



# CHAPTER 5

## The Standard Trade Model

Previous chapters developed two different models of international trade, each of which makes different assumptions about the determinants of production possibilities. To bring out important points, each of these models leaves out aspects of reality that the others stress. These models are:

- *The Ricardian model.* Production possibilities are determined by the allocation of a single resource, labor, between sectors. This model conveys the essential idea of comparative advantage but does not allow us to talk about the distribution of income.
- *The Heckscher-Ohlin model.* There are multiple factors of production, so that differences in resources can drive trade patterns, and trade can affect the distribution of income.

When we analyze real problems, we want to base our insights on a mixture of the models. For example, in the 1990s one of the central changes in world trade was the rapid growth in exports from newly industrializing economies. These countries experienced rapid productivity growth; to discuss the implications of this productivity growth we may want to apply the Ricardian model of Chapter 3. The changing pattern of trade has differential effects on different groups in the United States; to understand the effects of increased trade for U.S. income distribution, we may want to apply the Heckscher-Ohlin model of Chapter 4.

In spite of the differences in their details, our models share a number of features:

1. The productive capacity of an economy can be summarized by its production possibility frontier, and differences in these frontiers give rise to trade.
2. Production possibilities determine a country's relative supply schedule.
3. World equilibrium is determined by world relative demand and a *world* relative supply schedule that lies between the national relative supply schedules.

Because of these common features, the models we have studied may be viewed as special cases of a more general model of a trading world economy. There are many important issues in international economics whose analysis can be conducted in terms of this general model, with only the details depending on which special model you choose. These issues include the effects of shifts in world supply resulting from economic growth; shifts in world demand resulting from foreign aid, war reparations, and other international transfers of income; and simultaneous shifts in supply and demand resulting from tariffs and export subsidies.

This chapter stresses those insights from international trade theory that are not strongly dependent on the details of the economy's supply side. We develop a standard model of a trading world economy of which the models of Chapters 3 and 4 can be regarded as special cases and use this model to ask how a variety of changes in underlying parameters affect the world economy.

### Learning Goals

After reading this chapter, you will be able to:

- Understand how the components of the standard trade model, production possibilities frontiers, isovalue lines, and indifference curves fit together to illustrate how trade patterns are established by a combination of supply-side and demand-side factors.
- Recognize how changes in the terms of trade, economic growth, and transfers between nations affect the welfare of nations engaged in international trade.
- Understand the effects of tariffs and subsidies on trade patterns and the welfare of trading nations and on the distribution of income within countries.

## A Standard Model of a Trading Economy

The **standard trade model** is built on four key relationships: (1) the relationship between the production possibility frontier and the relative supply curve; (2) the relationship between relative prices and relative demand; (3) the determination of world equilibrium by world relative supply and world relative demand; and (4) the effect of the **terms of trade**—the price of a country's exports divided by the price of its imports—on a nation's welfare.

### Production Possibilities and Relative Supply

For the purposes of our standard model, we assume that each country produces two goods, food ( $F$ ) and cloth ( $C$ ), and that each country's production possibility frontier is a smooth curve like that illustrated by  $TT$  in Figure 5-1.<sup>1</sup>

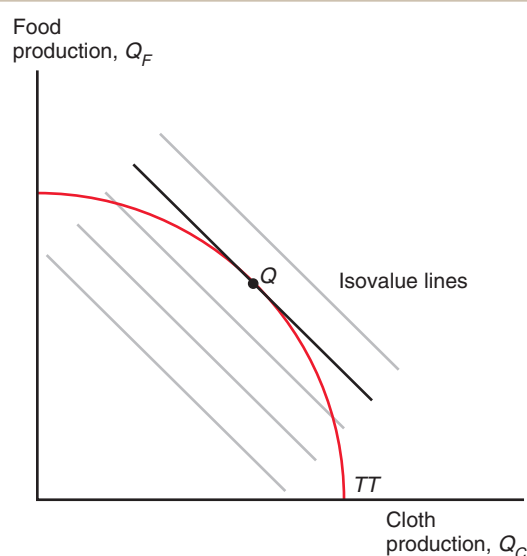
The point on its production possibility frontier at which an economy actually produces depends on the price of cloth relative to food,  $P_C/P_F$ . It is a basic proposition of microeconomics that a market economy that is not distorted by monopoly or other market failures is efficient in production, that is, maximizes the value of output at given market prices,  $P_CQ_C + P_FQ_F$ .

We can indicate the market value of output by drawing a number of **isovalue lines**—that is, lines along which the value of output is constant. Each of these lines is defined by an equation of the form  $P_CQ_C + P_FQ_F = V$ , or by rearranging,  $Q_F = V/P_F - (P_C/P_F)Q_C$ , where  $V$  is the value of output. The higher  $V$  is, the farther out an isovalue line lies; thus isovalue lines farther from the origin correspond to higher values of output. The slope of an isovalue line is minus the relative price of cloth. The economy will produce the highest value of output it can, which can be achieved by producing at point  $Q$ , where  $TT$  is just tangent to an isovalue line.

<sup>1</sup>We have seen that when there is only one factor of production, as in Chapter 3, the production possibility frontier is a straight line. For most models, however, it will be a smooth curve, and the Ricardian result can be viewed as an extreme case.

**Figure 5-1****Relative Prices Determine the Economy's Output**

An economy whose production possibility frontier is  $TT$  will produce at  $Q$ , which is on the highest possible iso-value line.



Now suppose that  $P_C/P_F$  were to rise. Then the iso-value lines would be steeper than before. In Figure 5-2 the highest iso-value line the economy could reach before the change in  $P_C/P_F$  is shown as  $VV^1$ ; the highest line after the price change is  $VV^2$ , the point at which the economy produces shifts from  $Q^1$  to  $Q^2$ . Thus, as we might expect, a rise in the relative price of cloth leads the economy to produce more cloth and less food. The relative supply of cloth will therefore rise when the relative price of cloth rises.

**Relative Prices and Demand**

Figure 5-3 shows the relationship among production, consumption, and trade in the standard model. As we pointed out in Chapter 4, the value of an economy's consumption equals the value of its production:

$$P_C Q_C + P_F Q_F = P_C D_C + P_F D_F = V,$$

where  $D_C$  and  $D_F$  are the consumption of cloth and food, respectively. The equation above says that production and consumption must lie on the same iso-value line.

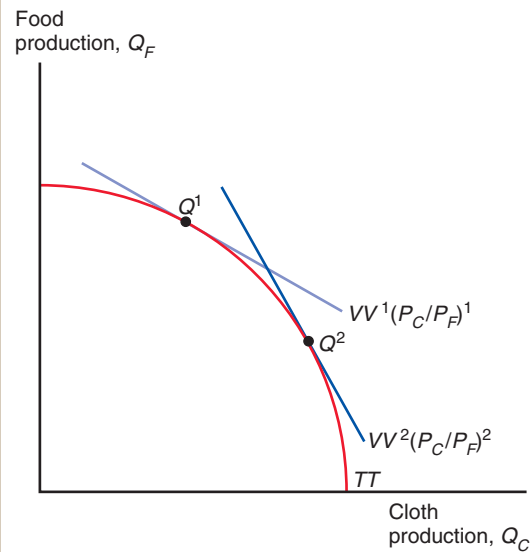
The economy's choice of a point on the iso-value line depends on the tastes of its consumers. For our standard model, we make the useful simplifying assumption that the economy's consumption decisions may be represented as if they were based on the tastes of a single representative individual.<sup>2</sup>

The tastes of an individual can be represented graphically by a series of **indifference curves**. An indifference curve traces a set of combinations of cloth ( $C$ ) and food ( $F$ )

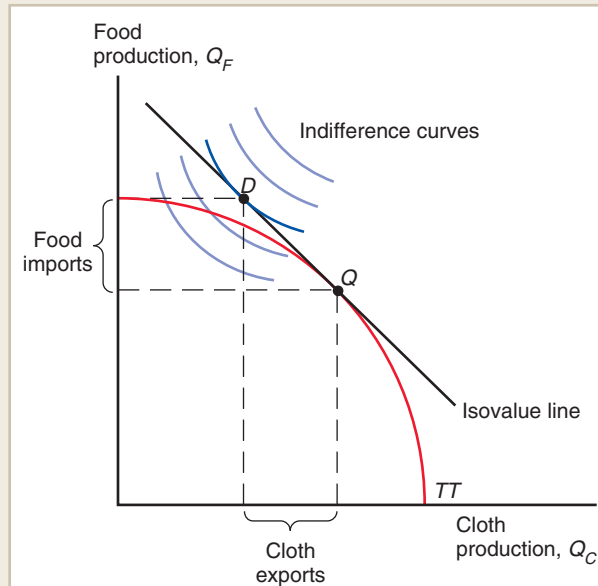
<sup>2</sup>There are several sets of circumstances that can justify this assumption. One is that all individuals have the same tastes and the same share of all resources. Another is that the government redistributes income so as to maximize its view of overall social welfare. Essentially, the assumption requires that effects of changing income distribution on demand not be too important.

