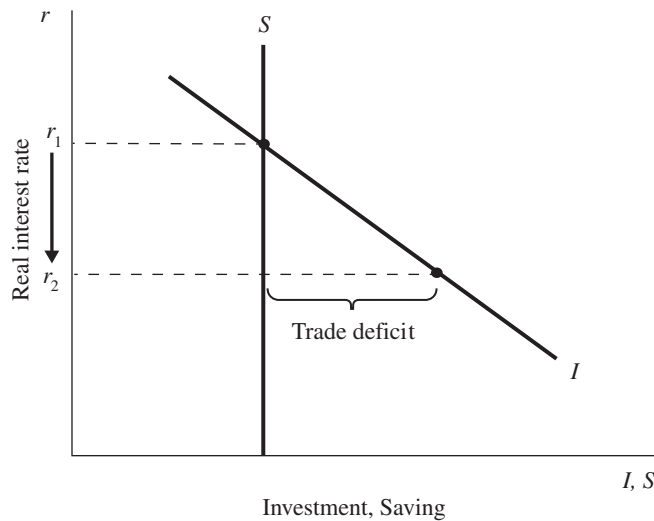


**Figure 5–7**

5.   The increase in government spending decreases government saving and, thus, decreases national saving; this shifts the saving schedule to the left, as in Figure 5–8. Given the world interest rate $r^*$, the decrease in domestic saving causes the trade balance to fall.
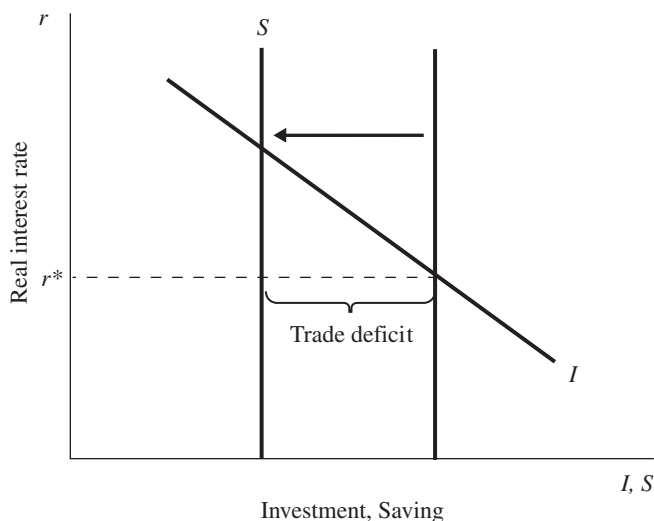


**Figure 5–8**

Figure 5–9 shows the impact of this increase in government purchases on the real exchange rate. The decrease in national saving causes the $(S - I)$ schedule to shift to the left, lowering the supply of dollars to be invested abroad. The lower supply of dollars causes the equilibrium real exchange rate to rise. As a result, domestic goods become more expensive relative to foreign goods, which causes exports to fall and imports to rise. In other words, as we determined in Figure 5–8, the trade balance falls.
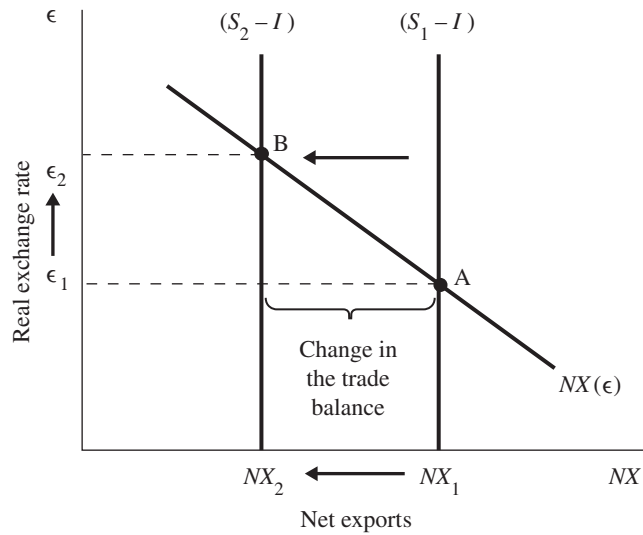


**Figure 5–9**

The answer to this question does depend on whether this is a local war or a world war. A world war causes many governments to increase expenditures; this increases the world interest rate $r^*$. The effect on a country's external accounts depends on the size of the change in the world interest rate relative to the size of the decrease in saving. For example, an increase in the world interest rate could cause a country to have a smaller trade deficit, as in Figure 5–10, or even a trade surplus, as in Figure 5–11.
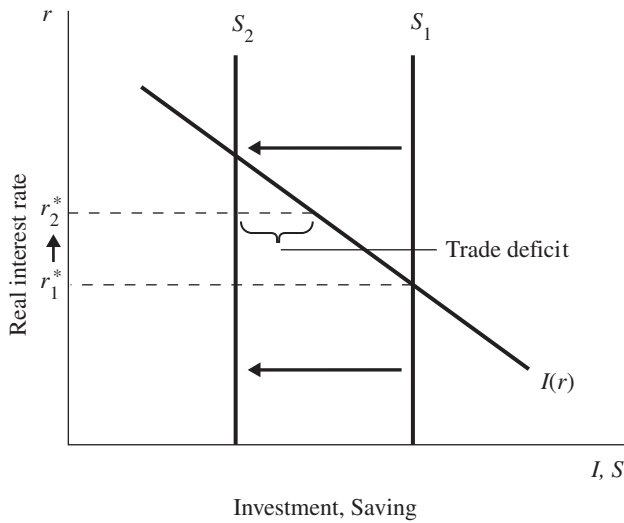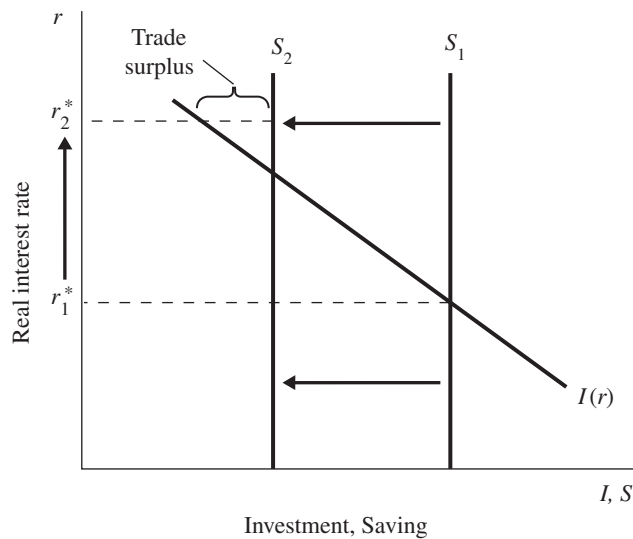


