Chapter 19. The Goods Market in an Open Economy

At the time of this writing, countries around the world are hoping for a strong and lasting U.S. expansion. Their hopes are not for the United States, but for themselves. To them, a strong and lasting U.S. expansion means higher exports to the United States, an improvement of their trade positions, and a higher probability of expansion for their own economy.

Are their hopes justified? Does the United States economy really drive other economies? Conversely, would a U.S. recession really throw other countries in recession? To answer these questions, we must expand our treatment of the goods market in the core (Chapter 3), to take into account openness in goods markets. This is what we do in this chapter.

Section 19–1 characterizes equilibrium in the goods market for an open economy.

Sections 19–2 and 19–3 show the effects of domestic shocks and foreign shocks on the domestic economy's output and trade balance.

Sections 19–4 and 19–5 look at the effects of a real depreciation on output and on the trade balance.

Section 19–6 gives an alternative description of the equilibrium, which shows the close connection between saving, investment, and the trade balance.

19–1. The IS Relation in the Open Economy

When we were assuming the economy was closed to trade, there was no need to distinguish between the *domestic demand for goods* and the *demand for domestic goods*: They were clearly the same thing. Now, we must distinguish between the two: Some domestic demand falls on foreign goods, and some of the demand for domestic goods comes from foreigners.[1] Let's look at this distinction more closely.

The Demand for Domestic Goods

In an open economy, the **demand for domestic goods** is given by

$$Z \equiv C + I + G - IM/\epsilon + X \tag{19.1}$$

The first three terms—consumption, C, investment, I, and government spending, G—constitute the **domestic demand for goods**. If the economy were closed, $C + I + G$ would also be the demand for domestic goods. This is why, until now, we have only looked at $C + I + G$. But now we have to make two adjustments:

- First, we must subtract imports—that part of the domestic demand that falls on foreign goods rather than on domestic goods.
  We must be careful here: Foreign goods are different from domestic goods, so we cannot just subtract the quantity of imports, IM. If we were to do so, we would be subtracting apples (foreign goods) from oranges (domestic goods). We must first express the value of imports in terms of domestic goods. This is what IM/ϵ in equation (19.1) stands for: Recall from Chapter 18 that ϵ, the real exchange rate, is defined as the price of domestic goods in terms of foreign

1. "The domestic demand for goods" and "The demand for domestic goods" sound close, but are not the same. Part of domestic demand falls on foreign goods. Part of foreign demand falls on domestic goods.

goods. Equivalently, $1/\epsilon$ is the price of foreign goods in terms of domestic goods. So $IM(1/\epsilon)$—or equivalently IM/ϵ—is the value of imports in terms of domestic goods.[2]

- Second, we must add exports—that part of the demand for domestic goods that comes from abroad. This is captured by the term X in equation (19.1).[3]

The Determinants of C, I, and G

Having listed the five components of demand, our next task is to specify their determinants. Let's start with the first three: C, I, and G. Now that we are assuming the economy is open, how should we modify our earlier descriptions of consumption, investment, and government spending? The answer: Not very much, if at all. How much consumers decide to spend still depends on their income and their wealth. While the real exchange rate surely affects the *composition* of consumption spending between domestic goods and foreign goods, there is no obvious reason why it should affect the overall *level* of consumption. The same is true of investment: The real exchange rate may affect whether firms buy domestic machines or foreign machines, but it should not affect total investment.

This is good news because it implies that we can use the descriptions of consumption, investment, and government spending that we developed earlier. Therefore

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2. In Chapter 3, I ignored the real exchange rate and subtracted IM, not IM/ϵ. This was a cheat; I did not want to have to talk about the real exchange rate—and complicate matters—so early in the book.

3.

Domestic demand for goods $C + I + G$
Minus Domestic demand for foreign goods (imports), IM/ϵ
Plus Foreign demand for domestic goods (exports), X
equals
Demand for domestic goods $C + I + G - IM/\epsilon + X$

$$\text{Domestic demand:} \qquad \begin{array}{rcl} C+I+G & = & C(Y-T)+I(Y\ ,\ r)+G \\ & & (\quad +\quad) \quad (+,-) \end{array}$$

We assume that consumption depends positively on disposable income $(Y - T)$, and that investment depends positively on production (Y) and negatively on the real interest rate (r). We continue to take government spending (G) as given. We leave aside the refinements introduced in Chapters 14 to 17, where we looked at the role of expectations in affecting spending. We want to take things one step at a time to understand the effects of opening the economy; we shall reintroduce some of those refinements later.

The Determinants of Imports

Imports are the part of domestic demand that falls on foreign goods. What do they depend on? They clearly depend on domestic income: Higher domestic income leads to a higher domestic demand for all goods, both domestic and foreign. So a higher domestic income leads to higher imports.[4] They also clearly depend on the real exchange rate—the price of domestic goods in terms of foreign goods: The more expensive domestic goods are relative to foreign goods—equivalently, the cheaper foreign goods are relative to domestic goods— the higher is the domestic demand for foreign goods. So a higher real exchange rate leads to higher imports. Thus, we write imports as

$$\begin{array}{rcl} IM & = & IM(\ Y,\ \epsilon) \\ & & (+,+) \end{array} \tag{19.2}$$

4. Recall the discussion at the start of the chapter. Countries in the rest of the world are hoping for a strong U.S. expansion. The reason: A strong U.S. expansion means an increase in the U.S. demand for foreign goods.

- An increase in domestic income, Y, (equivalently, an increase in domestic output—income and output are still equal in an open economy) leads to an increase in imports. This positive effect of income on imports is captured by the positive sign under Y in equation (19.2).
- An increase in the real exchange rate, ϵ, leads to an increase in imports, IM. This positive effect of the real exchange rate on imports is captured by the positive sign under ϵ in equation (19.2). (As ϵ goes up, note that IM goes up, but $1/\epsilon$ goes down, so what happens to IM/ϵ, the *value* of imports in terms of domestic goods, is ambiguous. We will return to this point shortly.)

The Determinants of Exports

Exports are the part of foreign demand which falls on domestic goods. What do they depend on? They depend on foreign income: Higher foreign income means higher foreign demand for all goods, both foreign and domestic. So higher foreign income leads to higher exports. They depend also on the real exchange rate: The higher the price of domestic goods in terms of foreign goods, the lower the foreign demand for domestic goods. So, the higher the real exchange rate, the lower exports.

Let Y^* denote foreign income (equivalently, foreign output).[5] We therefore write exports as

$$\begin{aligned} X &= X(Y^*, \epsilon) \\ &\quad (+\ ,\ -) \end{aligned} \tag{19.3}$$

- An increase in foreign income, Y^*, leads to an increase in exports.

5. Recall that asterisks refer to foreign variables.

- An increase in the real exchange rate, ϵ leads to a decrease in exports.

Putting the Components Together

Figure 19–1 puts together what we have learned so far. It plots the various components of demand against output, keeping constant all other variables (the interest rate, taxes, government spending, foreign output, and the real exchange rate) that affect demand.

In panel (a), the line DD plots domestic demand, $C + I + G$, as a function of output, Y. This relation between demand and output is familiar from Chapter 3. Under our standard assumptions, the slope of the relation between demand and output is positive but less than 1: An increase in output—equivalently, an increase in income—increases demand but less than one for one. (In the absence of good reasons to the contrary, I draw the relation between demand and output, and the other relations in this chapter, as lines rather than curves. This is purely for convenience, and none of the discussions that follow depend on this assumption.)

Figure 19–1. The Demand for Domestic Goods and Net Exports (Caption. The domestic demand for goods is an increasing function of income. The demand for domestic goods is obtained by subtracting the value of imports from domestic demand, and then adding exports. The trade balance is a decreasing function of output.)

To arrive at the demand for domestic goods, we must first *subtract imports.* This is done in panel (b) and it gives us the line AA. The line AA represents the domestic demand for domestic goods. The distance between DD and AA equals the value of imports, IM/ϵ.[6] Because the quantity of imports

6. For a given real exchange rate ϵ, IM/ϵ—the value of imports in terms of domestic goods—moves exactly with IM—the quantity of imports.

increases with income, the distance between the two lines increases with income. We can establish two facts about line AA, which will be useful later in the chapter:

- AA is flatter than DD: As income increases, some of the additional domestic demand falls on foreign goods rather than on domestic goods. As income increases, the domestic demand for domestic goods increases less than total domestic demand.
- As long as some of the additional demand falls on domestic goods, AA has a positive slope: An increase in income leads to some increase in the demand for domestic goods.

Finally, we must *add exports.* This is done in panel (c) and gives us the line ZZ, which is above AA. The line ZZ represents the demand for domestic goods. The distance between ZZ and AA equals exports. Because exports do not depend on domestic output, the distance between ZZ and AA is constant, which is why the two lines are parallel. Because AA is flatter than DD, ZZ is also flatter than DD.

