8

Import Tariffs and Quotas Under Perfect Competition

Over a thousand Americans are working today because we stopped a surge in Chinese tires.
President Barack Obama, State of the Union Address, January 24, 2012

I take this action to give our domestic steel industry an opportunity to adjust to surges in foreign imports, recognizing the harm from 50 years of foreign government intervention in the global steel market, which has resulted in bankruptcies, serious dislocation, and job loss.
President George W. Bush, in press statement announcing new "safeguard" tariffs on imported steel, March 5, 2002

On September 27, 2012, a tariff of 35% on U.S. imports of tires made in China expired, meaning that these products were no longer taxed as they crossed the U.S. border. The end of that tariff hardly made the news at all, especially as compared with the headlines when President Barack Obama first announced the tariff three years earlier, on September 11, 2009. At that time, the tariff was seen as a victory for the United Steelworkers, the union that represents American tire workers, but it was opposed by many economists as well as by a number of American tire-manufacturing companies. By approving this tariff in 2009, it is believed that President Obama won additional support from the labor movement for the health-care bill that would be considered later that year.

The tariff on Chinese-made tires announced by President Obama was not the first instance of a U.S. President—of either party—approving an import tariff soon after being elected. During the 2000 presidential campaign, George W. Bush promised that he would consider implementing a tariff on imports of steel. That promise was made for political purposes: It helped Bush secure votes in Pennsylvania, West Virginia, and Ohio, states that produce large amounts of steel. After he was elected, the U.S. tariffs

on steel were increased in March 2002, though they were removed less than two years later, as we discuss later in this chapter.

The steel and tire tariffs are examples of **trade policy,** a government action meant to influence the amount of international trade. In earlier chapters, we learned that the opening of trade normally creates both winners and losers. Because the gains from trade are unevenly spread, it follows that firms, industries, and labor unions often feel that the government should do something to help maximize their gains or limit their losses from international trade. That "something" is trade policy, which includes the use of **import tariffs** (taxes on imports), **import quotas** (quantity limits on imports), and **export subsidies** (meaning that the seller receives a higher price than the buyer pays). In this chapter, we begin our investigation of trade policies by focusing on the effects of tariffs and quotas in a perfectly competitive industry. In the next chapter, we continue by discussing the use of import tariffs and quotas when the industry is imperfectly competitive.

President Obama and President Bush could not just put tariffs on imports of tires made in China and foreign steel. Rather, they had to follow the rules governing the use of tariffs that the United States and many other countries have agreed to follow. Under these rules, countries can temporarily increase tariffs to safeguard an industry against import competition. This "safeguard" rationale was used to increase the U.S. tariffs on steel and tires. The international body that governs these rules is called the World Trade Organization (WTO); its precursor was the General Agreement on Tariffs and Trade (GATT). This chapter first looks briefly at the history and development of the WTO and GATT.

Once the international context for setting trade policy has been established, the chapter examines in detail the most commonly used trade policy, the tariff. We explain the reasons why countries apply tariffs and the consequences of these tariffs on the producers and consumers in the importing and exporting countries. We show that import tariffs typically lead to welfare losses for "small" importing countries, by which we mean countries that are too small to affect world prices. Following that, we examine the situation for a "large" importing country, meaning a country that is a large enough buyer for its tariff to affect world prices. In that case, we find that the importing country can possibly gain by applying a tariff, but only at the expense of the exporting countries.

A third purpose of the chapter is to examine the use of an import quota, which is a limit on the quantity of a good that can be imported from a foreign country. Past examples of import quotas in the United States include limits on the imports of agricultural goods, automobiles, and steel. More recently, the United States and Europe imposed temporary quotas on the import of textile and apparel products from China. We note that, like a tariff, an import quota often imposes a cost on the importing country. Furthermore, we argue that the cost of quotas can sometimes be even greater than the cost of tariffs. For that reason, the use of quotas has been greatly reduced under the WTO, though they are still used in some cases.

Throughout this chapter, we assume that firms are perfectly competitive. That is, each firm produces a homogeneous good and is small compared with the market, which comprises many firms. Under perfect competition, each firm is a price taker in its market. In the next chapter, we learn that tariffs and quotas have different effects in imperfectly competitive markets.