**Figure 5–10**



**Figure 5–11**

6. a. If poor nations offered better production efficiency and legal protections, then the marginal product of capital would rise. To increase the amount of capital that they have, firms need to increase the amount of investment. Hence, their investment demand curve shifts out—at any given interest rate, firms have a higher level of investment spending than they did previously.

   b. Assuming that together, the poor nations account for a noticeable share of world demand for investment, the demand for loanable funds in world financial markets rises. For the world overall, the picture looks like Figure 5–12, which follows.
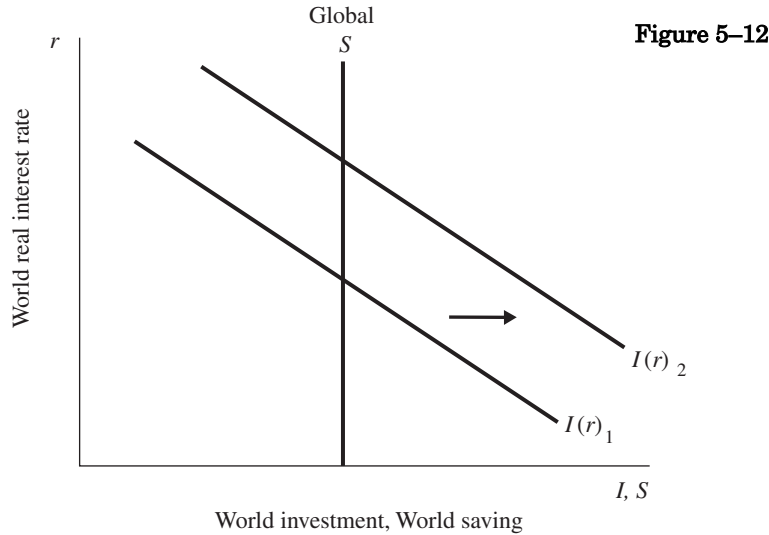


**Figure 5–12**

World investment, World saving

   c. In global financial markets, the increase in demand for loanable funds raises the interest rate.

   d. For rich countries, the increase in global interest rates reduces desired investment. Hence, $S - I(r)$ rises, which means that the trade balance rises.

7. The tariff on luxury cars would not affect net exports because it does not affect national saving (because it would not affect $Y$, $C$, or $G$) or investment. It would, however, shift the $NX$ curve by decreasing U.S. demand for Japanese auto imports. This shift of the curve, shown in Figure 5–13, would raise the exchange rate. Although net exports would not change, the volume of both imports and exports would fall by the same amount.
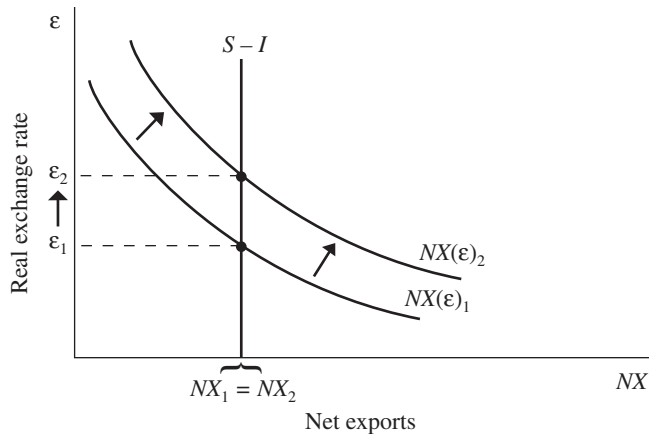


**Figure 5–13**

Net exports

There are also important compositional effects of this policy. On the production side, the higher exchange rate increases imports and puts pressure on the sales of American companies with the exception of American luxury car production, which is shielded by the tariff. Also American exporters will be hurt by the higher exchange rate, which makes their imported goods more expensive to foreign countries. Consumers of Japanese luxury cars will be hurt by the tariffs while all other consumers will benefit from the appreciated dollar, which allows them to purchase goods more cheaply. In sum, the policy would shift demand to American luxury car producers at the expense of the rest of American production and also shift consumption from Japanese luxury cars to all other imports.

8.  The real exchange rate measures the rate at which the goods of one country can be traded for the goods of the other country. In this case, the real exchange rate measures the number of bottles of vodka that must be exchanged for one TV. If Russia is experiencing no technological progress in vodka production, then the number of bottles produced is fixed. Since China is experiencing positive technological progress in TV production, the number of TVs produced will be increasing. Given that TVs are relatively more abundant and vodka is relatively more scarce, we would expect the real exchange rate to decrease—that is, it takes fewer bottles of vodka to buy one TV. The nominal exchange rate ($e$), measured as rubles per yuan, is determined by the following equation:

$$e = \varepsilon \times \left( \frac{P*}{P} \right)$$

where $\varepsilon$. measures the real exchange rate, $P*$ measures the price level in Russia, and $P$ measures the price level in China. Given China has stable money growth and Russia has rapid money growth, Russia's price level will be increasing at a faster rate than the price level in China. The effect on the nominal exchange rate is ambiguous. The decline in the real exchange rate will push the nominal exchange rate down, but the rapidly rising price level in Russia relative to China will push the nominal exchange rate up.