From the information in panel (c) we can characterize the behavior of net exports—the difference between exports and imports ($X - IM/\epsilon$)—as a function of output. At output level Y for example, exports are given by the distance AC and imports by the distance AB, so net exports are given by the distance BC.[7]

This relation between net exports and output is represented as the line NX (for Net eXports) in panel (d). Net exports are a decreasing function of output: As output increases, imports increase and exports are unaffected, leading to lower net exports. Call Y_{TB} (TB for trade balance) the level of output at which the value of imports equals the value of exports, so that net exports are equal to zero. Levels of output above Y_{TB} lead to higher

7. Recall that *net exports* is synonymous with trade balance. Positive net exports correspond to a trade surplus, while negative net exports correspond to a trade deficit.

imports, and to a trade deficit. Levels of output below Y_{TB} lead to lower imports, and to a trade surplus.

19–2. Equilibrium Output and the Trade Balance

The goods market is in equilibrium when domestic output equals the demand for domestic goods

$$Y = Z$$

Collecting the relations we derived for the components of the demand for domestic goods, Z, we get

$$Y = C(Y - T) + I(Y, r) + G - IM(Y, \epsilon)/\epsilon + X(Y^*, \epsilon) \qquad (19.4)$$

Figure 19–2. Equilibrium Output and Net Exports. (Caption. The goods market is in equilibrium when domestic output is equal to the demand for domestic goods. At the equilibrium level of output, the trade balance may show a deficit or a surplus.)

This equilibrium condition determines output as a function of all the variables we take as given, from taxes to the real exchange rate to foreign output. This is not a simple relation; Figure 19–2 represents it graphically, in a more user–friendly way.

In panel (a), demand is measured on the vertical axis, output (equivalently production or income) on the horizontal axis. The line ZZ plots demand as a function of output; this line just replicates the line ZZ in Figure 19–1; ZZ is upward sloping, but with slope less than 1.

Equilibrium output is at the point where demand equals output, at the intersection of the line ZZ and the 45–degree line: point A in the figure, with associated output level Y.

Panel (b) of Figure 19-2 replicates panel (d) of Figure 19–1, drawing net exports as a decreasing function of output. There is in general no reason why the equilibrium level of output, Y, should be the same as the level of output at which trade is balanced, Y_{TB}.[8] As I have drawn the figure, equilibrium output is associated with a trade deficit, equal to the distance BC.

We now have the tools needed to answer the questions we asked at the beginning of this chapter.

19–3. Increases in Demand, Domestic or Foreign

How do changes in demand affect output in an open economy? Let's start with an old favorite—an increase in government spending—then turn to a new exercise, the effects of an increase in foreign demand.

Increases in Domestic Demand

Suppose the economy is in recession and the government decides to increase government spending—so as to increase domestic demand and output. What will be the effects on output and on the trade balance?[9]

The answer is given in Figure 19–3. Before the increase in government spending, demand is given by ZZ in panel (a), and the equilibrium is at

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8. The equilibrium level of output is given by the condition $Y = Z$. The level of output at which there is trade balance is given by the condition $X = IM/\epsilon$. These are two different conditions.

9. As in the core, we start with the goods market; the conclusions we derive here will still largely be correct when we introduce financial markets and labor markets later on.

point A, where output equals Y. Let's assume—though, as we have seen, there is no reason why this should be true in general—that trade is initially balanced, so, in panel (b), $Y = Y_{TB}$.

What happens if the government increases spending by ΔG? At any level of output, demand is higher by ΔG, shifting the demand relation up by ΔG from ZZ to ZZ'. The equilibrium point moves from A to A', and output increases from Y to Y'. The increase in output is larger than the increase in government spending: There is a multiplier effect.

Figure 19–3. The Effects of an Increase in Government Spending. (Caption. An increase in government spending leads to an increase in output and to a trade deficit.)

So far, the story sounds the same as the story for a closed economy in Chapter 3. However, there are two important differences:

- There is now an effect on the trade balance. Because government spending enters neither the exports relation nor the imports relation directly, the relation between net exports and output in panel (b) does not shift. So the increase in output from Y to Y' leads to a *trade deficit* equal to BC: Imports go up, exports do not change.[10]
- Not only does government spending now generate a trade deficit, but the effect of government spending on output is smaller than it would be in a closed economy. Recall from Chapter 3 that the smaller the slope of the demand relation, the smaller the multiplier (for example, if ZZ were horizontal, the multiplier would be 1). And recall from Figure 19–1 that the demand relation, ZZ, is flatter than the demand relation in the closed economy, DD. That means the

10. Starting from trade balance, an increase in government spending leads to a trade deficit.

multiplier is smaller in the open economy.[11]

The trade deficit and the smaller multiplier have the same cause: An increase in demand now falls not only on domestic goods, but also on foreign goods. So, when income increases, the effect on the demand for domestic goods is smaller than it would be in a closed economy, leading to a smaller multiplier. And, because some of the increase in demand falls on imports—and exports are unchanged—the result is a trade deficit.[12]

These two implications are important. In an open economy, an increase in domestic demand has a smaller effect on output than in a closed economy, and an adverse effect on the trade balance. Indeed, the more open the economy, the smaller the effect on output and the larger the adverse effect on the trade balance. Take Belgium, and its ratio of imports to GDP close to 80%. When domestic demand increases in Belgium, most of the increase in demand is likely to take the form of an increase in the demand for foreign goods rather than an increase in the demand for domestic goods. The effect of an increase in government spending is thus likely to be a large increase in Belgium's trade deficit and only a small increase in its output, making domestic demand expansion a rather unattractive policy for Belgium. Even for the United States, which has an import ratio of only 14%, an increase in demand will be associated with a worsening of the trade balance. (This conclusion is developed further in the first appendix to this chapter, called "Multipliers: Belgium versus the United States".)

Increases in Foreign Demand

Consider now an increase in foreign output, an increase in Y^*. This could be due to an increase in foreign government spending, G^*—the policy change

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11. An increase in government spending increases output. The multiplier is smaller than in a closed economy.
12. The smaller multiplier and the trade deficit have the same cause: Some domestic demand falls on foreign goods.

we just analyzed, but now taking place abroad. But we do not need to know where the increase in Y^* comes from to analyze its effects on the U.S. economy.

Figure 19–4 shows the effects of an increase in foreign activity on domestic output and the trade balance. The initial demand for domestic goods is given by ZZ in panel (a). The equilibrium is at point A, with output level Y. Let's assume trade is balanced, so that in panel (b) the net exports associated with Y equal zero ($Y = Y_{TB}$).

It will be useful below to refer to the line which gives the *domestic demand for goods* $C+I+G$ as a function of income. This line is drawn as DD. Recall from Figure 19–1 that DD is steeper than ZZ. The difference between ZZ and DD equal net exports, so that if trade is balanced at point A, then ZZ and DD intersect at point A.[13]

Figure 19–4. The Effects of an Increase in Foreign Demand. (Caption. An increase in foreign demand leads to an increase in output and to a trade surplus.)

Now consider the effects of an increase in foreign output, ΔY^* (for the moment, ignore the line DD; we only need it later). Higher foreign output means higher foreign demand, including higher foreign demand for U.S. goods. So the direct effect of the increase in foreign output is an increase in U.S. exports by some amount, which we shall denote by ΔX.

- For a given level of output, this increase in exports leads to an increase in the demand for U.S. goods by ΔX, so the line giving the demand for domestic goods as a function of output shifts up by ΔX, from ZZ to ZZ'.

13. DD is the domestic demand for goods. ZZ is the demand for domestic goods. The difference between the two is equal to the trade deficit.

- For a given level of output, net exports go up by ΔX. So the line giving net exports as a function of output in panel (b) also shifts up by ΔX, from NX to NX'.

The new equilibrium is at point A' in panel (a), with output level Y'. The increase in foreign output leads to an increase in domestic output. The channel is clear: Higher foreign output leads to higher exports of domestic goods, which increases domestic output and the domestic demand for goods through the multiplier.

What happens to the trade balance? We know that exports go up. But could it be that the increase in domestic output leads to such a large increase in imports that the trade balance actually deteriorates? No: The trade balance must improve. To see why, note that, when foreign demand increases, the demand for domestic goods shifts up from ZZ to ZZ'; but the line DD, which gives the *domestic demand for goods* as a function of output, does not shift.[14] At the new equilibrium level of output Y', domestic demand is given by the distance DC, and the demand for domestic goods is given by DA'. Net exports are thus given by the distance CA' — which, because DD is necessarily below ZZ', is necessarily positive. Thus, while imports increase, the increase does not offset the increase in exports, and the trade balance improves.[15]

Fiscal Policy Revisited

We have derived two basic results so far:

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14. Y^* directly affects exports and so enters the relation between the demand for domestic goods and output. An increase in Y^* shifts ZZ up.
Y^* does not affect either domestic consumption, domestic investment or domestic government spending directly, and so does not enter the relation between the domestic demand for goods and output. An increase in Y^* does not shift DD.
15. An increase in foreign output increases domestic output and improves the trade balance.