**Figure 5-2****How an Increase in the Relative Price of Cloth Affects Relative Supply**

The isovalue lines become steeper when the relative price of cloth rises from  $(P_C/P_F)^1$  to  $(P_C/P_F)^2$  (shown by the rotation from  $VV^1$  to  $VV^2$ ). As a result, the economy produces more cloth and less food and the equilibrium output shifts from  $Q^1$  to  $Q^2$ .

**Figure 5-3****Production, Consumption, and Trade in the Standard Model**

The economy produces at point  $Q$ , where the production possibility frontier is tangent to the highest possible isovalue line. It consumes at point  $D$ , where that isovalue line is tangent to the highest possible indifference curve. The economy produces more cloth than it consumes and therefore exports cloth; correspondingly, it consumes more food than it produces and therefore imports food.



consumption that leave the individual equally well off. Indifference curves have three properties:

1. They are downward sloping: If an individual is offered less  $F$ , then to be made equally well off she must be given more  $C$ .
2. The farther up and to the right an indifference curve lies, the higher the level of welfare to which it corresponds: An individual will prefer more of both goods to less.

3. Each indifference curve gets flatter as we move to the right: The more  $C$  and the less  $F$  an individual consumes, the more valuable a unit of  $F$  is at the margin compared with a unit of  $C$ , so more  $C$  will have to be provided to compensate for any further reduction in  $F$ .

In Figure 5-3 we show a set of indifference curves for the economy that have these three properties. The economy will choose to consume at the point on the iso-value line that yields the highest possible welfare. This point is where the iso-value line is tangent to the highest reachable indifference curve, shown here as point  $D$ . Notice that at this point the economy exports cloth (the quantity of cloth produced exceeds the quantity of cloth consumed) and imports food. (If this is not obvious, refer back to our discussion of the pattern of trade in Chapter 4.)

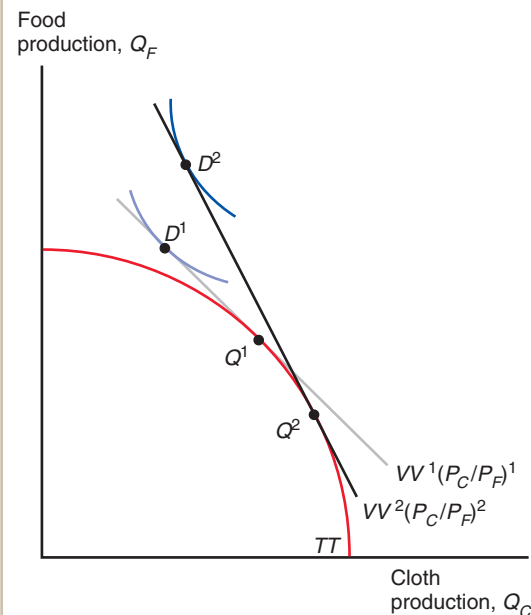
Now consider what happens when  $P_C/P_F$  is increased. In Figure 5-4 we show the effects. First, the economy produces more  $C$  and less  $F$ , shifting production from  $Q^1$  to  $Q^2$ . This shifts the iso-value line on which consumption must lie, from  $VV^1$  to  $VV^2$ . The economy's consumption choice therefore also shifts, from  $D^1$  to  $D^2$ .

The move from  $D^1$  to  $D^2$  reflects two effects of the rise in  $P_C/P_F$ . First, the economy has moved to a higher indifference curve: It is better off. The reason is that this economy is an exporter of cloth. When the relative price of cloth rises, the economy can afford to import more food for any given volume of exports. Thus the higher relative price of its export good represents an advantage. Second, the change in relative prices leads to a shift along the indifference curve, toward food and away from cloth.

These two effects are familiar from basic economic theory. The rise in welfare is an *income effect*; the shift in consumption at any given level of welfare is a *substitution effect*. The income effect tends to increase consumption of both goods, while the substitution effect acts to make the economy consume less  $C$  and more  $F$ .

**Figure 5-4**  
Effects of a Rise in the Relative Price of Cloth

The slope of the iso-value lines is equal to minus the relative price of cloth  $P_C/P_F$ , so when that relative price rises all iso-value lines become steeper. In particular, the maximum-value line rotates from  $VV^1$  to  $VV^2$ . Production shifts from  $Q^1$  to  $Q^2$ , consumption shifts from  $D^1$  to  $D^2$ .



It is possible in principle that the income effect will be so strong that when  $P_C/P_F$  rises, consumption of both goods actually rises. Normally, however, the ratio of  $C$  consumption to  $F$  consumption will fall, that is, *relative* demand for  $C$  will decline. This is the case shown in the figure.

### The Welfare Effect of Changes in the Terms of Trade

When  $P_C/P_F$  increases, a country that initially exports cloth is made better off, as illustrated by the movement from  $D^1$  to  $D^2$  in Figure 5-4. Conversely, if  $P_C/P_F$  were to decline, the country would be made worse off; for example, consumption might move back from  $D^2$  to  $D^1$ .

If the country were initially an exporter of food instead of cloth, the direction of this effect would of course be reversed. An increase in  $P_C/P_F$  would mean a fall in  $P_F/P_C$ , and the country would be worse off; a fall in  $P_C/P_F$  would make it better off.

We cover all cases by defining the terms of trade as the price of the good a country initially exports divided by the price of the good it initially imports. The general statement, then, is that *a rise in the terms of trade increases a country's welfare, while a decline in the terms of trade reduces its welfare.*

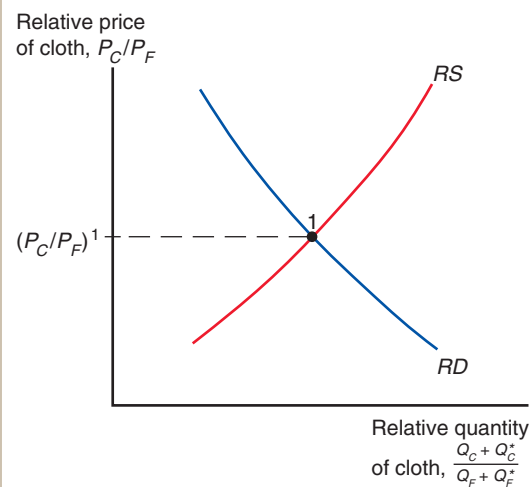
### Determining Relative Prices

Let's now suppose that the world economy consists of two countries, once again named Home (which exports cloth) and Foreign (which exports food). Home's terms of trade are measured by  $P_C/P_F$ , while Foreign's are measured by  $P_F/P_C$ .  $Q_C$  and  $Q_F$  are the quantities of cloth and food produced by Home;  $Q_C^*$  and  $Q_F^*$  are the quantities produced by Foreign.

To determine  $P_C/P_F$  we find the intersection of world relative supply of cloth and world relative demand. The world relative supply curve ( $RS$  in Figure 5-5) is upward sloping because an increase in  $P_C/P_F$  leads both countries to produce more cloth and less food. The world relative demand curve ( $RD$ ) is downward sloping because an

**Figure 5-5**  
**World Relative Supply and Demand**

The higher  $P_C/P_F$  is, the larger the world supply of cloth relative to food ( $RS$ ) and the lower the world demand for cloth relative to food ( $RD$ ). Equilibrium relative price (here,  $(P_C/P_F)^1$ ) is determined by the intersection of the world relative supply and demand curves.



increase in  $P_C/P_F$  leads both countries to shift their consumption mix away from cloth toward food. The intersection of the curves (point 1) determines the equilibrium relative price ( $P_C/P_F$ )<sup>1</sup>.

Now that we know how relative supply, relative demand, the terms of trade, and welfare are determined in the standard model, we can use it to understand a number of important issues in international economics.

### Economic Growth: A Shift of the RS Curve

The effects of economic growth in a trading world economy are a perennial source of concern and controversy. The debate revolves around two questions. First, is economic growth in other countries good or bad for our nation? Second, is growth in a country more or less valuable when that nation is part of a closely integrated world economy?

In assessing the effects of growth in other countries, commonsense arguments can be made on either side. On one side, economic growth in the rest of the world may be good for our economy because it means larger markets for our exports. On the other side, growth in other countries may mean increased competition for our exporters.