9.  a.  If the countries that institute an investment tax credit are large enough to shift the world investment demand schedule, then the tax credits shift the world investment demand schedule upward, as in Figure 5–14.
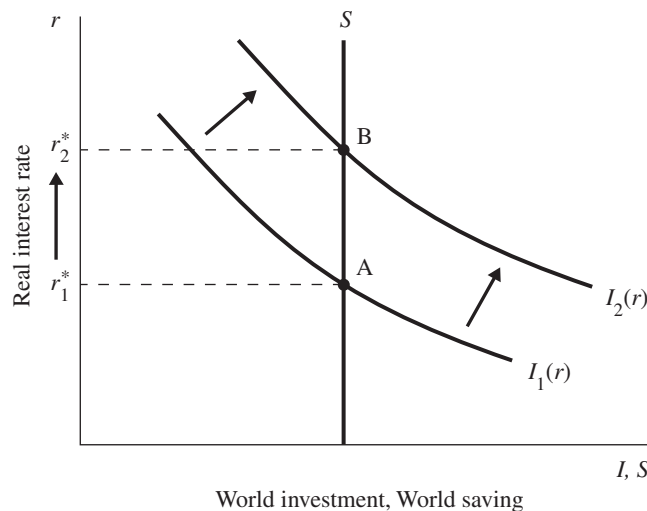


**Figure 5–14**

b.  The world interest rate increases from $r_1^*$ to $r_2^*$ because of the increase in world investment demand; this is shown in Figure 5–14. (Remember that the world is a closed economy.)

c.  The increase in the world interest rate increases the required rate of return on investments in our country. Because the investment schedule slopes downward, we know that a higher world interest rate means lower investment, as in Figure 5–15.
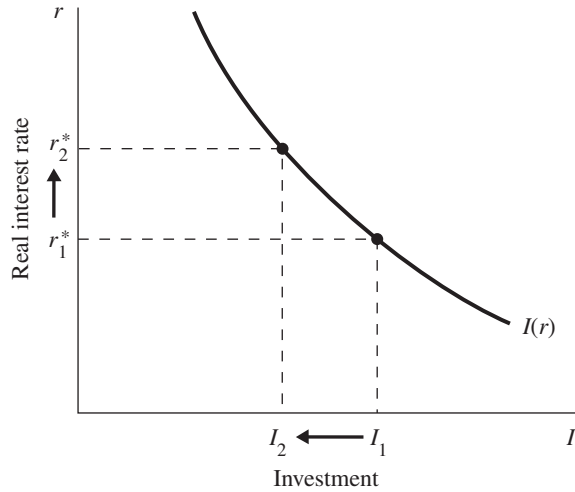


**Figure 5–15**

d.  Given that our saving has not changed, the higher world interest rate means that our trade balance increases, as in Figure 5–16.
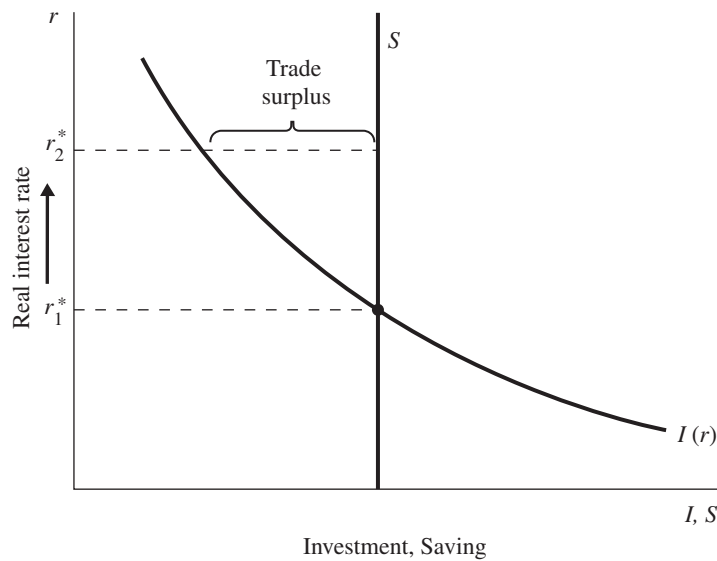


**Figure 5–16**

e.    To bring about the required increase in the trade balance, the real exchange rate must fall. Our goods become less expensive relative to foreign goods, so that exports increase and imports decrease, as in Figure 5–17.
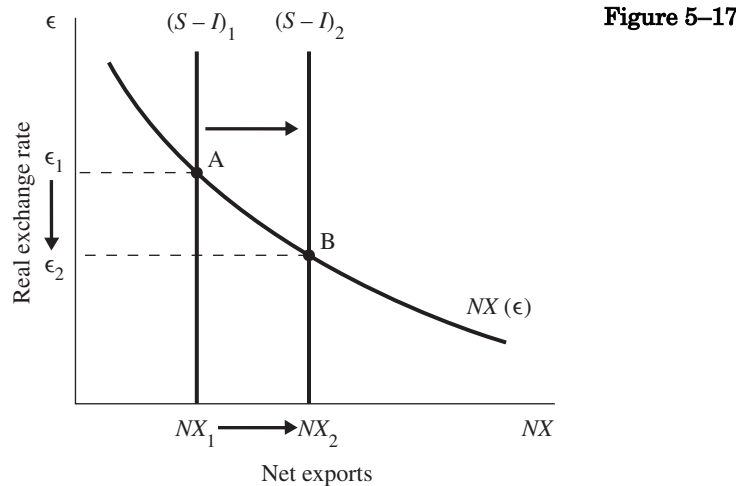


**Figure 5–17**

10.    The easiest way to tell if your friend is right or wrong is to consider an example. Suppose that ten years ago, an American hot dog cost $1, while a Mexican taco cost 10 pesos. Since $1 bought 10 pesos ten years ago, it cost the same amount of money to buy a hot dog as to buy a taco. Since total U.S. inflation has been 25 percent, the American hot dog now costs $1.25. Total Mexican inflation has been 100 percent, so the Mexican taco now costs 20 pesos. This year, $1 buys 15 pesos, so that the taco costs 20 pesos [15 pesos/dollar] = $1.33. This means that it is now more expensive to purchase a Mexican taco than a U.S. hot dog.