- An increase in domestic demand leads to an increase in domestic output, but leads also to a deterioration of the trade balance. (We looked at an increase in government spending, but the results would have been the same for a decrease in taxes, an increase in consumer spending, and so on.)
- An increase in foreign demand (which could come from the same types of changes taking place abroad) leads to an increase in domestic output and an improvement in the trade balance.

These results, in turn, have a number of important implications.

First, and most obviously, they imply that shocks to demand in one country affect all other countries. The stronger the trade links between countries, the stronger the interactions, and the more countries will move together. This implication seems indeed to be consistent with the facts. For example, most OECD countries experienced a strong economic expansion in the second half of the 1990s, followed by a slowdown or an outright recession in the early 2000s. Trade links were probably not the only reason for these common movements. It could be that most countries moved together partly because they were experiencing the same domestic shocks. For example, many countries went through the same "irrational exuberance" cycle, and the same investment boom and bust as the United States.[16] But the available evidence suggests that trade links also played an important role.

Second, these interactions very much complicate the task of policy makers, especially in the case of fiscal policy. Let's explore this argument more closely.

Start with the following observation: Governments do not like to run trade deficits, and for good reasons. The main reason: A country that consistently runs a trade deficit accumulates debt vis–à–vis the rest of the world, and therefore has to pay steadily higher interest payments to the rest of

16. See the box in Chapter 5 on the role of investment spending in the U.S. boom and bust.

the world. Thus, it is no wonder that countries prefer increases in foreign demand (which lead to an improvement in the trade balance) to increases in domestic demand (which lead to a deterioration of the trade balance).

These preferences may have disastrous implications. Consider a group of countries, all doing a large amount of trade with each other, so that an increase in demand in any one country falls largely on the goods produced in the other countries. Suppose all these countries are in recession and each has roughly balanced trade to start. Each country may be very reluctant to take measures to increase domestic demand. Were it to do so, the result might be a small increase in output but also a large trade deficit. Each country may just wait for the other countries to increase demand. But if they all wait, nothing will happen and the recession may last a long time.

Is there a way out of this situation? There is—at least in theory. If all countries coordinate their macroeconomic policies so as to increase domestic demand simultaneously, each can expand without increasing its trade deficit (vis–à–vis the others; their combined trade deficit with respect to the rest of the world will still increase). The reason is clear: The coordinated increase in demand leads to increases in both exports and imports in each country. It is still true that domestic demand expansion leads to larger imports; but this increase in imports is offset by the increase in exports, which comes from the foreign demand expansions.

Coordination is a word governments often invoke. The seven major countries of the world—the so–called **G–7** (the United States, Japan, France, Germany, the United Kingdom, Italy, and Canada; the "G" stands for "group")—meet regularly to discuss their economic situation; the communiqué at the end of the meeting rarely fails to mention coordination. But the evidence is that there is in fact very limited macro–coordination among countries. Here are some reasons why:

- Coordination may imply that some countries have to do more than

others. They may not want to do so.

Suppose that only some countries are in recession. Countries that are not in a recession will be reluctant to increase their own demand; but if they do not, the countries that expand will run a trade deficit vis–á–vis countries that do not.

Or suppose some countries are already running a large budget deficit. These countries will not want to cut taxes nor increase spending further, and will ask other countries to take on more of the adjustment. Those other countries may be reluctant to do so.

- Countries have a strong incentive to promise to coordinate, and then not deliver on that promise.

  Once all countries have agreed, say, to an increase in spending, each country has an incentive not to deliver, so as to benefit from the increase in demand elsewhere and thereby improve its trade position. But if each country cheats, or does not do everything it promised, there will be insufficient demand expansion to get out of the recession.

These reasons are far from abstract concerns. Countries in the European Union, which are highly integrated with one another, have in the past 30 years often suffered from such coordination problems. In the late 1970s, a bungled attempt at coordination left most countries weary of trying again.[17] In the early 1980s, an attempt by the French socialists to go at it alone led to a large French trade deficit, and eventually to a change in policy (this is described in the Focus box "The French Socialist Expansion: 1981–1983"). Thereafter, most countries decided that it was better to wait for an increase in foreign demand than to increase their own demand. There has been very little coordination of fiscal policy since then in Europe.

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17. European countries embarked on fiscal expansion "too late". By the time they increased spending, their economies were already recovering, and there was no longer a need for higher government spending.

Focus. The French Socialist Expansion: 1981–1983

In May 1981, the Socialist party won the elections in France. Faced with an economy suffering from more than 7% unemployment, the Socialists offered a program aimed at increasing demand through more generous social policies and subsidies to job creation. Welfare benefits and pensions were increased. Public jobs were created, as were new training programs for the young and the unemployed. Table 1 summarizes the macroeconomic results of the policy.

Table 1. Macroeconomic Aggregates, France: 1980–1983.

	1980	1981	1982	1983
GDP growth (%)	1.6	1.2	2.5	0.7
EU growth (%)	1.4	0.2	0.7	1.6
Budget surplus	0.0	–1.9	–2.8	–3.2
Current account surplus	–0.6	–0.8	–2.2	–0.9

The budget and current account surpluses are measured as ratios to GDP, in percent. A minus sign indicates a deficit. EU growth refers to the average growth rate for the countries of the European Union. Source : OECD Economic Outlook, December 1993.

The fiscal expansion is quite visible in the data: The budget, which was balanced in 1980, was in deficit by 2.8% of GDP in 1982. The effects on growth are equally visible. Average growth in 1981–1982 was 1.85%—not an impressive growth rate, but still much above the EU's dismal 0.45% average growth rate over the same two years.

Nevertheless, the Socialists abandoned their policy in March 1983. The last line of Table 1 tells us why. As France was expanding faster than

its trading partners, it experienced a sharp increase in its trade deficit. While the government may have tolerated those trade deficits, financial markets—which were very nervous about the Socialists in the first place—forced three devaluations of the franc in 18 months (Recall from Chapter 18 that when countries try to maintain a fixed exchange rate—as was the case for France at the time—depreciations are called devaluations. We shall see the mechanisms that lead to such devaluations in the next two chapters.) The first was in October 1981, by 8.5% against the DM; the second in June 1982, by 10% against the DM; and the third in March 1983, by 8% against the DM. In March 1983, unwilling to face further attacks on the franc and worried about the trade deficits, the French government gave up its attempt to use demand policies to decrease unemployment and shifted to a new policy of "austerity"—a policy aimed at achieving low inflation, budget and trade balance, and no further devaluations.

19–4. Depreciation, the Trade Balance, and Output

Suppose the U.S. government takes policy measures that lead to a depreciation of the dollar—a decrease in the nominal exchange rate. (We shall see in Chapter 20 how it can do this by using monetary policy; for the moment we assume the government can simply choose the exchange rate.)

Recall that the real exchange rate is given by

$$\epsilon \equiv \frac{E\ P}{P^*}$$

The real exchange rate, ϵ (the price of domestic goods in terms of foreign goods) is equal to the nominal exchange rate, E (the price of domestic

currency in terms of foreign currency) times the domestic price level, P, divided by the foreign price level, P^*. In the short run, we can take both P and P^* as given. This implies that the nominal depreciation is reflected one for one in a real depreciation.[18] More concretely, if the dollar depreciates vis–à–vis the yen by 10% (a 10% nominal depreciation), and if the price levels in Japan and the United States do not change, U.S. goods will be 10% cheaper compared to Japanese goods (a 10% real depreciation).[19]

Let's now ask what the effects of this real depreciation will be on the U.S. trade balance and on U.S. output.

Depreciation and the Trade Balance: The Marshall–Lerner Condition

Return to the definition of net exports:

$$NX \equiv X - IM/\epsilon$$

Replace X and IM by their expressions from equations (19.2) and (19.3)

$$NX = X(Y^*, \epsilon) - IM(Y, \epsilon)/\epsilon$$

As the real exchange rate ϵ enters the right side of the equation in three places, this makes clear that the real depreciation affects the trade balance through three separate channels:[20]

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18. Given P and P^*, E increases $\Rightarrow$ $\epsilon \equiv EP/P^*$ increases.
19. A look ahead: In Chapter 21, we shall look at the effects of a nominal depreciation when we allow the price level to adjust over time. You will see that a nominal depreciation leads to a real depreciation in the short run, but not in the medium run.
20. More concretely, if the dollar depreciates vis a vis the yen by 10%:
[Note to ed: align with each of the bullet points below, as in 3e]
U.S. goods will be cheaper in Japan, leading to a larger quantity of U.S. exports to Japan.
Japanese goods will be more expensive in the United States, leading to a smaller quantity

- *Exports, X, increase.* The real depreciation makes U.S. goods relatively less expensive abroad. This leads to an increase in foreign demand for U.S. goods—an increase in U.S. exports.
- *Imports, IM, decrease.* The real depreciation makes foreign goods relatively more expensive in the United States. This leads to a shift in domestic demand towards domestic goods, and to a decrease in the quantity of imports.
- *The relative price of foreign goods in terms of domestic goods, $1/\epsilon$, increases.* This increases the import bill, IM/ϵ. The same quantity of imports now costs more to buy (in terms of domestic goods).