1 A Brief History of the World Trade Organization

As we discussed in Chapter 1, during the period between the First and Second World Wars, unusually high tariffs between countries reduced the volume of world trade. When peace was reestablished following World War II, representatives of the Allied countries met on several occasions to discuss the rebuilding of Europe and issues such as high trade barriers and unstable exchange rates. One of these conferences, held in Bretton Woods, New Hampshire, in July 1944, established the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development, later known as the World Bank. A second conference held at the Palais des Nations, in Geneva, Switzerland, in 1947 established the General Agreement on Tariffs and Trade (GATT), the purpose of which was to reduce barriers to international trade between nations.[1]

Under the GATT, countries met periodically for negotiations, called "rounds," to lower trade restrictions between countries. Each round is named for the country in which the meeting took place. The Uruguay Round of negotiations, which lasted from 1986 to 1994, established the World Trade Organization (WTO) on January 1, 1995. The WTO is a greatly expanded version of the GATT. It keeps most of the GATT's earlier provisions but adds rules that govern an expanded set of global interactions (including trade in services and intellectual property protection) through binding agreements. The most recent round of WTO negotiations, the Doha Round, began in Doha, Qatar, in November 2001.

Although the goal of the WTO is to keep tariffs low, it allows countries to charge a higher tariff on a specific import under some conditions. In **Side Bar: Key Provisions of the GATT,** we show some of the articles of the GATT that still govern trade in the WTO. Some of the main provisions are as follows:

1. A nation must extend the same tariffs to all trading partners that are WTO members. Article I of the GATT, the "most favored nation" clause, states that every country belonging to the WTO must be treated the same: if a country imposes low tariffs on one trading partner, then those low tariffs must be extended to every other trading partner belonging to the WTO.[2]
2. Tariffs may be imposed in response to unfair trade practices such as **dumping.** As we discuss in the next chapter, "dumping" is defined as the sale of export goods in another country at a price less than that charged at home, or alternatively, at a price less than costs of production and shipping. Article VI of the GATT states that an importing country may impose a tariff on goods being dumped into its country by a foreign exporter.
3. Countries should not limit the quantity of goods and services that they import. Article XI states that countries should not maintain quotas against imports. We discuss exceptions to this rule later in this chapter.
4. Countries should declare export subsidies provided to particular firms, sectors, or industries. Article XVI deals with export subsidies, benefits such as tax

[1] A history of the GATT is provided in Douglas A. Irwin, Petros C. Mavroidis, and Alan O. Sykes, 2008, *The Genesis of the GATT* (New York: Cambridge University Press).

[2] In the United States, the granting of most favored nation trade status to a country is now called "normal trade relations" because most countries now belong to the WTO and enjoy that status.

breaks or other incentives for firms that produce goods specifically for export. The article states that countries should notify each other of the extent of subsidies and discuss the possibility of eliminating them. During the Doha Round of WTO negotiations, the elimination of agricultural subsidies has recently been discussed.

5. Countries can temporarily raise tariffs for certain products. Article XIX, called the **safeguard provision** or the **escape clause,** is our focus in this chapter. Article XIX lists the conditions under which a country can temporarily raise tariffs on particular products. It states that a country can apply a tariff when it imports "any product . . . in such increased quantities and under such conditions as to cause or threaten serious injury to domestic producers." In other words, the importing country can temporarily raise the tariff when domestic producers are suffering due to import competition.

   The steel tariff of 2002–2004 is an example of a tariff that was applied by the United States under Article XIX of the GATT (and the tire tariff of 2009–2012 was applied under a related provision that focused on U.S. imports from China, discussed later in the chapter). European governments strenuously objected to the steel tariffs, however, and filed a complaint against the United States with the WTO. A panel at the WTO ruled in favor of the European countries. This ruling entitled them to retaliate against the United States by putting tariffs of their own on some $2.2 billion worth of U.S. exports. This pressure from Europe, along with pressure from companies in the United States that had been purchasing the cheaper imported steel, led President Bush to remove the steel tariffs in December 2003. Later in the chapter, we discuss the steel tariff in more detail, and see how Article XIX of the GATT is reflected in U.S. trade laws.