Similar ambiguities seem present when we look at the effects of growth at home. On one hand, growth in an economy's production capacity should be more valuable when that country can sell some of its increased production to the world market. On the other hand, the benefits of growth may be passed on to foreigners in the form of lower prices for the country's exports rather than retained at home.

The standard model of trade developed in the last section provides a framework that can cut through these seeming contradictions and clarify the effects of economic growth in a trading world.

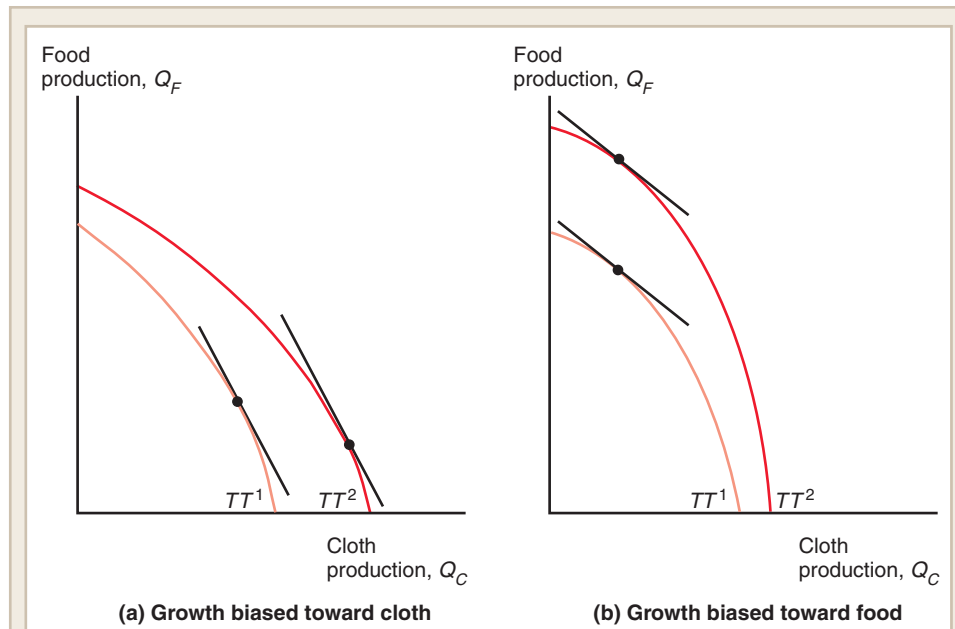
### Growth and the Production Possibility Frontier

Economic growth means an outward shift of a country's production possibility frontier. This growth can result either from increases in a country's resources or from improvements in the efficiency with which these resources are used.

The international trade effects of growth result from the fact that such growth typically has a *bias*. **Biased growth** takes place when the production possibility frontier shifts out more in one direction than in the other. Figure 5-6a illustrates growth biased toward cloth, and Figure 5-6b shows growth biased toward food. In each case the production possibility frontier shifts from  $TT^1$  to  $TT^2$ .

Growth may be biased for two main reasons:

1. The Ricardian model of Chapter 3 shows that technological progress in one sector of the economy will expand the economy's production possibilities more in the direction of that sector's output than in the direction of the other sector's output.
2. The factor proportions model of Chapter 4 showed that an increase in a country's supply of a factor of production—say, an increase in the capital stock resulting from saving and investment—will produce biased expansion of production possibilities. The bias will be in the direction of either the good to which the factor is specific or the good whose production is intensive in the factor whose supply has increased. Thus the same considerations that give rise to international trade will also lead to biased growth in a trading economy.



**Figure 5-6**  
Biased Growth

Growth is biased when it shifts production possibilities out more toward one good than toward another. In both cases shown the production possibility frontier shifts out from  $TT^1$  to  $TT^2$ . In case (a) this shift is biased toward cloth, in case (b) toward food.

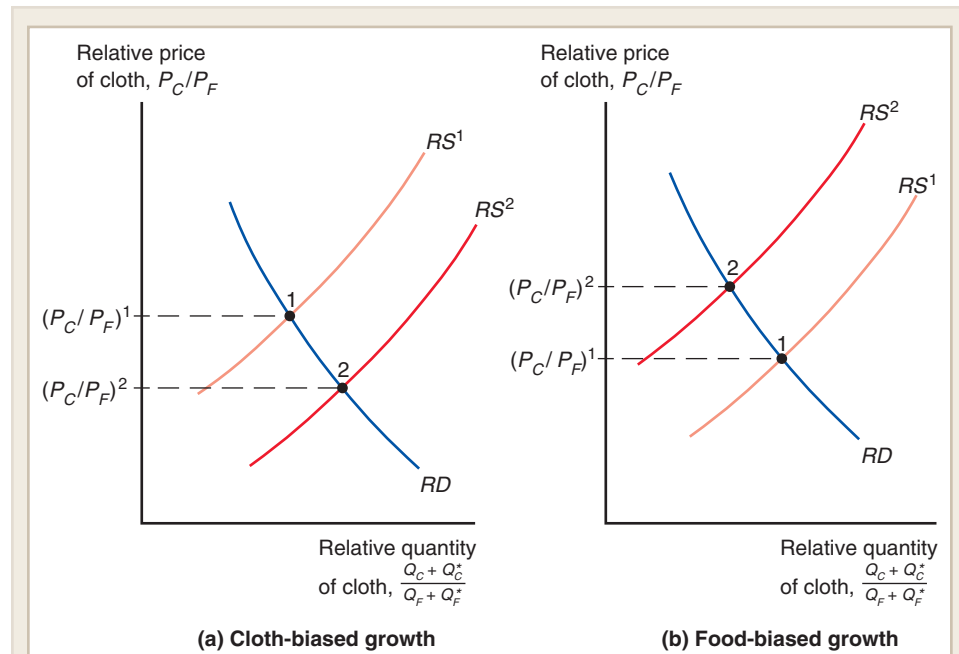
The biases of growth in Figure 5-6a and 5-6b are strong. In each case the economy is able to produce more of both goods, but at an unchanged relative price of cloth the output of food actually falls in Figure 5-6a, while the output of cloth actually falls in Figure 5-6b. Although growth is not always as strongly biased as it is in these examples, even growth that is more mildly biased toward cloth will lead, *for any given relative price of cloth*, to a rise in the output of cloth *relative* to that of food. The reverse is true for growth biased toward food.

### Relative Supply and the Terms of Trade

Suppose now that Home experiences growth strongly biased toward cloth, so that its output of cloth rises at any given relative price of cloth, while its output of food declines. Then for the world as a whole the output of cloth relative to food will rise at any given price and the world relative supply curve will shift to the right from  $RS^1$  to  $RS^2$  (Figure 5-7a). This shift results in a decrease in the relative price of cloth from  $(P_C/P_F)^1$  to  $(P_C/P_F)^2$ , a worsening of Home's terms of trade and an improvement in Foreign's terms of trade.

Notice that the important consideration here is not which economy grows but the bias of the growth. If Foreign had experienced growth biased toward cloth, the effect on the relative supply curve and thus on the terms of trade would have been the same. On the other hand, either Home or Foreign growth biased toward food (Figure 5-7b) leads to a *leftward*



**Figure 5-7****Growth and Relative Supply**

Growth biased toward cloth shifts the  $RS$  curve to the right (a), while growth biased toward food shifts it to the left (b).

shift of the  $RS$  curve ( $RS^1$  to  $RS^2$ ) and thus to a rise in the relative price of cloth from  $(P_C/P_F)^1$  to  $(P_C/P_F)^2$ . This increase is an improvement in Home's terms of trade, a worsening of Foreign's.

Growth that disproportionately expands a country's production possibilities in the direction of the good it exports (cloth in Home, food in Foreign) is **export-biased growth**. Similarly, growth biased toward the good a country imports is **import-biased growth**. Our analysis leads to the following general principle: *Export-biased growth tends to worsen a growing country's terms of trade, to the benefit of the rest of the world; import-biased growth tends to improve a growing country's terms of trade at the rest of the world's expense.*

**International Effects of Growth**

Using this principle, we are now in a position to resolve our questions about the international effects of growth. Is growth in the rest of the world good or bad for our country? Does the fact that our country is part of a trading world economy increase or decrease the benefits of growth? In each case the answer depends on the *bias* of the growth. Export-biased growth in the rest of the world is good for us, improving our terms of trade, while import-biased growth abroad worsens our terms of trade. Export-biased growth in our own country worsens our terms of trade, reducing the direct benefits of growth, while import-biased growth leads to an improvement of our terms of trade, a secondary benefit.

During the 1950s, many economists from poorer countries believed that their nations, which primarily exported raw materials, were likely to experience steadily declining terms of trade over time. They believed that growth in the industrial world would be marked by an increasing development of synthetic substitutes for raw materials, while growth in the poorer nations would take the form of a further extension of their capacity to produce what they were already exporting rather than a move toward industrialization. That is, the growth in the industrial world would be import biased, while that in the less-developed world would be export biased.