For the trade balance to improve following a depreciation, exports must increase enough and imports must decrease enough to compensate for the increase in the price of imports. The condition under which a real depreciation leads to an increase in net exports is known as the **Marshall–Lerner condition**.[21] (It is derived formally in the second appendix, called "Derivation of the Marshall Lerner Condition" at the end of the chapter.) It turns out—with a complication we shall state when we introduce dynamics later in this chapter—that this condition is satisfied in reality. So, for the rest of this book, we shall assume that a real depreciation—a decrease in ϵ—leads to an increase in net exports—an increase in NX.

The Effects of a Depreciation

We have looked so far at the *direct* effects of a depreciation on the trade balance—that is, the effects *given U.S. and foreign output*. But the effects do not end there. The change in net exports changes domestic output, which affects net exports further.

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of imports of Japanese goods to the United States.
Japanese goods will be more expensive, leading to a higher import bill for a given quantity of imports of Japanese goods to the United States.
21. Named after the two economists, Alfred Marshall and Abba Lerner, who were the first to derive it.

Because the effects of a real depreciation are very much like those of an increase in foreign output, we can use Figure 19–4, the same figure that we used to show the effects of an increase in foreign output earlier.

Just like an increase in foreign output, a depreciation leads to an increase in net exports (assuming, as we do, that the Marshall–Lerner condition holds), at any level of output.[22] Both the demand relation (ZZ in panel (a)) and the net exports relation (NX in panel (b)) shift up. The equilibrium moves from A to A'; output increases from Y to Y'. By the same argument we used earlier, the trade balance improves: The increase in imports induced by the increase in output is smaller than the direct improvement in the trade balance induced by the depreciation.

Let's summarize: *The depreciation leads to a shift in demand, both foreign and domestic, toward domestic goods. This shift in demand leads in turn to both an increase in domestic output and an improvement in the trade balance.*

While a depreciation and an increase in foreign output have the same effect on domestic output and the trade balance, there is a subtle but important difference between the two. A depreciation works by making foreign goods relatively more expensive. But this means that given their income, people—who now have to pay more to buy foreign goods because of the depreciation—are worse off. This mechanism is strongly felt in countries that go through a large depreciation. Governments trying to achieve a large depreciation often find themselves with strikes and riots in the streets, as people react to the much higher prices of imported goods. This was for example the case in Mexico, where the large depreciation of the peso in 1994–1995—from 29 cents per peso in November 1994 to 17 cents per peso in May 1995—led to a large decline in workers' living standards, and to

22. Marshall Lerner condition: Given output, a real depreciation leads to an increase in net exports.

social unrest.[23]

Combining Exchange–Rate and Fiscal Policies

Suppose a government wants to reduce the trade deficit without changing the level of output. A depreciation alone will not do: It will reduce the trade deficit, but it will also increase output. Nor will a fiscal contraction: It will reduce the trade deficit, but it will decrease output. What should the government do? Answer: Use the right combination of depreciation and fiscal contraction. Figure 19–5 shows what this combination should be.

Figure 19–5. Reducing the Trade Deficit Without Changing Output. (Caption. To reduce the trade deficit without changing output, the government must both achieve a depreciation and decrease government spending.)

Suppose the initial equilibrium in panel (a) is at A, associated with output Y. At this level of output, there is a trade deficit, given by the distance BC in panel (b). If the government wants to eliminate the trade deficit without changing output, it must do two things:

- It must achieve a depreciation sufficient to eliminate the trade deficit at the initial level of output. So the depreciation must be such as to shift the net exports relation from NX to NX' in panel (b).
  The problem is that this depreciation, and the associated increase in net exports, also shifts the demand relation in panel (a) from ZZ to ZZ'. In the absence of other measures, the equilibrium would move from A to A', and output would increase from Y to Y'.

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23. There is an alternative to riots—asking for and obtaining an increase in wages. But, if wages increase, the prices of domestic goods will follow and increase as well, leading to a smaller real depreciation. To discuss this mechanism, we need to look at the supply side in more detail than we have done so far. We return to the dynamics of depreciation, wage and price movements in Chapter 21.

- In order to avoid the increase in output, the government must reduce government spending so as to shift ZZ' back to ZZ. This combination of a depreciation and a fiscal contraction leads to the same level of output and an improved trade balance.

The combination of a depreciation and a fiscal contraction leads to an unchanged level of output, and an improvement in the trade balance.

There is a general point behind this example. To the extent that governments care about *both* the level of output and the trade balance, they have to use *both* fiscal policy and exchange–rate policies.[24] We just saw one such combination. Table 19–1 gives you others, depending on the initial output and trade situation. Take, for example, the box in the top right corner of the table: Initial output is too low (put another way, unemployment is too high), and the economy has a trade deficit. A depreciation will help on both the trade and the output fronts: It reduces the trade deficit and increases output. But there is no reason for the depreciation to achieve both the correct increase in output and the elimination of the trade deficit. Depending on the initial situation and the relative effects of the depreciation on output and the trade balance, the government may need to complement the depreciation with either an increase or a decrease in government spending. This ambiguity is captured by the question mark in the box. Make sure that you understand the logic behind each of the other three boxes.

Table 19–1. Exchange–Rate and Fiscal Policy Combinations

Initial conditions:	Trade Surplus	Trade Deficit
Low output	$\epsilon?$ $G\uparrow$	$\epsilon\downarrow$ $G?$
High output	$\epsilon\uparrow$ $G?$	$\epsilon?$ $G\downarrow$

24. A general lesson: If you want to achieve two targets (here, output and trade balance), you better have two instruments (here, fiscal policy and the exchange rate).

We have now seen how shifts in domestic demand, shifts in foreign demand, and changes in the real exchange rate, all affect output and the trade balance. With these tools in hand, we have what we need to look at the sources and implications of the large current U.S. trade deficits. This is what we do in the Focus box "The U.S. Trade Deficit: Origins and Implications".

Focus. The U.S. Trade Deficit: Origins and Implications.

Figure 1 shows the evolution of U.S. exports and imports as ratios to GDP since 1990. It shows how, since the mid–1990s, exports and imports have steadily diverged. The import ratio has continued to increase, but the export ratio has decreased, going from 11.5% in 1997 to 9.5% in 2003. As a result, the U.S. trade deficit has steadily increased, and, in 2003, it stood at 4.5%. The current account deficit (which, you will remember, is equal to the trade deficit, plus transfers from the United States to the rest of the world, minus net income payments from the rest of the world to the United States, and tells us how much the United States has to borrow from the rest of the world) stood at an even higher 5% of GDP.

Figure 1. U.S. Exports and Imports as Ratios to U.S. GDP, 1990-2003

The 2003 trade and current account deficits were by far the largest (both absolutely, and in proportion to GDP) in recorded U.S. history. And, given the size of the U.S. economy, a current account deficit of 5% of GDP represents a very large amount—more than $ 500 billion—which the United States has to borrow from the rest of the world. This raises two main questions. Where do these deficits come from, and what do they imply for the future? Let's take up each question in turn.

Where does the trade deficit, and by implication the current account deficit, come from? *There are two main causes:*

The first cause is the high U.S. growth rate since the mid 1990s, relative to the growth rate of its trading partners.

Table 1 gives the average annual growth rate for the United States, Japan, the European Union, and the world economy (excluding the United States) for three periods, 1990-1995, 1996–2000, and 2000-2003. From 1991 to 1995, growth in the United States was roughly in line with growth in the rest of the world. Since 1996 however, U.S. growth has been much higher than growth in the rest of the world. The U.S. performance from 1996 to 2000 reflects the "New economy" boom, which we have discussed at many points in the book. U.S. growth has decreased since 2000 (recall that the United States went through a recession in 2001), but growth has slowed down even more in the rest of the world.

Higher growth does not necessarily lead to a higher trade deficit: If the main source of the increase in demand and growth in a country is an increase in foreign demand, the country can grow fast and maintain trade balance, or even sustain a trade surplus. In the case of the United States since the mid–1990s however, the main source of increased demand has been domestic demand, with high consumption and investment demand as the main factors behind the sustained expansion. Thus, higher growth has come with an increasing trade deficit.