Thus, your friend is simply wrong to conclude that it is cheaper to travel in Mexico. Even though the dollar buys more pesos than it used to, the relatively rapid inflation in Mexico means that pesos buy fewer goods than they used to—it is more expensive now for an American to travel there.

11.  a.    The Fisher equation says that

$$i = r + \pi^e$$

where

$i$ = the nominal interest rate
$r$ = the real interest rate (same in both countries)
$\pi^e$ = the expected inflation rate.

Plugging in the values given in the question for the nominal interest rates for each country, we find:

$$12 = r + \pi^e_{Can}$$

$$8 = r + \pi^e_{US}$$

This implies that

$$\pi^e_{Can} - \pi^e_{US} = 4.$$

Because we know that the real interest rate $r$ is the same in both countries, we conclude that expected inflation in Canada is four percentage points higher than in the United States.

b. As in the text, we can express the nominal exchange rate as

$$e = \varepsilon \times (P_{Can}/P_{US}),$$

where

$\varepsilon$ = the real exchange rate
$P_{Can}$ = the price level in Canada
$P_{US}$ = the price level in the United States.

The change in the nominal exchange rate can be written as:

$$\% \text{ change in } e = \% \text{ change in } \varepsilon + (\pi_{Can} - \pi_{US}).$$

We know that if purchasing-power parity holds, then a dollar must have the same purchasing power in every country. This implies that the percent change in the real exchange rate $\varepsilon$ is zero because purchasing-power parity implies that the real exchange rate is fixed. Thus, changes in the nominal exchange rate result from differences in the inflation rates in the United States and Canada. In equation form this says

$$\% \text{ change in } e = (\pi_{Can} - \pi_{US}).$$

Because people know that purchasing-power parity holds, they expect this relationship to hold. In other words, the expected change in the nominal exchange rate equals the expected inflation rate in Canada minus the expected inflation rate in the United States. That is,

$$\text{Expected } \% \text{ change in } e = \pi_{Can}^{e} - \pi_{US}^{e}$$

In part (a), we found that the difference in expected inflation rates is 4 percent. Therefore, the expected change in the nominal exchange rate $e$ is 4 percent.

c. The problem with your friend's scheme is that it does not take into account the change in the nominal exchange rate $e$ between the U.S. and Canadian dollars. Given that the real interest rate is fixed and identical in the United States and Canada, and given purchasing-power parity, we know that the difference in nominal interest rates accounts for the expected change in the nominal exchange rate between U.S. and Canadian dollars. In this example, the Canadian nominal interest rate is 12 percent, while the U.S. nominal interest rate is 8 percent. We conclude from this that the expected change in the nominal exchange rate is 4 percent. Therefore,

$$e \text{ this year} = 1 \text{ C\$/US\$}.$$
$$e \text{ next year} = 1.04 \text{ C\$/US\$}.$$

Assume that your friend borrows 1 U.S. dollar from an American bank at 8 percent, exchanges it for 1 Canadian dollar, and puts it in a Canadian Bank. At the end of the year your friend will have \$1.12 in Canadian dollars. But to repay the American bank, the Canadian dollars must be converted back into U.S. dollars. The \$1.12 (Canadian) becomes \$1.08 (American), which is the amount owed to the U.S. bank. So in the end, your friend breaks even. In fact, after paying for transaction costs, your friend loses money.

# More Problems and Applications to Chapter 5

1.  a.  As shown in Figure 5–18, an increase in government purchases reduces national saving. This reduces the supply of loans and raises the equilibrium interest rate. This causes both domestic investment and net capital outflow to fall. The fall in net capital outflow reduces the supply of dollars to be exchanged into foreign currency, so the exchange rate appreciates and the trade balance falls.