6. **Regional trade agreements** are permitted under Article XXIV of the GATT. The GATT recognizes the ability of blocs of countries to form two types of regional trade agreements: (i) **free-trade areas,** in which a group of countries voluntarily agrees to remove trade barriers between themselves, and (ii) **customs unions,** which are free-trade areas in which the countries also adopt identical tariffs between themselves and the rest of the world. We discuss regional trade agreements in a later chapter.

2 The Gains from Trade

In earlier chapters, we demonstrated the gains from trade using a production possibilities frontier and indifference curves. We now instead demonstrate the gains from trade using Home demand and supply curves, together with the concepts of **consumer surplus** and **producer surplus.** You may already be familiar with these concepts from an earlier economics course, but we provide a brief review here.

Consumer and Producer Surplus

Suppose that Home consumers have the demand curve D in panel (a) of Figure 8-1 and face the price of P_1. Then total demand is D_1 units. For the last unit purchased, the consumer buying it values that unit at close to its purchase price of P_1, so he or

SIDE BAR

Key Provisions of the GATT

ARTICLE I

General Most-Favoured-Nation Treatment

1. With respect to customs duties . . . and with respect to all rules and formalities in connection with importation and exportation . . . any advantage, favour, privilege or immunity granted by any contracting party to any product originating in or destined for any other country shall be accorded immediately and unconditionally to the like product originating in or destined for the territories of all other contracting parties. . . .

ARTICLE VI

Anti-Dumping and Countervailing Duties

1. The contracting parties recognize that dumping, by which products of one country are introduced into the commerce of another country at less than the normal value of the products, is to be condemned if it causes or threatens material injury to an established industry. . . . [A] product is to be considered . . . less than its normal value, if the price of the product exported from one country to another
   a. is less than the comparable price . . . for the like product when destined for consumption in the exporting country, or,
   b. in the absence of such domestic price, is less than either
      i) the highest comparable price for the like product for export to any third country in the ordinary course of trade, or
      ii) the cost of production of the product in the country of origin plus a reasonable addition for selling cost and profit. . . .

ARTICLE XI

General Elimination of Quantitative Restrictions

1. No prohibitions or restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licenses or other measures, shall be instituted or maintained by any contracting party on the importation of any product of the territory of any other contracting party or on the exportation or sale for export of any product destined for the territory of any other contracting party. . . .

ARTICLE XVI

Subsidies

1. If any contracting party grants or maintains any subsidy, including any form of income or price support, which operates directly or indirectly to increase exports of any product from, or to reduce imports of any product into, its territory, it shall notify the contracting parties in writing of the extent and nature of the subsidization. In any case in which it is determined that serious prejudice to the interests of any other contracting party is caused or threatened by any such subsidization, the contracting party granting the subsidy shall, upon request, discuss with the other contracting party . . . the possibility of limiting the subsidization.

ARTICLE XIX

Emergency Action on Imports of Particular Products

1.
   a. If, as a result of unforeseen developments and of the effect of the obligations incurred by a contracting party under this Agreement, including tariff concessions, any product is being imported into the territory of that contracting party in such increased quantities and under such conditions as to cause or threaten serious injury to domestic producers in that territory of like or directly competitive products, the contracting party shall be free, in respect of such product, and to the extent and for such time as may be necessary to prevent or remedy such injury, to suspend the obligation in whole or in part or to withdraw or modify the concession. . . .

ARTICLE XXIV

Territorial Application—Frontier Traffic—Customs Unions and Free-Trade Areas

4. The contracting parties recognize the desirability of increasing freedom of trade by the development, through voluntary agreements, of closer integration between the economies of the countries party to such agreements. They also recognize that the purpose of a customs union or of a free-trade area should be to facilitate trade between the constituent territories and not to raise barriers to the trade of other contracting parties with such territories.
5. Accordingly, the provisions of this Agreement shall not prevent [the formation of customs unions and free-trade areas, provided that:]
   a. . . . the duties [with outside parties] shall not on the whole be higher or more restrictive than the general incidence of the duties . . . prior to the formation. . . .