Table 1. Average Annual Growth Rates in the United States, Japan, the European Union, and the World, 1991-2003 (percent per year)

The second cause is the steady real appreciation of U.S. goods—the increase in the real U.S. effective exchange rate.

	1991-1995	1996-2000	2001-2003
United States	2.5	4.1	2.9
Japan	1.5	1.5	0.9
European Union	2.1	2.6	1.9
World (excluding U.S.)	3.2	2.8	1.5

Even if, at a given real exchange rate, growth leads to an increase in the trade deficit, a real depreciation can help maintain trade balance by making domestic goods more competitive. But just the opposite happened to the U.S. real exchange rate in the late 1990s: The United States experienced a real appreciation, not a real depreciation. As shown in Figure 2, the multilateral real exchange rate (normalized to equal 1.0 in 2000) increased from 0.85 in 1995 to 1.05 in 2002—a 20% real appreciation. While the dollar has depreciated since 2002, the depreciation has so far been limited, and the exchange rate remains much higher than in the mid–1990s.

Figure 2. The Multilateral Real Exchange Rate, 1990-2003

What happens next? *Should we expect the large trade deficit and current account deficit to naturally disappear in the future? At an unchanged real exchange rate, the answer is probably not. If there were good reasons to expect U.S. trading partners to experience much higher growth than the United States over the coming decade, then we could expect to see the same process we saw in the 1990s, but this in time in reverse: Lower growth in the United States than in the rest of the world would lead to a steady reduction in the trade deficit. There are few reasons however to expect such a scenario. While the United States cannot expect to replicate the growth rates of the late 1990s, there is also no reason either to expect much lower growth than average over the coming decade. And nobody is predicting sustained high growth in the European Union or in Japan.*

Can the United States afford to sustain a large trade deficit and a large

current account deficit for many more years? The answer, again: Probably not. While financial investors have been willing to lend to the United States until now, it may be difficult for the United States to continue to borrow $500 billion per year or so in the future. And, even if financial investors were willing to continue to lend, it is not clear that it would be a wise policy for the United States to accumulate such a large debt vis–a–vis the rest of the world.

These arguments have two implications:

- *The U.S. trade and current account deficits will need to be reduced.*
- *This is unlikely to happen without a real depreciation. How large a depreciation? Estimates range from 20% to 40%—in short, a substantial real depreciation. When will this depreciation take place? This is a much harder question to answer. It will take place when foreign investors become reluctant to lend to the United States at the rate of $500 billion or so a year.*

Going back to the issues discussed in Table 19-1 in the text: A depreciation on such a scale will have major effects on the demand for goods both in the United States and abroad:

The depreciation will increase the demand for U.S. goods. If, when the depreciation takes place, U.S. output is already close to its natural level, the risk is that the depreciation will lead to too high a level of demand, and too high a level of output. In that case, the right policy will be a fiscal contraction, a reduction in the large budget deficits that the U.S. government currently runs. If the U.S. government succeeds in achieving a smooth depreciation and the appropriate fiscal contraction, the outcome may be sustained growth and a reduction of the trade deficit.

The depreciation will decrease the demand for foreign goods. By the same argument, this may require foreign governments to use policy to sustain demand and output in their own country. This would ordinarily call for

a fiscal expansion, but this may not be the solution this time. A number of countries, for example France, Germany, and Japan, are already running large budget deficits. For the reasons we saw in Chapter 17, further increasing these deficits further may be difficult, even dangerous. If fiscal policy cannot be used, a strong dollar depreciation may therefore trigger a recession in those countries.

In short, a smooth reduction of the U.S. trade deficit will require the combination of a dollar depreciation and fiscal policy changes both in the United States and abroad. Many economists worry that this may not be easy to achieve.

19–5. Looking at Dynamics: The J-Curve

We have ignored dynamics so far in this chapter. It is time to reintroduce them. The dynamics of consumption, investment, sales, and production we discussed in Chapter 3 are as relevant to the open economy as they are to the closed economy. But there are additional dynamic effects as well, which come from the dynamics of exports and imports. I focus on these effects here.

Return to the effects of the exchange rate on the trade balance. I argued earlier that a depreciation leads to an increase in exports and to a decrease in imports. But these effects do not happen overnight. Think of the dynamic effects of, say, a 10% dollar depreciation.

In the first few months following the depreciation, the effect of the depreciation is likely to be reflected much more in prices than in quantities. The price of imports in the United States goes up, and the price of U.S. exports abroad goes down. But the quantity of imports and exports is likely to

adjust only slowly: It takes a while for consumers to realize that relative prices have changed, it takes a while for firms to shift to cheaper suppliers, and so on. So a depreciation may well lead to an initial deterioration of the trade balance; ϵ decreases, but neither X nor IM adjusts very much initially, leading to a decline in net exports $(X - IM/\epsilon)$.

As time passes, the effects of the change in the relative prices of both exports and imports become stronger. Cheaper U.S. goods lead U.S. consumers and firms to decrease their demand for foreign goods: U.S. imports decrease. Cheaper U.S. goods abroad lead foreign consumers and firms to increase their demand for U.S. goods: U.S. exports increase. If the Marshall–Lerner condition eventually holds—and we have argued that it does—the response of exports and imports eventually becomes stronger than the adverse price effect, and the eventual effect of the depreciation is an improvement of the trade balance.[25]

Figure 19–6 captures this adjustment by plotting the evolution of the trade balance against time in response to a real depreciation. The pre–depreciation trade deficit is OA. The depreciation initially *increases* the trade deficit to OB: ϵ decreases, but neither IM nor X changes right away. Over time, exports increase and imports decrease, reducing the trade deficit. Eventually (if the Marshall–Lerner condition is satisfied), the trade balance improves beyond its initial level; this is what happens from point C on in the figure. Economists refer to this adjustment process as the **J–curve**, because—admittedly, with a bit of imagination—the curve in the figure resembles a "J": first down, then up.

Figure 19–6. The J–Curve. (Caption. A real depreciation leads initially to a deterioration, and then to an improvement of the trade balance.)

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25. The response of the trade balance to the real exchange rate:
Initially: X, IM unchanged, ϵ decreases $\Rightarrow$ $(X - IM/\epsilon)$ decreases.
Eventually: X increases, IM decreases, ϵ decreases $\Rightarrow$ $(X - IM/\epsilon)$ increases.

The importance of the dynamic effects of the real exchange rate on the trade balance can be seen from the evidence from the United States in the mid–1980s: Figure 19–7 plots the U.S. trade deficit against the U.S. real exchange rate in the 1980s. As we saw in the last chapter, the period from 1980 to 1985 was one of sharp real appreciation, and the period from 1985 to 1988 one of sharp real depreciation. Turning to the trade deficit, which is expressed as a proportion of GDP, two facts are clear:

1. Movements in the real exchange rate were reflected in parallel movements in net exports. The appreciation was associated with a large increase in the trade deficit, and the later depreciation was associated with a large decrease in the trade balance.
2. There were, however, substantial lags in the response of the trade balance to changes in the real exchange rate. Note how from 1981 to 1983, the trade deficit remained small while the dollar was appreciating. And note how the steady depreciation of the dollar from 1985 on was not reflected in an improvement in the trade balance before 1987: The dynamics of the J–curve were very much at work in both episodes.[26]

Figure 19–7. The Real Exchange Rate and the Ratio of the Trade Deficit to GDP: United States, 1980–1990 (Caption. The real appreciation and depreciation of the dollar in the 1980s were reflected in increasing and then decreasing trade deficits. There were, however, substantial lags in the effects of the real exchange rate on the trade balance.)

In general, the econometric evidence on the dynamic relation between exports, imports, and the real exchange rate, suggests that in all OECD countries, a real depreciation eventually leads to a trade balance improvement.

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26. The delays in 1985–1988 were unusually long, prompting some economists at the time to question whether there was still a relation between the real exchange rate and the trade balance. In retrospect, the relation was still there—the delays were just longer than usual.

But it also suggests that this process takes some time, typically between six months and a year. These lags have implications not only for the effects of a depreciation on the trade balance but also for the effects of a depreciation on output. If a depreciation initially decreases net exports, it also initially exerts a contractionary effect on output. Thus, if a government relies on a depreciation both to improve the trade balance and to expand domestic output, the effects will go the "wrong" way for a while.

19–6. Saving, Investment, and the Trade Balance

You saw in Chapter 3 how we could rewrite the condition for equilibrium in the goods market as the condition that investment was equal to saving—the sum of private saving and public saving. We can now derive the corresponding condition for the open economy, and show how useful this alternative way of looking at the equilibrium can be.