Some analysts suggested that growth in the poorer nations would actually be self-defeating. They argued that export-biased growth by poor nations would worsen their terms of trade so much that they would be worse off than if they had not grown at all. This situation is known to economists as the case of **immiserizing growth**.

In a famous paper published in 1958, economist Jagdish Bhagwati of Columbia University showed that such perverse effects of growth can in fact arise within a rigorously specified economic model.<sup>3</sup> The conditions under which immiserizing growth can occur are, however, extreme: Strongly export-biased growth must be combined with very steep *RS* and *RD* curves, so that the change in the terms of trade is large enough to offset the initial favorable effects of an increase in a country's productive capacity. Most economists now regard the concept of immiserizing growth as more a theoretical point than a real-world issue.

While growth at home normally raises our own welfare even in a trading world, however, this is by no means true of growth abroad. Import-biased growth is not an unlikely possibility, and whenever the rest of the world experiences such growth, it worsens our terms of trade. Indeed, as we point out below, it is possible that the United States has suffered some loss of real income because of foreign growth over the postwar period.

## Case Study

### Has the Growth of Newly Industrializing Countries Hurt Advanced Nations?

In the early 1990s, many observers began warning that the growth of newly industrializing economies poses a threat to the prosperity of advanced nations. In the case study in Chapter 4 on North-South trade we addressed one way in which that growth might prove a problem: It might aggravate the growing gap in incomes between high-skilled and low-skilled workers in advanced nations. Some alarmists, however, believed that the threat was still broader—that the overall real income of advanced nations, as opposed to its distribution, had been or would be reduced by the appearance of new competitors. For example, a 1993 report released by the European Commission (the administrative arm of the European Union), in listing reasons for Europe's economic difficulties, emphasized the fact that “other countries are becoming industrialized and competing with us—even in our own markets—at cost levels which we simply cannot match.” Another report by an influential private organization went even further, arguing that the rising productivity of low-wage countries would

<sup>3</sup>“Immiserizing Growth: A Geometrical Note,” *Review of Economic Studies* 25 (June 1958), pp. 201–205.

put immense pressure on high-wage nations, to such an extent that “the *raison d’être* of many countries is at stake.”<sup>4</sup>

These concerns appeared to gain some intellectual support from a 2004 paper by Paul Samuelson, who created much of the modern theory of international trade. In that paper Samuelson, using a Ricardian model, offered an example of how technological progress in developing countries can hurt advanced countries.<sup>5</sup> His analysis was simply a special case of the analysis we have just described: Growth in the rest of the world can hurt you if it takes place in sectors that compete with your exports. Samuelson took this to its logical conclusion: If China becomes sufficiently good at producing goods it currently imports, comparative advantage disappears—and the United States loses the gains from trade.

The popular press seized on this result, treating it as if it were somehow revolutionary. “The central question Samuelson and others raise is whether unfettered trade is always still as good for the U.S. as they have long believed,” wrote *Business Week*, which went on to suggest that such results might “completely derail comparative advantage theory.”<sup>6</sup>

But the proposition that growth abroad can hurt your economy isn’t a new idea, and it says nothing about whether free trade is better than protection. Also, it’s an empirical question whether the growth of newly industrializing countries such as China has actually hurt advanced countries. And the facts don’t support the claim.

Bear in mind that the channel through which growth abroad can hurt a country is via the terms of trade. So if the claim that competition from newly industrializing countries hurts advanced economies were true, we should see large negative numbers for the terms of trade of advanced countries and large positive numbers for the terms of trade of the new competitors. In the Mathematical Postscript to this chapter, we show that the percentage real income effect of a change in the terms of trade is approximately equal to the percent change in the terms of trade, multiplied by the share of imports in income. Since advanced countries on average spend about 25 percent of their income on imports, a 1 percent decline in the terms of trade would reduce real income by only about 0.25 percent. So the terms of trade would have to decline by several percent a year to be a noticeable drag on economic growth.

Table 5-1 shows that the terms of trade of advanced countries actually improved from 1986 to 1995 and then declined only slightly thereafter. Meanwhile, the terms of trade of developing Asia—a group dominated by China—actually worsened steadily.

**TABLE 5-1** Average Annual Percent Changes in Terms of Trade

	1986–1995	1996–2005
Advanced economies	0.8	–0.1
Developing Asia	–0.4	–1.1

<sup>4</sup>Commission of the European Communities, *Growth, Competitiveness, Employment*, Brussels 1993; World Economic Forum, *World Competitiveness Report 1994*.

<sup>5</sup>Paul Samuelson, “Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization,” *Journal of Economic Perspectives*, Summer 2004.

<sup>6</sup>“Shaking up Trade Theory,” *Business Week*, December 6, 2004.

One final point: In Samuelson's example, Chinese technological progress makes the United States worse off by eliminating trade between the two countries! Since what we actually see is rapidly growing China–U.S. trade, it's hard to find much of a relationship between the model and today's reality.

## International Transfers of Income: Shifting the *RD* Curve

We now turn from terms of trade changes originating on the supply side of the world economy to changes that originate on the demand side.

Relative world demand for goods may shift for many reasons. Tastes may change: With rising concern over cholesterol, demand for fish has risen relative to the demand for red meat. Technology may also change demand: Whale oil fueled lamps at one time but was supplanted by kerosene, later by gas, and finally by electricity. In international economics, however, perhaps the most important and controversial issue is the shift in world relative demand that can result from international **transfers of income**.

In the past, transfers of income between nations often occurred in the aftermath of wars. Germany demanded a payment from France after the latter's defeat in the Franco-Prussian war of 1871; after World War I the victorious Allies demanded large reparations payments from Germany (mostly never paid). After World War II, the United States provided aid to defeated Japan and Germany as well as to its wartime allies to help them rebuild. Since the 1950s, advanced countries have provided aid to poorer nations, although the sums have made a major contribution to the income of only a few of the very poorest countries.

International loans are not strictly transfers of income, since the current transfer of spending power that a loan implies comes with an obligation to repay later. In the short run, however, the economic effects of a sum of money given outright to a nation and the same sum lent to that nation are similar. Thus an analysis of international income transfers is also useful in understanding the effects of international loans.

### The Transfer Problem

The issue of how international transfers affect the terms of trade was raised in a famous debate between two great economists, Bertil Ohlin (one of the originators of the factor-proportions theory of trade) and John Maynard Keynes. The subject of the debate was the reparations payments demanded of Germany after World War I, and the question was how much of a burden these payments represented to the German economy.<sup>7</sup>

Keynes, who made a forceful case that the vengeful terms of the Allies (the “Carthaginian peace”) were too harsh, argued that the monetary sums being demanded were an understatement of the true burden on Germany. He pointed out that to pay money to other countries Germany would have to export more and import less. To do this, he argued, Germany would have to make its exports cheaper relative to its imports. The resulting worsening of Germany's terms of trade would add an excess burden to the direct burden of the payment.

Ohlin questioned whether Keynes was right in assuming that Germany's terms of trade would worsen. He counterargued that when Germany raised taxes to finance its reparations,

<sup>7</sup>See Keynes, “The German Transfer Problem” and Ohlin, “The German Transfer Problem: A Discussion,” both in *Economic Journal* 39 (1929), pp. 1–7 and pp. 172–182, respectively.

its demand for foreign goods would automatically decrease. At the same time, the reparation payment would be distributed in other countries in the form of reduced taxes or increased government spending, and some of the resulting increased foreign demand would be for German exports. Thus Germany might be able to reduce imports and increase exports without having its terms of trade worsen.

In the particular case in dispute the debate turned out to be beside the point: In the end, Germany paid very little of its reparations. The issue of the terms of trade effects of a transfer, however, arises in a surprisingly wide variety of contexts in international economics.

### Effects of a Transfer on the Terms of Trade

If Home makes a transfer of some of its income to Foreign, Home's income is reduced, and it must reduce its expenditure. Correspondingly, Foreign increases its expenditure. This shift in the national division of world spending may lead to a shift in world relative demand and thus affect the terms of trade.

The shift in the  $RD$  curve (if it occurs) is the only effect of a transfer of income. The  $RS$  curve does not shift. As long as only income is being transferred, and not physical resources like capital equipment, the production of cloth and food for any given relative price will not change in either country. Thus the transfer problem is a purely demand-side issue.

The  $RD$  curve does not necessarily shift when world income is redistributed, however (this was Ohlin's point). If Foreign allocates its extra income between cloth and food in the same proportions that Home reduces its spending, then *world* spending on cloth and food will not change. The  $RD$  curve will not shift, and there will be no terms of trade effect.