**Figure 5–18**



**A. The Market for Loanable Funds**

**B. Net Capital Outflow**

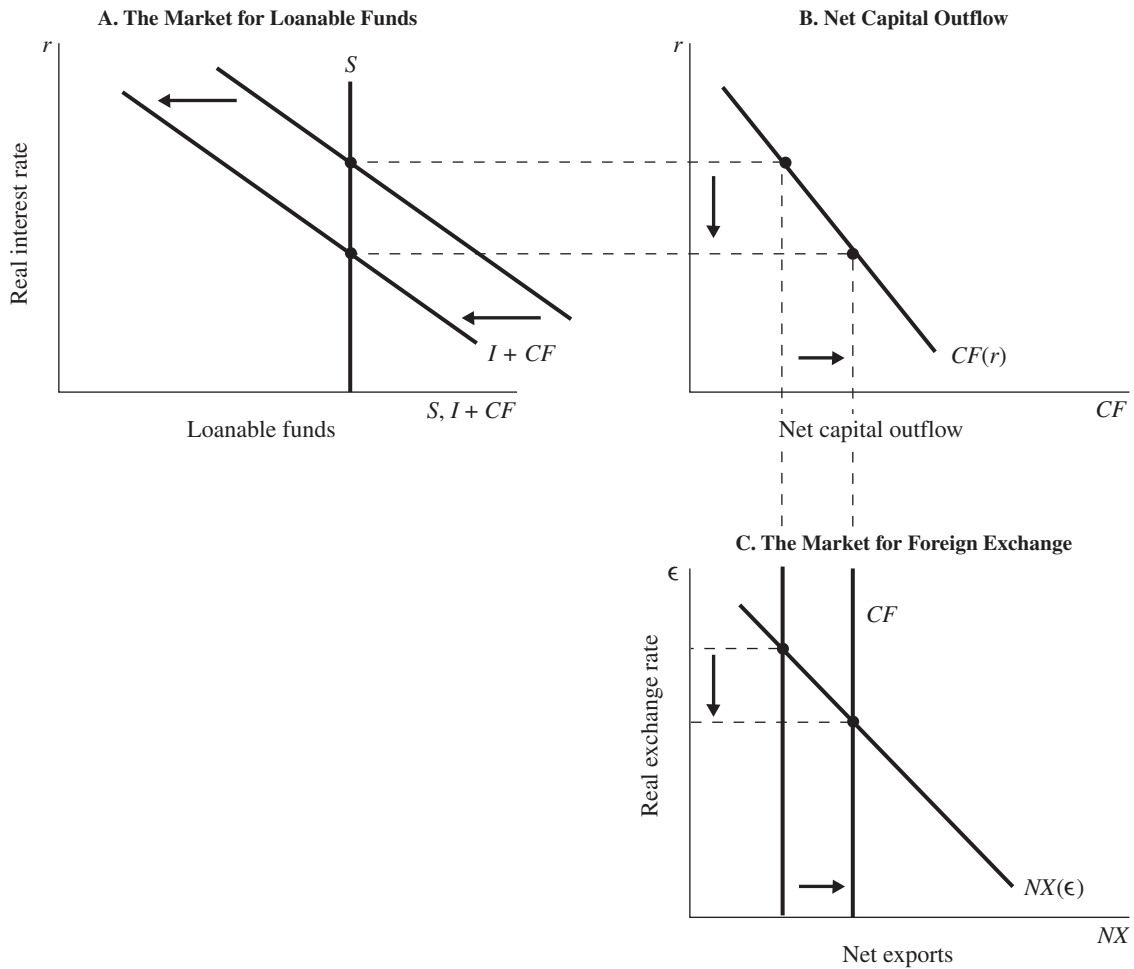**C. The Market for Foreign Exchange**
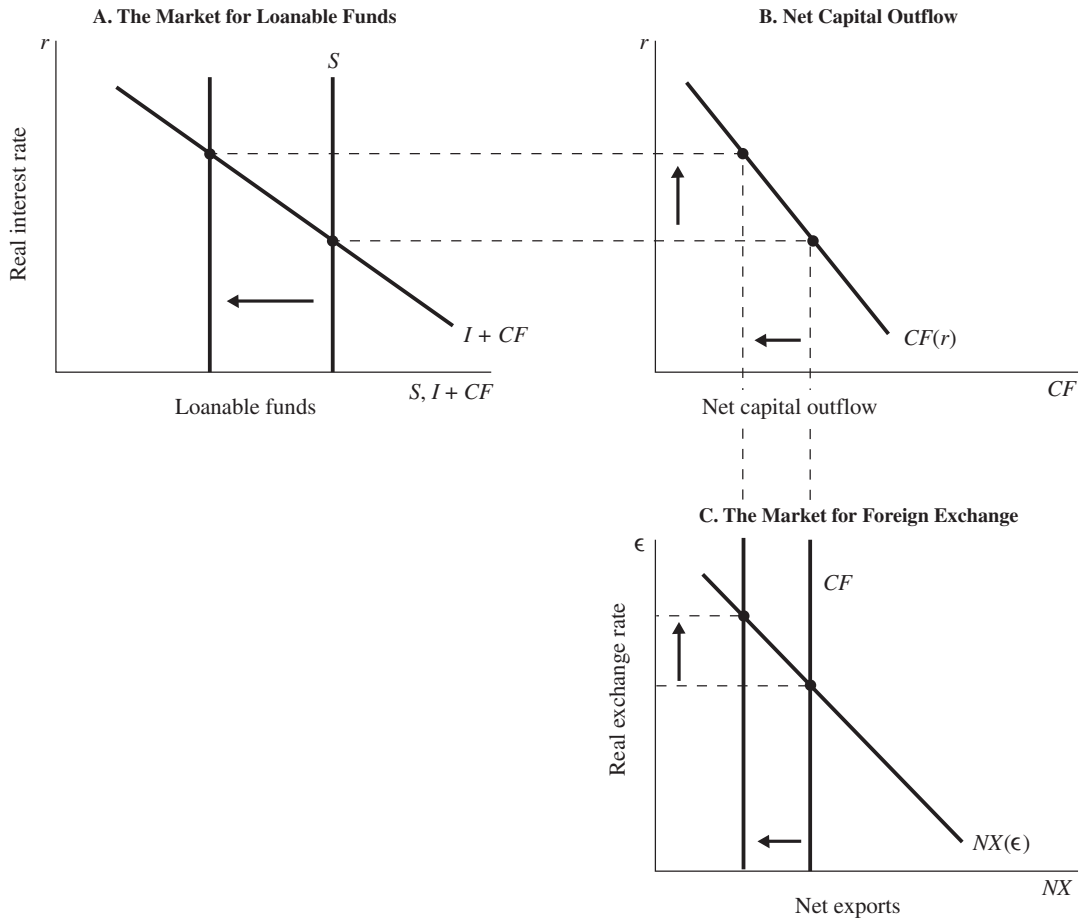
b.  As shown in Figure 5–19, the increase in demand for exports shifts the net exports schedule outward. Since nothing has changed in the market for loanable funds, the interest rate remains the same, which in turn implies that net capital outflow remains the same. The shift in the net exports schedule causes the exchange rate to appreciate. The rise in the exchange rate makes U.S. goods more expensive relative to foreign goods, which depresses exports and stimulates imports. In the end, the increase in demand for American goods does not affect the trade balance.