Start from our equilibrium condition

$$Y = C + I + G - IM/\epsilon + X$$

Subtract $C + T$ from both sides, and use the fact that private saving is given by $S = Y - C - T$, to get

$$S = I + G - T - IM/\epsilon + X$$

Using the definition of net exports $NX \equiv X - IM/\epsilon$, and reorganizing gives

$$NX = S + (T - G) - I \tag{19.5}$$

This condition says that in equilibrium, the trade balance (NX) must be equal to saving—private saving (S) and public saving ($T - G$)—minus investment (I). It follows that *a trade surplus must correspond to an excess of saving over investment; a trade deficit must correspond to an excess of investment over saving.*

One way of getting more intuition for this relation is to go back to the discussion of the current account and the capital account in Chapter 18. There we saw that a trade surplus implies net lending from the country to the rest of the world, and a trade deficit implies net borrowing by the country from the rest of the world. So, consider a country that invests more than it saves, so that $S + (T - G) - I$ is negative. That country must be borrowing the difference from the rest of the world; it must therefore be running a trade deficit.

Note some of the things that equation (19.5) says:

- An increase in investment must be reflected in either an increase in private saving or public saving, or in a deterioration of the trade balance (a smaller trade surplus, or a larger trade deficit).
- An increase in the budget deficit must be reflected in an increase in either private saving, or a decrease in investment, or a deterioration of the trade balance.
- A country with a high saving rate (private plus public) must have either a high investment rate or a large trade surplus.

Note also however what equation (19.5) *does not say*. It does not say, for example, whether a budget deficit will lead to a trade deficit, or, instead, to an increase in private saving, or to a decrease in investment. To find out what happens in response to a budget deficit, we must explicitly solve for what happens to output and its components using the assumptions that we have made about consumption, investment, exports, and imports. We can do so using either equation (19.1)—as we have done throughout this chapter—or equation (19.5), as the two are equivalent. However, let me

strongly recommend that you use equation (19.1). Using (19.5) can, if you are not careful, be very misleading. To see how misleading, consider, for example, the following argument (which is so common that you may have read it in some form in newspapers):

"It is clear the United States cannot reduce its large trade deficit (currently above 4% of GDP) through a depreciation. Look at equation (19.5). It shows that the trade deficit is equal to investment minus saving. Why should a depreciation affect either saving or investment? So, how can a depreciation affect the trade deficit?"

The argument may sound convincing, but we know it is wrong. We showed earlier that a depreciation leads to an improvement in the trade position. So what is wrong with the argument? A depreciation actually affects saving and investment: It does so by affecting the demand for domestic goods, thereby increasing output. Higher output leads to an increase in saving over investment, or equivalently to a decrease in the trade deficit.

A good way of making sure that you understand the material in this chapter is to go back and look at the various cases we have considered, from changes in government spending, to changes in foreign output, to combinations of depreciation and fiscal contraction, and so on. Trace what happens in each case to each of the four components of equation (19.5): private saving, public saving (equivalently, the budget surplus), investment, and the trade balance.[27] Make sure, as always, that you can tell the story in words. If you can, you are ready to go on to Chapter 20.

Summary

27. Suppose for example that the U.S. government wants to reduce the trade deficit without changing the level of output, so it uses a combination of depreciation and fiscal contraction. What happens to private saving, public saving, and investment?

- In an open economy, the demand for domestic goods is equal to the domestic demand for goods (consumption, plus investment, plus government spending) minus the value of imports (in terms of domestic goods), plus exports.
- In an open economy, an increase in domestic demand leads to a smaller increase in output than it would in a closed economy because some of the additional demand falls on imports. For the same reason, an increase in domestic demand also leads to a deterioration of the trade balance.
- An increase in foreign demand leads, as a result of increased exports, to both an increase in domestic output and an improvement of the trade balance.
- Because increases in foreign demand improve the trade balance and increases in domestic demand worsen the trade balance, countries may be tempted to wait for increases in foreign demand to move them out of a recession. When a group of countries is in recession, coordination can in principle help them get out of it.
- If the Marshall–Lerner condition is satisfied—and the empirical evidence indicates that it is—a real depreciation leads to an improvement in net exports.
- A real depreciation leads first to a deterioration of the trade balance, and then to an improvement. This adjustment process is known as the J–curve.
- The condition for equilibrium in the goods market can be rewritten as the condition that saving (public and private) minus investment must be equal to the trade balance. A trade surplus corresponds to an excess of saving over investment. A trade deficit corresponds to an excess of investment over saving.

Key terms

- demand for domestic goods
- domestic demand for goods
- marginal propensity to import
- coordination, G–7
- Marshall–Lerner condition
- J–curve

Further readings

A good discussion of the relation among trade deficits, budget deficits, private saving, and investment is given in Barry Bosworth's *Saving and Investment in a Global Economy* (Washington, DC: Brookings Institution, 1993).

A good discussion of the U.S. trade deficit and its implications for the future is given in *Dollar Overvaluation and the World Economy*, edited by Fred Bergsten and John Williamson (Washington, DC: Institute for International Economics, 2003).

Appendix 1. Multipliers: Belgium versus the United States.

If we assume that the various relations in equation (19.4) are linear, we can compute the effects of government spending, foreign output, and so forth, on both output and the trade balance. In this appendix we look at the differences between the effects of government spending in a large country such as the United States and in a small country such as Belgium.

Assume consumption and investment for a given country are given by

$$\begin{aligned} C &= c_0 + c_1(Y - T) \\ I &= d_0 + d_1 Y - d_2 r \end{aligned}$$

Consumption C increases with disposable income $Y - T$; investment I increases with output Y and decreases with the real interest rate r. c_0, c_1, d_0, d_1, d_2 are parameters.

For simplicity, ignore movements in the real exchange rate ϵ and assume $\epsilon = 1$. Assume imports and exports are given by

$$\begin{aligned} IM &= im_1 Y \\ X &= x_1 Y^* \end{aligned}$$

Imports IM are proportional to domestic output Y, and exports X are proportional to foreign output Y^*. im_1 and x_1 are parameters. In the same way as we referred to c_1 as the marginal propensity to consume, im_1 is the **marginal propensity to import.**

The equilibrium condition is that output equals the demand for domestic goods

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

(Recall that we are assuming that ϵ equals 1, so IM/ϵ is simply equal to

IM.) Replace C, I, G, IM and X by their expressions from above

$$Y = [c_0 + c_1(Y - T)] + (d_0 + d_1 Y - d_2 r) + G - im_1 Y + x_1 Y^*$$

Regroup terms

$$Y = (c_1 + d_1 - im_1)Y + (c_0 + d_0 - c_1 T - d_2 r + G + x_1 Y^*)$$

Bring the terms in output together, and solve for output

$$Y = [\frac{1}{1 - (c_1 + d_1 - im_1)}] \ (c_0 + d_0 - c_1 T - d_2 r + G + x_1 Y^*)$$

Output equals the multiplier (the term in square brackets) times autonomous spending (the term in parentheses, which captures the effect of all the variables we take as given in explaining output.

Consider the multiplier. Specifically, consider $(c_1 + d_1 - im_1)$ in the denominator. As in the closed economy, $(c_1 + d_1)$ gives the effects of an increase in output on consumption and investment demand; $(-im_1)$ captures the fact that some of the increased demand falls not on domestic goods but on foreign goods.

- In the extreme case where all the additional demand falls on foreign goods—when $im_1 = c_1 + d_1$—an increase in output has no effect back on the demand for domestic goods; in that case, the multiplier equals 1.
- In general, im_1 is less than $(c_1 + d_1)$, so that the multiplier is larger than 1. But the multiplier is smaller than it would be in a closed economy.

Using this equation, we can easily characterize the effects of an increase in government spending of ΔG:

The increase in output is equal to the multiplier times the change in gov-

ernment spending

$$\Delta Y = \frac{1}{1-(c_1+d_1-im_1)}\Delta G$$

And the increase in imports that follows from the increase in output implies the following change in net exports

$$\begin{aligned}\Delta NX &= -im_1\ \Delta Y \\ &= -\frac{im_1}{1-(c_1+d_1-im_1)}\Delta G\end{aligned}$$

Let's see what these formulas imply by choosing numerical values for the parameters.

Let $c_1 + d_1$ equal to 0.6. What value should we choose for im_1? We saw in Chapter 18 that, in general, the larger the country, the more self sufficient it is, and the less it imports. So let's choose two values of im_1—a small value, say 0.1, for a large country such as the United States, and a larger one, say 0.5, for a small country such as Belgium. Note that the proportion of an increase in demand that falls on imports is given by $im_1/(c_1+d_1)$ (An increase in output of 1 dollar leads to an increase in spending of $(c_1 + d_1)$ dollars, of which im_1 dollars is spent on foreign goods.) So an equivalent way of stating our choice of im_1 is that, in the large country, 1/6 (0.1 divided by 0.6) of demand falls on imports, versus 5/6 (0.5 divided by 0.6) in the small country.