If the two countries do not allocate their change in spending in the same proportions, however, there will be a terms of trade effect; the direction of the effect will depend on the difference in Home and Foreign spending patterns. Suppose that Home allocates a higher proportion of a marginal shift in expenditure to cloth than Foreign does. That is, Home has a higher **marginal propensity to spend** on cloth than Foreign. (Correspondingly, Home in this case must have a lower marginal propensity to spend on food.) Then at any given relative price Home's transfer payment to Foreign reduces demand for cloth and increases demand for food. In this case the  $RD$  curve shifts to the left, from  $RD^1$  to  $RD^2$  (Figure 5-8) and equilibrium shifts from point 1 to point 2. This shift lowers the relative price of cloth from  $(P_C/P_F)^1$  to  $(P_C/P_F)^2$ , worsening Home's terms of trade (because it exports cloth) while improving Foreign's. This is the case that Keynes described: The indirect effect of an international transfer on terms of trade reinforces its original effect on the incomes of the two countries.

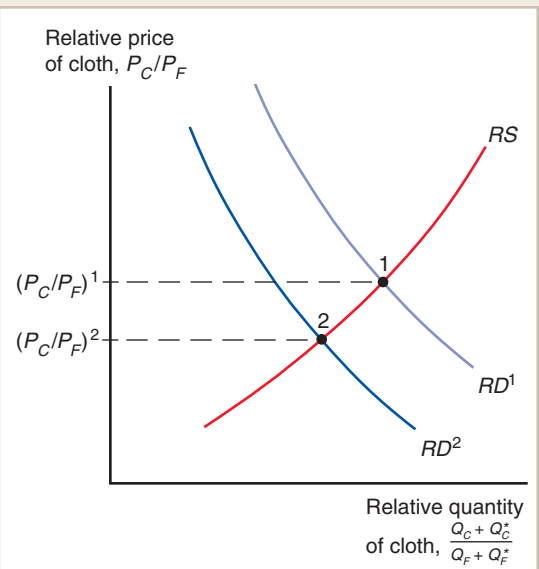
There is, however, another possibility. If Home has a *lower* marginal propensity to spend on cloth, a transfer by Home to Foreign shifts the  $RD$  curve right, and improves Home's terms of trade at Foreign's expense. This effect offsets both the negative effect on Home's income and the positive effect on Foreign's income.

In general, then, *a transfer worsens the donor's terms of trade if the donor has a higher marginal propensity to spend on its export good than the recipient*. If the donor has a *lower* marginal propensity to spend on its export, its terms of trade will actually improve.

A paradoxical possibility is implied by this analysis. A transfer payment—say foreign aid—could conceivably improve the donor's terms of trade so much that it leaves the donor better off and the recipient worse off. In this case it is definitely better to give than to receive! Some theoretical work has shown that this paradox, like the case of immiserizing growth, is possible in a rigorously specified model. The conditions are, however, even

**Figure 5-8****Effects of a Transfer on the Terms of Trade**

If Home has a higher marginal propensity to spend on cloth than Foreign, a transfer of income by Home to Foreign shifts the  $RD$  curve left from  $RD^1$  to  $RD^2$ , reducing the equilibrium relative price of cloth.



more stringent than those for immiserizing growth, and this possibility is almost surely purely theoretical.<sup>8</sup>

This analysis shows that the terms of trade effects of reparations and foreign aid can go either way. Thus Ohlin was right about the general principle. Many would still argue, however, that Keynes was right in suggesting that there is a presumption that transfers cause terms of trade effects that reinforce their effects on the incomes of donors and recipients.

### Presumptions About the Terms of Trade Effects of Transfers

A transfer will worsen the donor's terms of trade if the donor has a higher marginal propensity to spend on its export good than the recipient. If differences in marginal propensities to spend were simply a matter of differences in taste, there would be no presumption either way: Which good a country exports depends for the most part on differences in technology or resources, which need have nothing to do with tastes. When we look at actual spending patterns, however, each country seems to have a relative preference for its own goods. The United States, for example, produces only about 25 percent of the value of output of the world's market economies, so that total sales of U.S. goods are 25 percent of world sales. If spending patterns were the same everywhere, the United States would spend only 25 percent of its income on U.S. products. In fact, imports are only 15 percent of national income; that is, the United States spends 85 percent of its income domestically. On the other hand, the rest of the world only spends about 9 percent of its income on U.S. products. This difference in spending patterns certainly suggests that if the United States were to transfer some of its income to foreigners, the relative demand for U.S. goods would fall and the U.S. terms of trade would decline, just as Keynes argued.

<sup>8</sup>For examples of how an immiserizing transfer might occur, see Graciela Chichilnisky, "Basic Goods, the Effects of Commodity Transfers and the International Economic Order," *Journal of Development Economics* 7 (1980), pp. 505–519; and Jagdish Bhagwati, Richard Brecher, and Talsuo Hatta, "The Generalized Theory of Transfers and Welfare," *American Economic Review* 73 (1983), pp. 606–618.

The United States spends so much of its income at home because of barriers to trade, both natural and artificial. Transportation costs, tariffs (taxes on imports), and import quotas (government regulations that limit the quantity of imports) cause residents of each country to buy a variety of goods and services at home rather than import them from abroad. As we noted in Chapter 3, the effect of such barriers to trade is to create a set of nontraded goods. Even if every country divides its income among different goods in the same proportions, local purchase of nontraded goods will ensure that spending has a national bias.

Consider the following example. Suppose that there are not two but *three* goods: cloth, food, and haircuts. Only Home produces cloth; only Foreign produces food. Haircuts, however, are a nontraded good that each country produces for itself. Each country spends one-third of its income on each good. Even though these countries have the same tastes, each of them spends two-thirds of its income domestically and only one-third on imports.

Nontraded goods can give rise to what looks like a national preference for all goods produced domestically. But to analyze the effects of a transfer on the terms of trade we need to know what happens to the supply and demand for *exports*. Here the crucial point is that a country's nontraded goods compete with exports for resources. A transfer of income from the United States to the rest of the world lowers the demand for nontraded goods in the United States, releasing resources that can be used to produce U.S. exports. As a result, the supply of U.S. exports rises. At the same time, the transfer of income from the United States to the rest of the world increases the rest of the world's demand for nontraded goods because some of that income is spent on haircuts and other nontradables. The increase in the demand for nontraded goods in the rest of the world draws foreign resources away from exports and reduces the supply of foreign exports (which are U.S. imports). The result is that a transfer by the United States to other countries may lower the price of U.S. exports relative to foreign, worsening U.S. terms of trade.

Demand shifts also cause resources to move between the nontraded and import-competing sectors. As a practical matter, however, most international economists believe that the effect of barriers to trade *is* to validate the presumption that an international transfer of income worsens the donor's terms of trade. Thus, Keynes was right in practice.

## Case Study

### The Transfer Problem and the Asian Crisis



In 1997 to 1998, several Asian nations—including Thailand, Indonesia, Malaysia, and South Korea—experienced a sudden reversal of international capital flows. During the preceding few years, these nations, as the favorites of international investors, had attracted large inflows of money, allowing them to import considerably more than they exported. But confidence in these economies collapsed in 1997; foreign banks that had been lending heavily to Asian companies now demanded that the loans be repaid, stock market investors began selling off their holdings, and many domestic residents also began shifting funds overseas.

We discuss the causes of this crisis, and the disputes that have raged over its management, in Chapter 22. For now we simply note that whatever the reasons investors first blew hot, then cold, on Asian economies, in effect these economies went quickly from receiving large *inward* transfers to making large *outward* transfers. If Keynes's presumption about the effects of transfers were right, this

reversal of fortune should have produced a noticeable deterioration of Asian terms of trade, exacerbating what was already a severe economic blow.

In fact, some observers worried that with so many countries in crisis at the same time and all trying to export more simultaneously, their terms of trade would drastically deteriorate, making the crisis that much worse.

As it turned out, however, the terms of trade of developing countries in Asia did not worsen nearly as much as feared. Export prices fell sharply: In 1998 developing countries in Asia exported the same volume of goods as they had in 1997, but the dollar value of their exports dropped 8 percent. However, import prices also fell.

What seems to have saved Asia from a severe transfer problem was that other things were happening at the same time. Oil prices fell sharply, benefitting all the crisis countries except Indonesia. Japan, the leading exporter to the region, also saw its export prices fall as the yen plunged against the U.S. dollar. So there probably was a transfer problem for Asia, but its effects were masked by other forces.