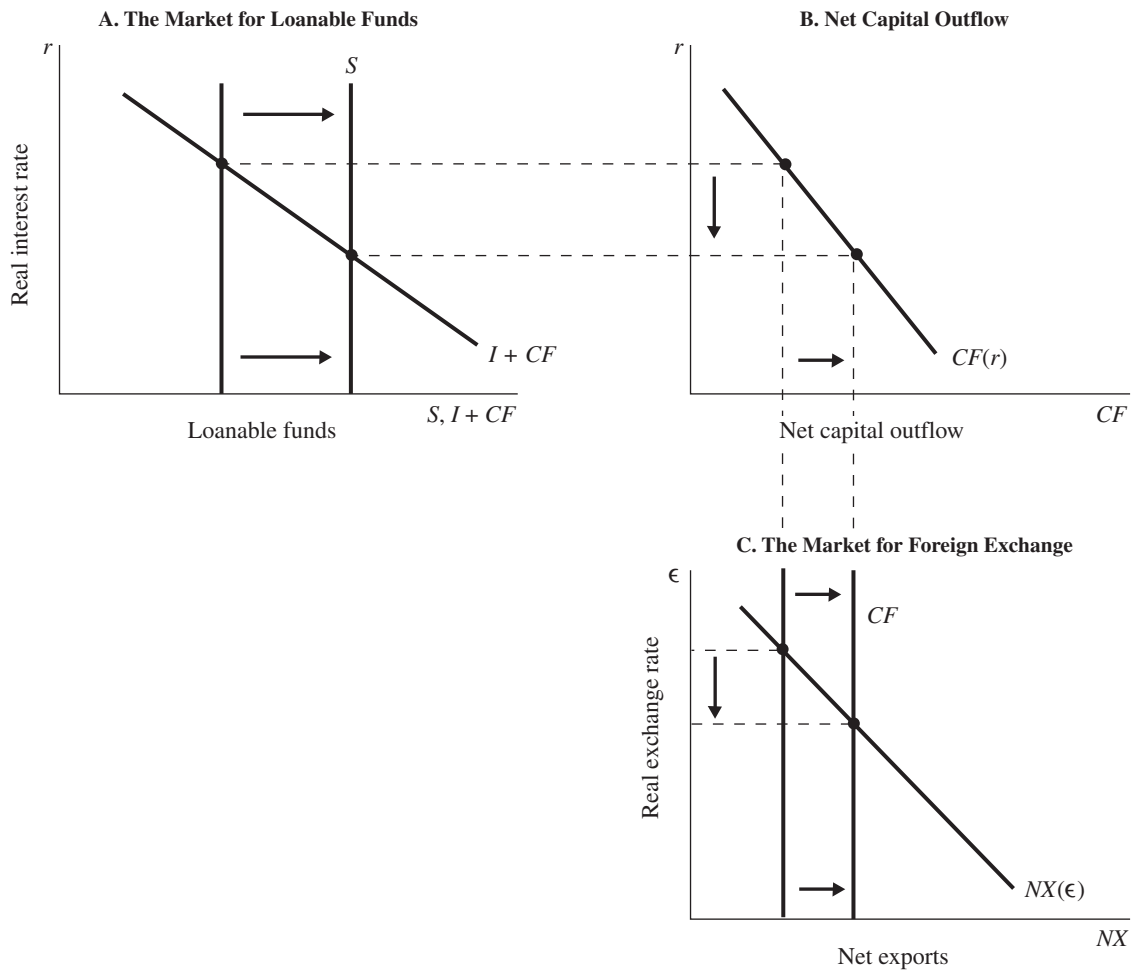
**Figure 5–19**
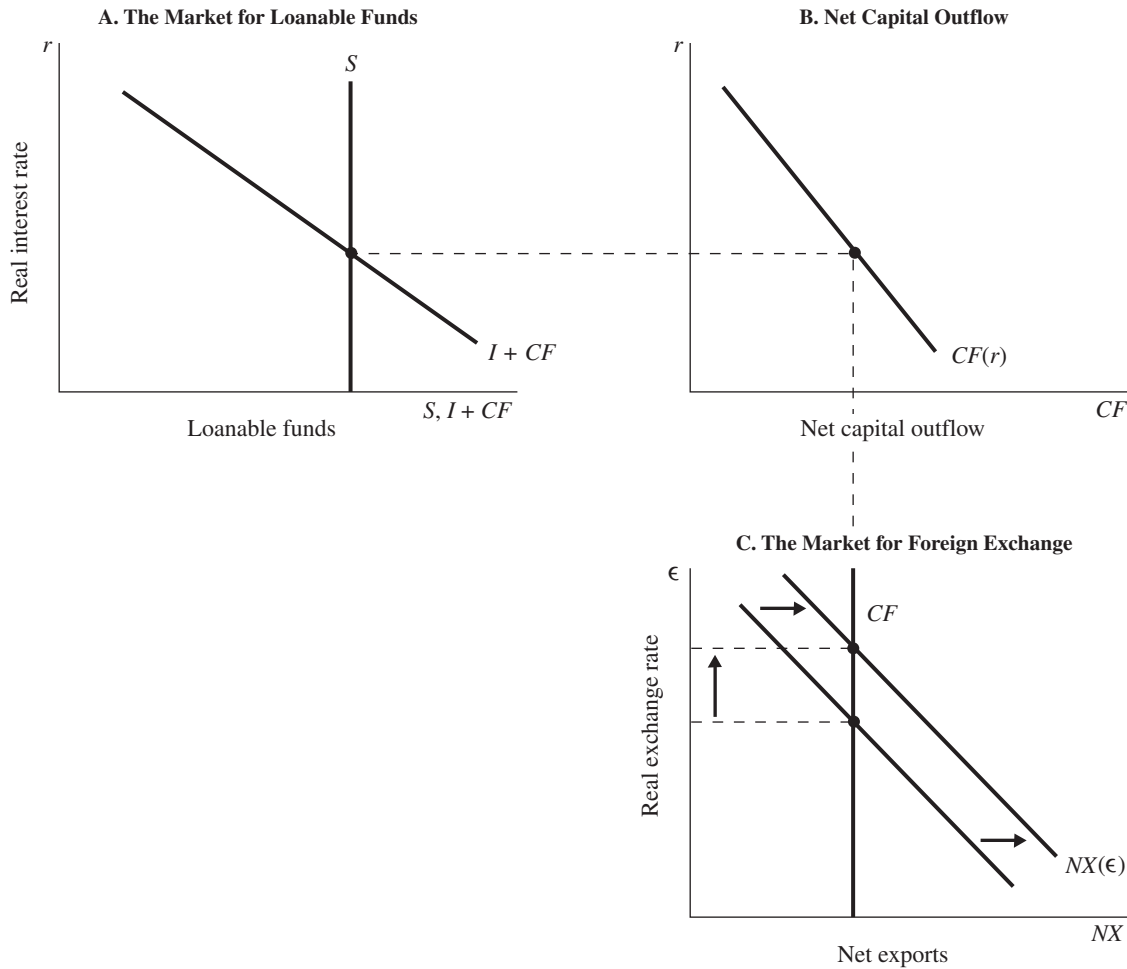
c. As shown in Figure 5–20, the U.S. investment demand schedule shifts inward. The demand for loans falls, so the equilibrium interest rate falls. The lower interest rate increases net capital outflow. Despite the fall in the interest rate, domestic investment falls; we know this because $I + CF$ does not change, and $CF$ rises. The rise in net capital outflow increases the supply of dollars in the market for foreign exchange. The exchange rate depreciates, and net exports rise.