Now return to the expressions for output and the trade balance.

For the large country:

- The effect of the change in government spending on output is given by:

$$\Delta Y = \frac{1}{1-(0.6-0.1)}\Delta G = 2.0\Delta G$$

- The effect of the change in government spending on the trade balance is given by:

$$\Delta NX = -0.1\Delta Y = \frac{-0.1}{1-(0.6-0.1)}\Delta G = -0.2\Delta G$$

For the small country:

- The effects of the change in government spending on output are given by:

$$\Delta Y = \frac{1}{1-(0.6-0.5)}\Delta G = 1.11\Delta G$$

- The effects of the change in government spending on the trade balance are given by:

$$\Delta NX = -0.5\Delta Y = \frac{-0.5}{1-(0.6-0.5)}\Delta G = -0.65\Delta G$$

These computations show the very different trade-offs faced by each country:

- In the large country, the effect of an increase in G on output is large and the effect on the trade balance is small.
- In the small country, the effect of an increase in G on output is small, and the deterioration of the trade balance is equal to half of the increase in government spending.

This example shows how openness makes it more difficult to use fiscal policy to affect output, especially in small countries. The more open the economy, the smaller the effect of fiscal policy on output and the larger the effect on the trade position. We shall see more examples of this proposition as we go along.

Appendix 2: Derivation of the Marshall–Lerner Condition

Start from the definition of net exports

$$NX \equiv X - IM/\epsilon$$

Assume trade to be initially balanced, so that $NX = 0$ and $X = IM/\epsilon$, or equivalently $\epsilon X = IM$. The Marshall–Lerner condition is the condition under which a real depreciation, a decrease in ϵ, leads to an increase in net exports.

To derive this condition, first multiply both sides of the equation above by ϵ to get

$$\epsilon\ NX = \epsilon X - IM$$

Now consider a change in the real exchange rate of $\Delta\epsilon$. The effect of the change in the real exchange rate on the left side of the equation is given by $(\Delta\epsilon)NX + \epsilon\ (\Delta NX)$. Note that, if trade is initially balanced, $NX = 0$, so the first term in this expression is equal to zero, and the effect of the change on the left side is simply given by $\epsilon\ (\Delta NX)$. The effect of the change in the real exchange rate on the right side of the equation is given by $(\Delta\epsilon)X + \epsilon\ (\Delta X) - (\Delta IM)$. Putting the two sides together gives

$$\epsilon\ (\Delta NX) = (\Delta\epsilon)\ X + \epsilon(\Delta X) - (\Delta IM)$$

Divide both sides by ϵX to get:

$$\frac{\epsilon\ (\Delta NX)}{\epsilon X} = \frac{(\Delta\epsilon)\ X}{\epsilon X} + \frac{\epsilon\ (\Delta X)}{\epsilon X} - \frac{\Delta(IM)}{\epsilon X}$$

Simplify, and use the fact that, if trade is initially balanced, $\epsilon X = IM$ to replace ϵX by IM in the last term on the right. This gives

$$\frac{\Delta NX}{X} = \frac{\Delta\epsilon}{\epsilon} + \frac{\Delta X}{X} - \frac{\Delta IM}{IM}$$

The change in the trade balance (as a ratio to exports) in response to a real depreciation is equal to the sum of three terms:

- The first term is equal to the proportional change in the real exchange rate. It is negative if there is a real depreciation.
- The second term is equal to the proportional change in exports. It is positive if there is a real depreciation.
- The third term is equal to minus the proportional change in the imports. It is positive if there is a real depreciation.

The Marshall–Lerner condition is the condition that the sum of these three terms be positive. If it is satisfied, a real depreciation leads to an improvement in the trade balance.

A numerical example will help here. Suppose that a 1% depreciation leads to a proportional increase in exports of 0.9% and to a proportional decrease in imports of 0.8%. (Econometric evidence on the relation of exports and imports to the real exchange rate suggest that these are indeed reasonable numbers.) In that case, the right hand side of the equation is equal to –1% + 0.9% – (–0.8%) = 0.7%. Thus the trade balance improves: The Marshall–Lerner condition is satisfied.

Figure 19-7. The Real Exchange Rate and the Trade Deficit

Figure 19-4. The Effects of an Increase in Foreign Demand

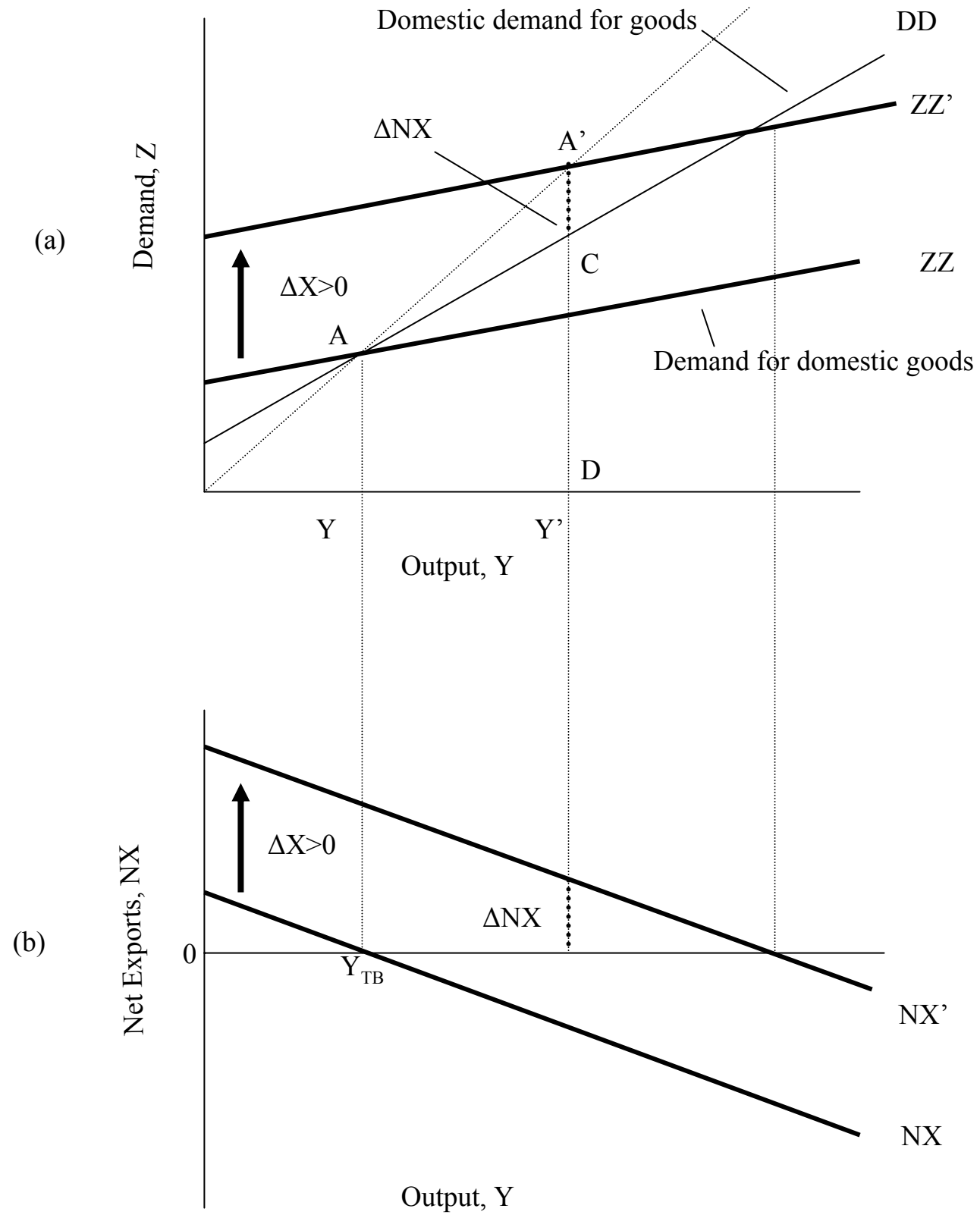
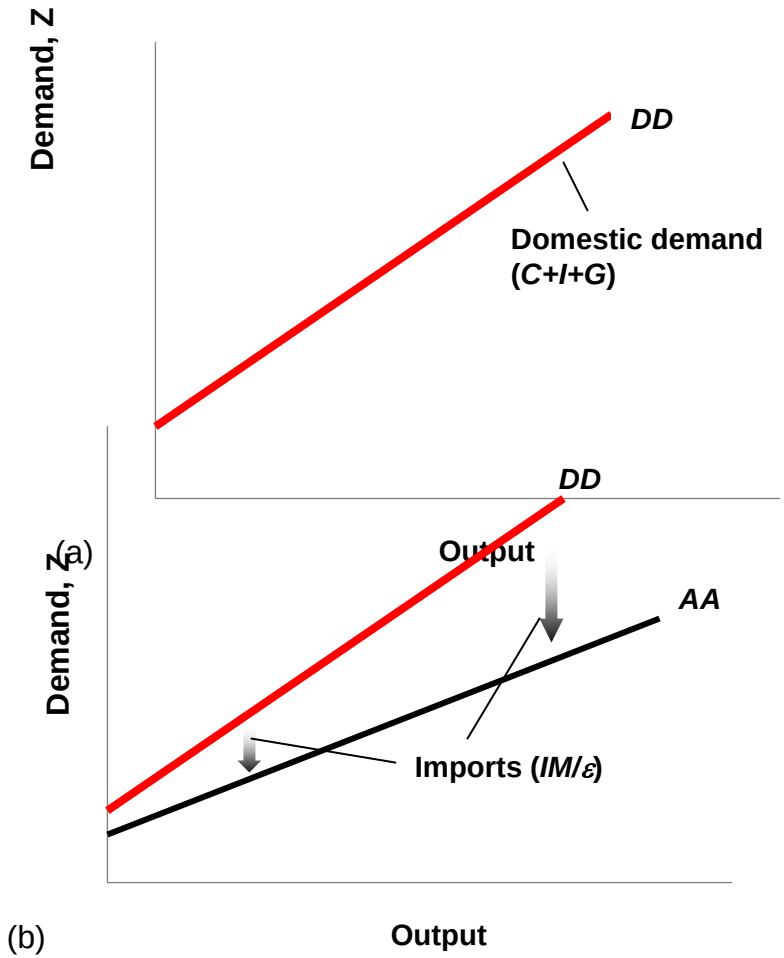
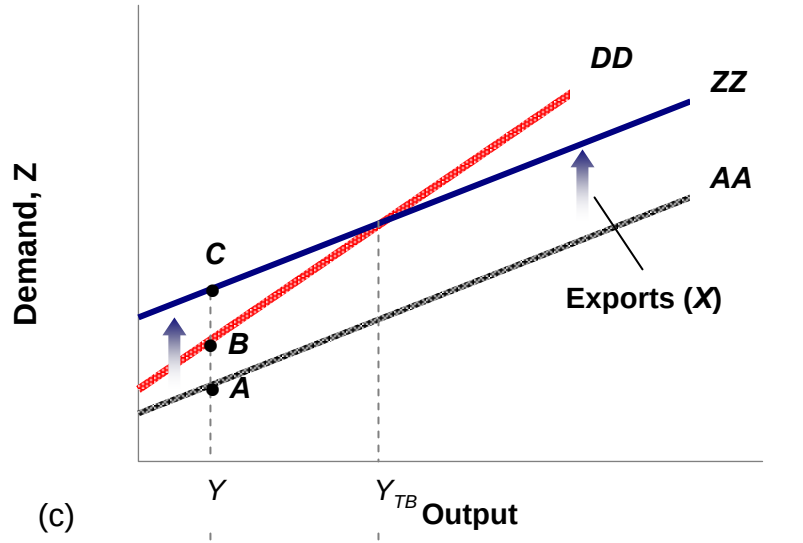