## Tariffs and Export Subsidies: Simultaneous Shifts in $RS$ and $RD$

**Import tariffs** (taxes levied on imports) and **export subsidies** (payments given to domestic producers who sell a good abroad) are not usually put in place to affect a country's terms of trade. These government interventions in trade usually take place for income distribution, for the promotion of industries thought to be crucial to the economy, or for balance of payments (these motivations are examined in Chapters 9, 10, and 11). Whatever the motive for tariffs and subsidies, however, they *do* have terms of trade effects that can be understood by using the standard trade model.

The distinctive feature of tariffs and export subsidies is that they create a difference between prices at which goods are traded on the world market and their prices within a country. The direct effect of a tariff is to make imported goods more expensive inside a country than they are outside. An export subsidy gives producers an incentive to export. It will therefore be more profitable to sell abroad than at home unless the price at home is higher, so such a subsidy raises the price of exported goods inside a country.

The price changes caused by tariffs and subsidies change both relative supply and relative demand. The result is a shift in the terms of trade of the country imposing the policy change and in the terms of trade of the rest of the world.

### Relative Demand and Supply Effects of a Tariff

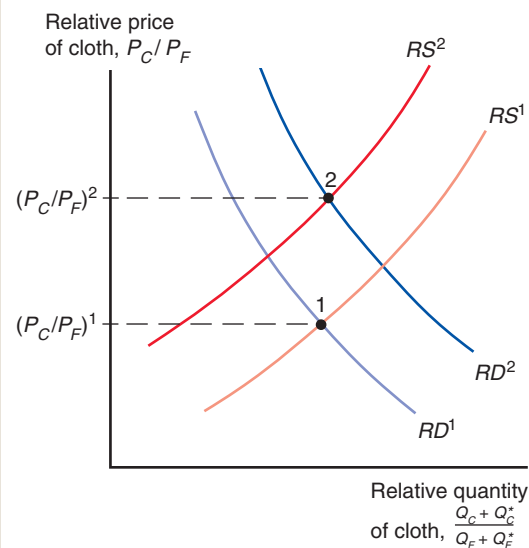
Tariffs and subsidies drive a wedge between the prices at which goods are traded internationally (**external prices**) and the prices at which they are traded within a country (**internal prices**). This means that we have to be careful in defining the terms of trade. The terms of trade are intended to measure the ratio at which countries exchange goods; for example, how many units of food can Home import for each unit of cloth that it exports? The terms of trade therefore correspond to external, not internal, prices. When analyzing the effects of a tariff or export subsidy, we want to know how it affects relative supply and demand *as a function of external prices*.

If Home imposes a 20 percent tariff on the value of food imports, the internal price of food relative to cloth faced by Home producers and consumers will be 20 percent higher than the



**Figure 5-9****Effects of a Tariff on the Terms of Trade**

An import tariff imposed by Home both reduces the relative supply of cloth (from  $RS^1$  to  $RS^2$ ) and increases the relative demand (from  $RD^1$  to  $RD^2$ ). As a result, the relative price of cloth must rise.



external relative price of food on the world market. Equivalently, the internal relative price of cloth on which Home residents base their decisions will be lower than the relative price on the external market.

At any given world relative price of cloth, then, Home producers will face a lower relative cloth price and therefore will produce less cloth and more food. At the same time, Home consumers will shift their consumption toward cloth and away from food. From the point of view of the world as a whole, the relative supply of cloth will fall (from  $RS^1$  to  $RS^2$  in Figure 5-9) while the relative demand for cloth will rise (from  $RD^1$  to  $RD^2$ ). Clearly, the world relative price of cloth rises from  $(P_C/P_F)^1$  to  $(P_C/P_F)^2$ , and thus Home's terms of trade improve at Foreign's expense.

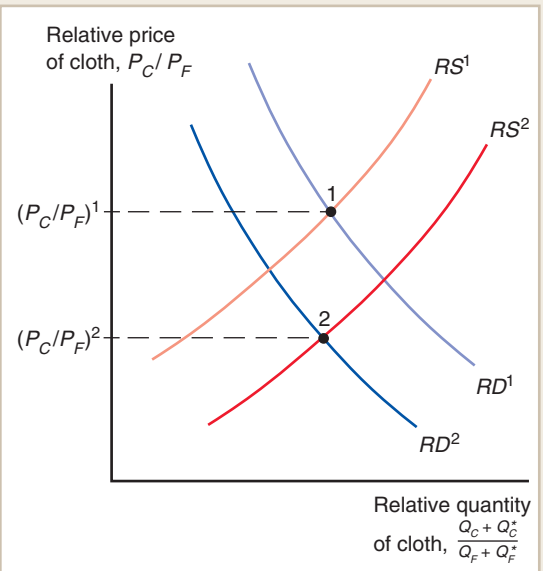
The extent of this terms of trade effect depends on how large the country imposing the tariff is relative to the rest of the world—if the country is only a small part of the world, it cannot have much effect on world relative supply and demand and therefore cannot have much effect on relative prices. If the United States, a very large country, were to impose a 20 percent tariff, some estimates suggest that the U.S. terms of trade might rise by 15 percent. That is, the price of U.S. imports relative to exports might fall by 15 percent on the world market, while the relative price of imports would rise only 5 percent inside the United States. On the other hand, if Luxembourg or Paraguay were to impose a 20 percent tariff, the terms of trade effect would probably be too small to measure.

**Effects of an Export Subsidy**

Tariffs and export subsidies are often treated as similar policies, since they both seem to support domestic producers, but they have opposite effects on the terms of trade. Suppose that Home offers a 20 percent subsidy on the value of any cloth exported. For any given world prices this subsidy will raise Home's internal price of cloth relative to food by 20 percent. The rise in the relative price of cloth will lead Home producers to produce more cloth and less food, while leading Home consumers to substitute food for cloth. As illustrated in Figure 5-10, the subsidy will increase the world relative supply of cloth (from  $RS^1$  to  $RS^2$ ) and decrease the world relative demand for cloth (from  $RD^1$  to  $RD^2$ ), shifting equilibrium from point 1 to point 2. A Home export subsidy worsens Home's terms of trade and improves Foreign's.

**Figure 5-10****Effects of a Subsidy on the Terms of Trade**

An export subsidy's effects are the reverse of those of a tariff. Relative supply of cloth rises, while relative demand falls. Home's terms of trade decline as the relative price of cloth falls from  $(P_C/P_F)^1$  to  $(P_C/P_F)^2$ .



### Implications of Terms of Trade Effects: Who Gains and Who Loses?

The question of who gains and who loses from tariffs and export subsidies has two dimensions. First is the issue of the *international* distribution of income; second is the issue of the distribution of income *within* each of the countries.

**The International Distribution of Income** If Home imposes a tariff, it improves its terms of trade at Foreign's expense. Thus tariffs hurt the rest of the world.

The effect on Home's welfare is not quite as clear-cut. The terms of trade improvement benefits Home; however, a tariff also imposes costs by distorting production and consumption incentives within Home's economy (see Chapter 8). The terms of trade gains will outweigh the losses from distortion only as long as the tariff is not too large: We will see later how to define an optimum tariff that maximizes net benefit. (For small countries that cannot have much impact on their terms of trade, the optimum tariff is near zero.)

The effects of an export subsidy are quite clear. Foreign's terms of trade improve at Home's expense, leaving it clearly better off. At the same time, Home loses from terms of trade deterioration *and* from the distorting effects of its policy.

This analysis seems to show that export subsidies never make sense. In fact, it is difficult to come up with any situation in which export subsidies would serve the national interest. The use of export subsidies as a policy tool usually has more to do with the peculiarities of trade politics than with economic logic.

Are foreign tariffs always bad for a country and foreign export subsidies always beneficial? Not necessarily. Our model is of a two-country world, where the other country exports the good we import and vice versa. In the real world of many countries, a foreign government may subsidize the export of a good that competes with U.S. exports; this foreign subsidy will obviously hurt the U.S. terms of trade. A good example of this effect is European subsidies to agricultural exports (see Chapter 8). Alternatively, a country may impose a tariff on something the United States also imports, lowering its price and benefiting the United States.

We thus need to qualify our conclusions from a two-country analysis: Subsidies to exports of things *the United States imports* help us, while tariffs *against U.S. exports* hurt us.

The view that subsidized foreign sales to the United States are good for us is not a popular one. When foreign governments are charged with subsidizing sales in the United States, the popular and political reaction is that this is unfair competition. Thus when a Commerce Department study determined that European governments were subsidizing exports of steel to the United States, our government demanded that they raise their prices. The standard model tells us that when foreign governments subsidize exports to the United States, the appropriate response from a national point of view should be to send them a note of thanks!