**Figure 5–20**



A. The Market for Loanable Funds

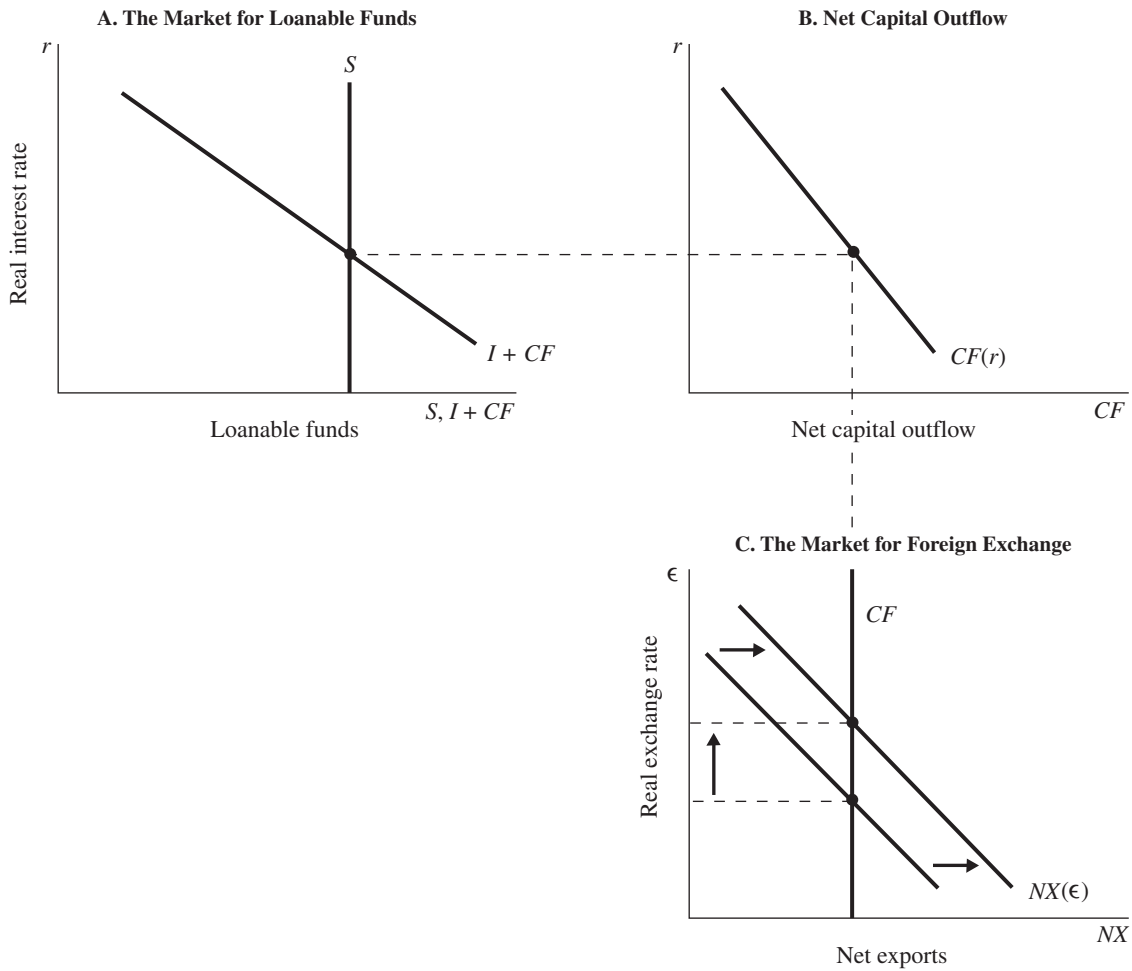B. Net Capital Outflow

C. The Market for Foreign Exchange

d.  As shown in Figure 5–21, the increase in saving increases the supply of loans and lowers the equilibrium interest rate. This causes both domestic investment and net capital outflow to rise. The increase in net capital outflow increases the supply of dollars to be exchanged into foreign currency, so the exchange rate depreciates and the trade balance rises.