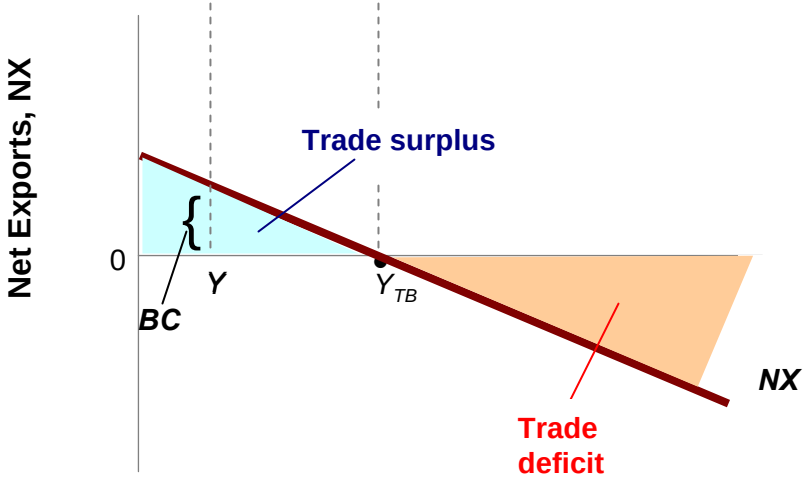
Figure 19-1. The Demand for Domestic Goods And Net Exports



(figure 19-1. continued)



(c)



(d)

Figure 2. The U.S. Multilateral Real Exchange Rate, 1990-2003

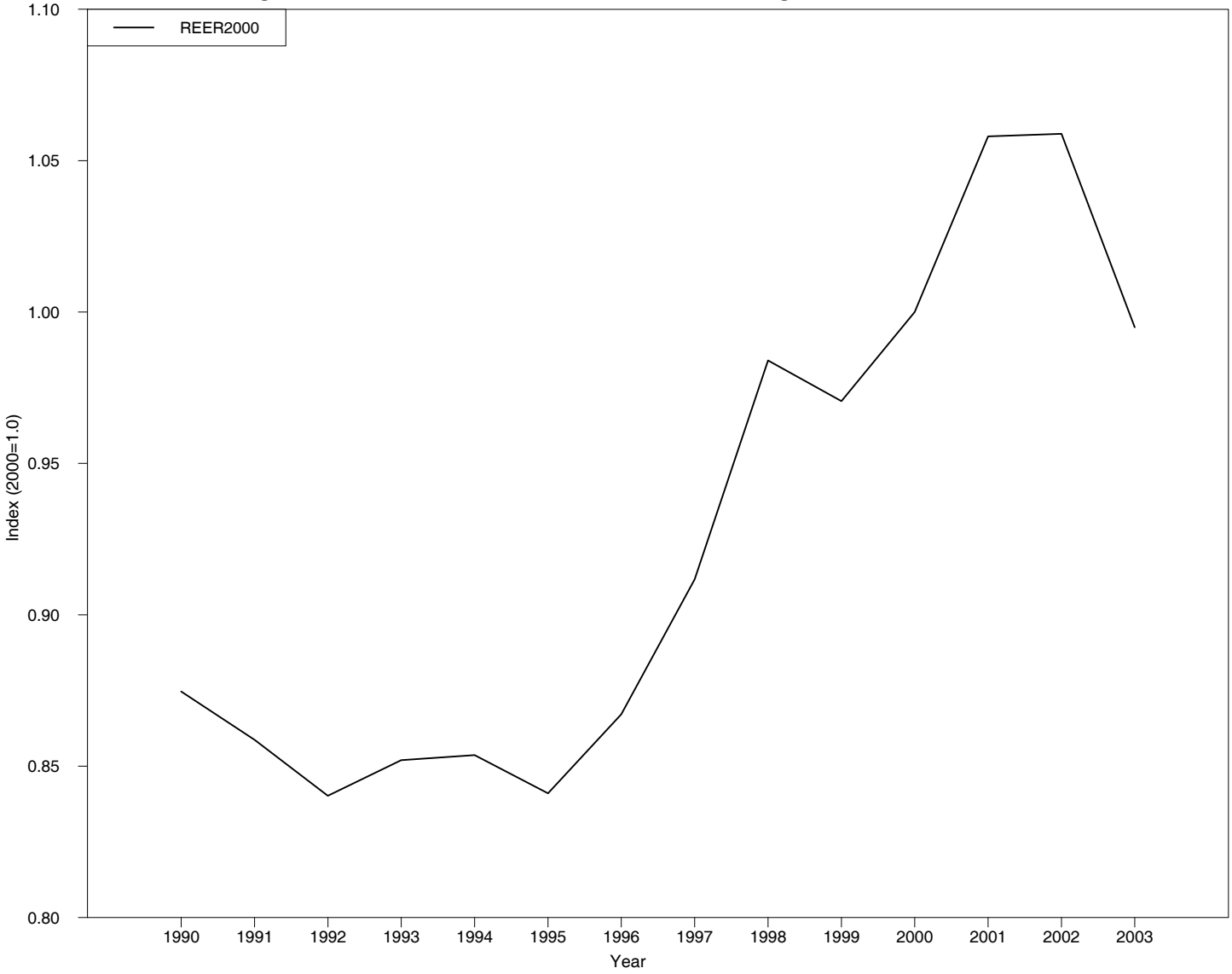


Figure 1. U.S. Exports and Imports as Ratios of GDP, 1990-2003