Of course this never happens, largely because of the effects of foreign subsidies on income distribution within the United States. If Europe subsidizes exports of steel to the United States, most U.S. residents gain from cheaper steel, but steelworkers, the owners of steel company stock, and industrial workers in general may not be so cheerful.

**The Distribution of Income Within Countries** Foreign tariffs or subsidies change the relative prices of goods. Such changes have strong effects on income distribution because of factor immobility and differences in the factor intensity of different industries.

At first glance, the direction of the effect of tariffs and export subsidies on relative prices, and therefore on income distribution, may seem obvious. A tariff has the direct effect of raising the internal relative price of the imported good, while an export subsidy has the direct effect of raising the internal relative price of the exported good. We have just seen, however, that tariffs and export subsidies have an indirect effect on a country's terms of trade. The terms of trade effect suggests a paradoxical possibility. A tariff might improve a country's terms of trade so much—that is, raise the relative price of its export good so much on world markets—that even after the tariff rate is added, the internal relative price of the import good *falls*. Similarly, an export subsidy might worsen the terms of trade so much that the internal relative price of the export good falls in spite of the subsidy. If these paradoxical results occur, the income distribution effects of trade policies will be just the opposite of what is expected.

The possibility that tariffs and export subsidies might have perverse effects on internal prices in a country was pointed out and demonstrated by University of Chicago economist Lloyd Metzler and is known as the **Metzler paradox**.<sup>9</sup> This paradox has roughly the same status as immiserizing growth and a transfer that makes the recipient worse off; that is, it is possible in theory but will happen only under extreme conditions and is not likely in practice.

Leaving aside the possibility of a Metzler paradox, then, a tariff will help the import-competing sector at home while hurting the exporting sector; an export subsidy will do the reverse. These shifts in the distribution of income *within* countries are often more obvious and more important to the formation of policy than the shifts in the distribution of income *between* countries that result from changes in the terms of trade.

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<sup>9</sup>See Metzler, "Tariffs, the Terms of Trade, and the Distribution of National Income," *Journal of Political Economy* 57 (February 1949), pp. 1–29.

## SUMMARY

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1. The standard trade model derives a world relative supply curve from production possibilities and a world relative demand curve from preferences. The price of exports relative to imports, a country's terms of trade, is determined by the intersection of the world relative supply and demand curves. Other things equal, a rise in a country's terms of trade increases its welfare. Conversely, a decline in a country's terms of trade will leave the country worse off.
2. Economic growth means an outward shift in a country's production possibility frontier. Such growth is usually biased; that is, the production possibility frontier shifts out more in the direction of some goods than in the direction of others. The immediate effect of biased growth is to lead, other things equal, to an increase in the world relative supply of the goods toward which the growth is biased. This shift in the world relative supply curve in turn leads to a change in the growing country's terms of trade, which can go in either direction. If the growing country's terms of trade improve, this improvement reinforces the initial growth at home but hurts the rest of the world. If the growing country's terms of trade worsen, this decline offsets some of the favorable effects of growth at home but benefits the rest of the world.
3. The direction of the terms of trade effects depends on the nature of the growth. Growth that is export-biased (growth that expands the ability of an economy to produce the goods it was initially exporting more than it expands the ability to produce goods that compete with imports) worsens the terms of trade. Conversely, growth that is import-biased, disproportionately increasing the ability to produce import-competing goods, improves a country's terms of trade. It is possible for import-biased growth abroad to hurt a country.
4. International transfers of income, such as war reparations and foreign aid, may affect a country's terms of trade by shifting the world relative demand curve. If the country receiving a transfer spends a higher proportion of an increase in income on its export good than the giver, a transfer raises world relative demand for the recipient's export good and thus improves its terms of trade. This improvement reinforces the initial transfer and provides an indirect benefit in addition to the direct income transfer. On the other hand, if the recipient has a lower propensity to spend on its export at the margin than the donor, a transfer worsens the recipient's terms of trade, offsetting at least part of the transfer's effect.
5. In practice, most countries spend a much higher share of their income on domestically produced goods than foreigners do. This is not necessarily due to differences in taste but rather to barriers to trade, natural and artificial, which cause many goods to be nontraded. If nontraded goods compete with exports for resources, transfers will usually raise the recipient's terms of trade. The evidence suggests that this is, in fact, the case.
6. Import tariffs and export subsidies affect both relative supply and demand. A tariff raises relative supply of a country's import good while lowering relative demand. A tariff unambiguously improves the country's terms of trade at the rest of the world's expense. An export subsidy has the reverse effect, increasing the relative supply and reducing the relative demand for the country's export good, and thus worsening the terms of trade.
7. The terms of trade effects of an export subsidy hurt the subsidizing country and benefit the rest of the world, while those of a tariff do the reverse. This suggests that export subsidies do not make sense from a national point of view and that foreign export subsidies should be welcomed rather than countered. Both tariffs and subsidies, however, have strong effects on the distribution of income within countries, and these effects often weigh more heavily on policy than the terms of trade concerns.

## KEY TERMS

biased growth, p. 94	internal price, p. 103
export-biased growth, p. 96	isovalue lines, p. 89
export subsidy, p. 103	marginal propensity to spend, p. 100
external price, p. 103	Metzler paradox, p. 106
immiserizing growth, p. 97	standard trade model, p. 89
import-biased growth, p. 96	terms of trade, p. 89
import tariff, p. 103	transfers of income, p. 99
indifference curves, p. 90	

## PROBLEMS



- Assume that Norway and Sweden trade with each other, with Norway exporting fish to Sweden, and Sweden exporting Volvos (automobiles) to Norway. Illustrate the gains from trade between the two countries using the standard trade model, assuming first that tastes for the goods are the same in both countries, but the production possibilities frontiers differ: Norway has a long coast that borders on the north Atlantic, making it relatively more productive in fishing. Sweden has a greater endowment of capital, making it relatively more productive in automobiles.
- In the trade scenario in Problem 1, due to overfishing, Norway becomes unable to catch the quantity of fish that it could in previous years. This change causes both a reduction in the potential quantity of fish that can be produced in Norway, and an increase in the relative world price for fish,  $P_f/P_a$ .
  - Show how the overfishing problem can result in a decline in welfare for Norway.
  - Also show how it is possible that the overfishing problem could result in an *increase* in welfare for Norway.
- In some economies relative supply may be unresponsive to changes in prices. For example, if factors of production were completely immobile between sectors, the production possibility frontier would be right-angled, and output of the two goods would not depend on their relative prices. Is it still true in this case that a rise in the terms of trade increases welfare? Analyze graphically.
- The counterpart to immobile factors on the supply side would be lack of substitution on the demand side. Imagine an economy where consumers always buy goods in rigid proportions—for example, one yard of cloth for every pound of food—regardless of the prices of the two goods. Show that an improvement in the terms of trade benefits this economy, as well.
- Japan primarily exports manufactured goods, while importing raw materials such as food and oil. Analyze the impact on Japan's terms of trade of the following events:
  - A war in the Middle East disrupts oil supply.
  - Korea develops the ability to produce automobiles that it can sell in Canada and the United States.
  - U.S. engineers develop a fusion reactor that replaces fossil fuel electricity plants.
  - A harvest failure in Russia.
  - A reduction in Japan's tariffs on imported beef and citrus fruit.
- The Internet has allowed for increased trade in services such as programming and technical support, a development that has lowered the prices of such services relative to manufactured goods. India in particular has been recently viewed as an "exporter" of technology-based services, an area in which the United States had been a major

exporter. Using manufacturing and services as tradable goods, create a standard trade model for the U.S. and Indian economies that shows how relative price declines in exportable services that lead to the “outsourcing” of services can reduce welfare in the United States and increase welfare in India.

7. Countries A and B have two factors of production, capital and labor, with which they produce two goods,  $X$  and  $Y$ . Technology is the same in the two countries.  $X$  is capital-intensive; A is capital-abundant.

Analyze the effects on the terms of trade and the welfare of the two countries of the following:

- a. An increase in A’s capital stock.
  - b. An increase in A’s labor supply.
  - c. An increase in B’s capital stock.
  - d. An increase in B’s labor supply.
8. It is just as likely that economic growth will worsen a country’s terms of trade as that it will improve them. Why, then, do most economists regard immiserizing growth, where growth actually hurts the growing country, as unlikely in practice?
9. From an economic point of view, India and China are somewhat similar: Both are huge, low-wage countries, probably with similar patterns of comparative advantage, which until recently were relatively closed to international trade. China was the first to open up. Now that India is also opening up to world trade, how would you expect this to affect the welfare of China? Of the United States? (Hint: Think of adding a new economy identical to that of China to the world economy.)
10. In practice much foreign aid is “tied”; that is, it comes with restrictions that require that the recipient spend the aid on goods from the donor country. For example, France might provide money for an irrigation project in Africa, on the condition that the pumps, pipelines, and construction equipment be purchased from France rather than from Japan. How does such tying of aid affect the transfer problem analysis? Does tying of aid make sense from the donor’s point of view? Can you think of a scenario in which tied aid actually makes the recipient worse off?
11. Suppose that one country subsidizes its exports and the other country imposes a “countervailing” tariff that offsets its effect, so that in the end relative prices in the second country are unchanged. What happens to the terms of trade? What about welfare in the two countries?