**Figure 5–21**



**A. The Market for Loanable Funds**

**B. Net Capital Outflow**

**C. The Market for Foreign Exchange**

e.    The reduction in the willingness of Americans to travel abroad reduces imports, since foreign travel counts as an import. As shown in Figure 5–22, this shifts the net exports schedule outward. Since nothing has changed in the market for loanable funds, the interest rate remains the same, which in turn implies that net capital outflow remains the same. The shift in the net exports schedule causes the exchange rate to appreciate. The rise in the exchange rate makes U.S. goods more expensive relative to foreign goods, which depresses exports and stimulates imports. In the end, the fall in Americans' desire to travel abroad does not affect the trade balance.

**Figure 5–22**



**A. The Market for Loanable Funds**

**B. Net Capital Outflow**

**C. The Market for Foreign Exchange**

f. As shown in Figure 5–23, the net capital outflow schedule shifts in. This reduces demand for loans, so the equilibrium interest rate falls and investment rises. Net capital outflow falls, despite the fall in the interest rate; we know this because $I + CF$ is unchanged and investment rises. The fall in net foreign investment reduces the supply of dollars to be exchanged into foreign currency, so the exchange rate appreciates and the trade balance falls.

**Figure 5–23**
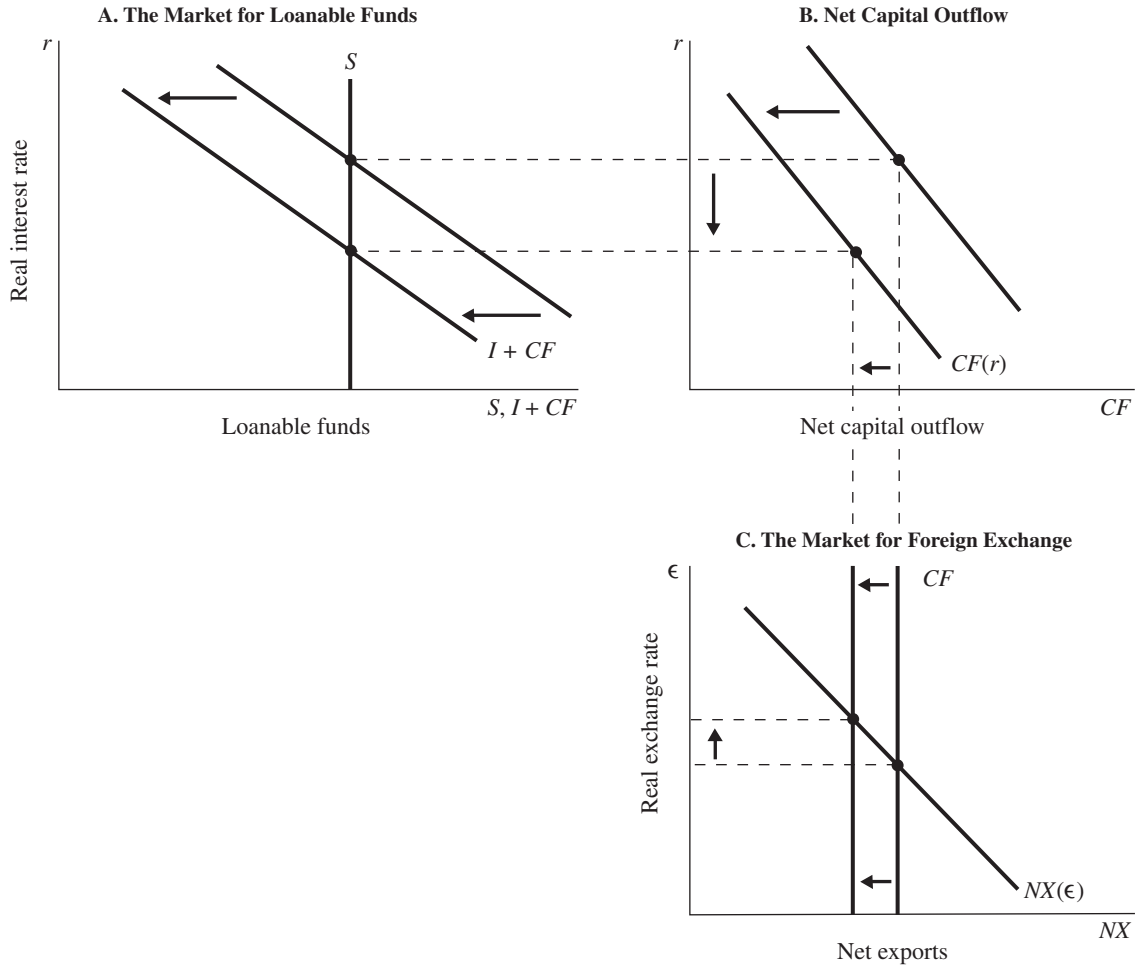
2. Gingrich's statement has no immediate effect on any of the "fundamentals" in the economy: consumption, government purchases, taxes, and output are all unchanged. International investors, however, will be more reluctant to invest in the American economy, particularly to purchase U.S. government debt, because of the default risk. As both Americans and foreigners move their money out of the United States, the *CF* curve shifts outward (there is more capital outflow), as shown in Figure 5–24(B). This raises the interest rate in order to keep $I + CF$ equal to the unchanged $S$, shown in Figure 5–24(A). The increase in *CF* raises the supply in the market for foreign exchange, which lowers the equilibrium exchange rate as shown in Figure 5–24(C).

**Figure 5–24**



**A. The Market for Loanable Funds**

**B. Net Capital Outflow**

**C. The Market for Foreign Exchange**