Suppose, on the other hand, that the second country retaliates with an export subsidy of its own. Contrast the result.

## FURTHER READING

- Rudiger Dornbusch, Stanley Fischer, and Paul Samuelson. “Comparative Advantage, Trade, and Payments in a Ricardian Model with a Continuum of Goods.” *American Economic Review* 67 (1977). This paper, cited in Chapter 3, also gives a clear exposition of the role of nontraded goods in establishing the presumption that a transfer improves the recipient’s terms of trade.
- J. R. Hicks. “The Long Run Dollar Problem.” *Oxford Economic Papers* 2 (1953), pp. 117–135. The modern analysis of growth and trade has its origins in the fears of Europeans, in the early years after World War II, that the United States had an economic lead that could not be overtaken (this sounds dated today, but many of the same arguments have now resurfaced about Japan). The paper by Hicks is the most famous exposition.
- Harry G. Johnson. “Economic Expansion and International Trade.” *Manchester School of Social and Economic Studies* 23 (1955), pp. 95–112. The paper that laid out the crucial distinction between export- and import-biased growth.

**110 PART ONE International Trade Theory**

Paul Krugman. “Does Third World Growth Hurt First World Prosperity?” *Harvard Business Review* 72 (July–August 1994), pp. 113–121. An analysis that attempts to explain why growth in developing countries need not hurt advanced countries in principle and probably does not do so in practice.

Paul Samuelson. “The Transfer Problem and Transport Costs.” *Economic Journal* 62 (1952), pp. 278–304 (Part I) and 64 (1954), pp. 264–289 (Part II). The transfer problem, like so many issues in international economics, was given its basic formal analysis by Paul Samuelson.

John Whalley. *Trade Liberalization Among Major World Trading Areas*. Cambridge: MIT Press, 1985. The impact of tariffs on the international economy has been the subject of extensive study. Most impressive are the huge “computable general equilibrium” models, numerical models based on actual data that allow computation of the effects of changes in tariffs and other trade policies. Whalley’s book presents one of the most carefully constructed of these.

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## APPENDIX TO CHAPTER

## 5

## Representing International Equilibrium with Offer Curves

For most purposes, analyzing international equilibrium in terms of relative supply and demand is the simplest and most useful technique. In some circumstances, however, it is useful to analyze trade in a diagram that shows directly what each country ships to the other. A diagram that does this is the *offer curve* diagram.

## Deriving a Country's Offer Curve

In Figure 5-3 we showed how to determine a country's production and consumption given the relative price  $P_C/P_F$ . Trade is the difference between production and consumption. In an offer curve diagram we show directly the trade flows that correspond to any given relative price. On one axis of Figure 5A-1 we show the country's exports ( $Q_C - D_C$ ), on the other its imports ( $D_F - Q_F$ ). Point  $T$  in Figure 5A-1 corresponds to the situation shown in Figure 5-3 (production at  $Q$ , consumption at  $D$ ). Since

$$(D_F - Q_F) = (Q_C - D_C) \times (P_C/P_F), \quad (5A-1)$$

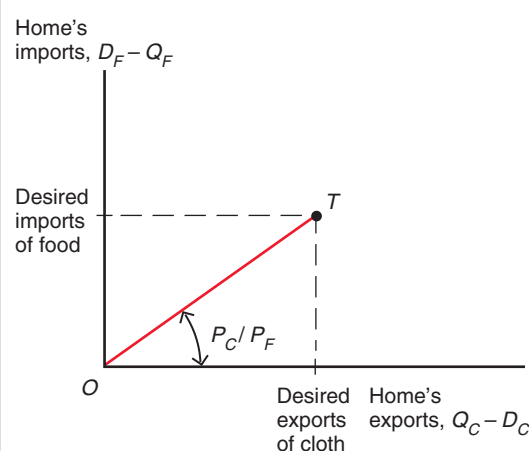
the slope of the line from the origin of Figure 5A-1 to  $T$  is equal to  $P_C/P_F$ .  $T$  is Home's offer at the assumed relative price: At that price, Home residents are willing to trade  $(Q_C - D_C)$  units of cloth for  $(D_F - Q_F)$  units of food.

By calculating Home's offer at different relative prices, we trace out Home's offer curve (Figure 5A-2). We saw in Figure 5-4 that as  $P_C/P_F$  rises,  $Q_C$  rises,  $Q_F$  falls,  $D_F$  rises, and  $D_C$  may rise or fall. Desired  $(Q_C - D_C)$  and  $(D_F - Q_F)$ , however, both normally rise if income effects are not too strong. In Figure 5A-2,  $T^1$  is the offer corresponding to  $Q^1, D^1$  in Figure 5-4;  $T^2$  the offer corresponding to  $Q^2, D^2$ . By finding Home's offer at many prices we trace out the Home offer curve  $OC$ .

Figure 5A-1

## Home's Desired Trade at a Given Relative Price

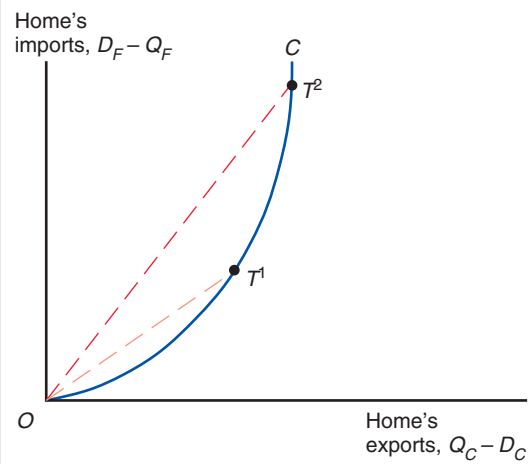
At the relative price corresponding to the slope of the line from the origin, Home makes the offer to trade  $Q_C - D_C$  units of cloth for  $D_F - Q_F$  units of food.





**Figure 5A-2****Home's Offer Curve**

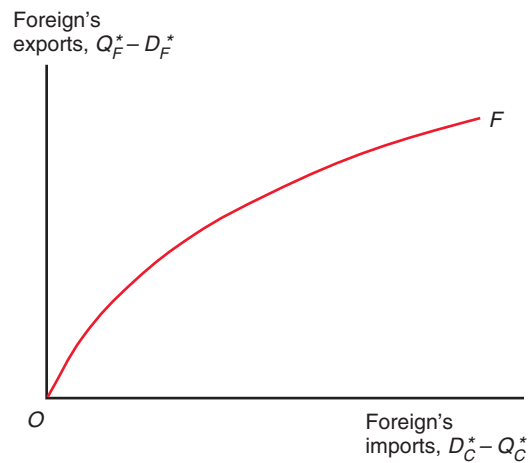
The offer curve is generated by tracing out how Home's offer varies as the relative price of cloth is changed.



Foreign's offer curve  $OF$  may be traced out in the same way (Figure 5A-3). On the vertical axis we plot  $(Q_F^* - D_F^*)$ , Foreign's desired exports of food, while on the horizontal axis we plot  $(D_C^* - Q_C^*)$ , desired imports of cloth. The lower  $P_C/P_F$  is, the more food Foreign will want to export and the more cloth it will want to import.

**Figure 5A-3****Foreign's Offer Curve**

Foreign's offer curve shows how that country's desired imports of cloth and exports of food vary with the relative price.



### International Equilibrium

In equilibrium it must be true that  $(Q_C - D_C) = (D_C^* - Q_C^*)$ , and also that  $(D_F - Q_F) = (Q_F^* - D_F^*)$ . That is, world supply and demand must be equal for both cloth and food. Given these equivalences, we can plot the Home and Foreign offer curves on the same diagram (Figure 5A-4). Equilibrium is at the point where the Home and Foreign offer curves cross. At the equilibrium point  $E$  the relative price of cloth is equal to the slope of  $OE$ . Home's exports of cloth, which equal Foreign's imports, are  $OX$ . Foreign's exports of food, which equal Home's imports, are  $OY$ .

This representation of international equilibrium helps us see that equilibrium is in fact *general* equilibrium, in which supply and demand are equalized in both markets at the same time.

**Figure 5A-4**

#### Offer Curve Equilibrium

World equilibrium is where the Home and Foreign offer curves intersect.