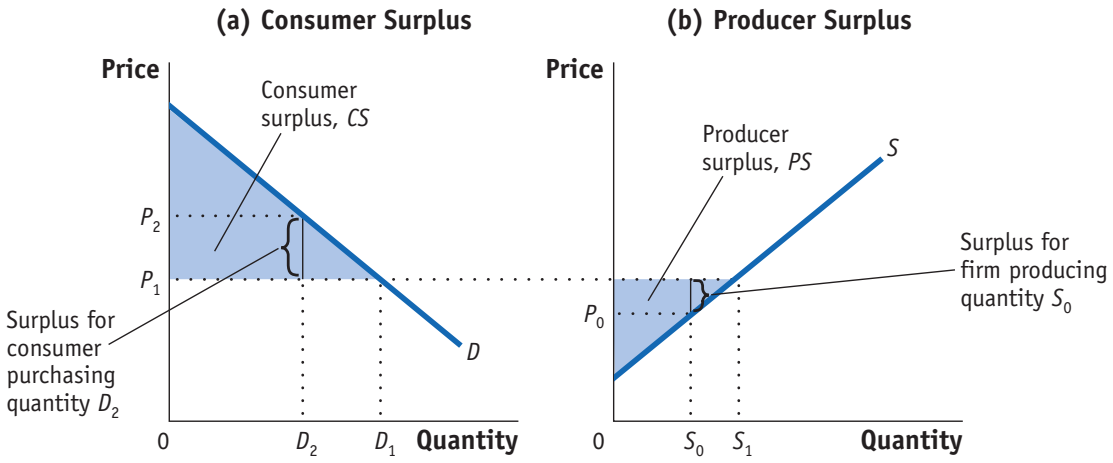
Source: http://www.wto.org/english/docs_e/legal_e/gatt47_01_e.htm#articleI.

she obtains little or no surplus over the purchase price. But for all the earlier units purchased (from 0 to D_1 units), the consumers valued the product at *higher than* its purchase price: the consumers' willingness to pay for the product equals the height of the demand curve. For example, the person buying unit D_2 would have been willing to pay the price of P_2, which is the height of the demand curve at that quantity. Therefore, that individual obtains the surplus of $(P_2 - P_1)$ from being able to purchase the good at the price P_1.

For each unit purchased before D_1, the value that the consumer places on the product exceeds the purchase price of P_1. Adding up the surplus obtained on each unit purchased, from 0 to D_1, we can measure consumer surplus (CS) as the shaded region below the demand curve and above the price P_1. This region measures the satisfaction that consumers receive from the purchased quantity D_1, over and above the amount $P_1 \cdot D_1$ that they have paid.

Panel (b) of Figure 8-1 illustrates producer surplus. This panel shows the supply curve of an industry; the height of the curve represents the firm's marginal cost at each level of production. At the price of P_1, the industry will supply S_1. For the last unit supplied, the price P_1 equals the marginal cost of production for the firm supplying that unit. But for all earlier units supplied (from 0 to S_1 units), the firms were able to produce those units at a marginal cost *less than* the price P_1. For example, the firm supplying unit S_0 could produce it with a marginal cost of P_0, which is the height of the supply curve at that quantity. Therefore, that firm obtains the producer surplus of $(P_1 - P_0)$ from being able to sell the good at the price P_1.

FIGURE 8-1



Consumer and Producer Surplus In panel (a), the consumer surplus from purchasing quantity D_1 at price P_1 is the area below the demand curve and above that price. The consumer who purchases D_2 is willing to pay price P_2 but has to pay only P_1. The difference is the consumer surplus and represents the satisfaction of consumers over and above the amount paid. In panel (b), the producer surplus from supplying the quantity S_1 at the price P_1 is the area above the supply curve and below that price. The supplier who supplies unit S_0 has marginal costs of P_0 but sells it for P_1. The difference is the producer surplus and represents the return to fixed factors of production in the industry.

For each unit sold before S_1, the marginal cost to the firm is less than the sale price of P_1. Adding up the producer surplus obtained for each unit sold, from 0 to S_1, we obtain producer surplus (*PS*) as the shaded region in panel (b) above the supply curve and below the price of P_1. It is tempting to think of producer surplus as the profits of firms, because for all units before S_1, the marginal cost of production is less than the sale price of P_1. But a more accurate definition of producer surplus is that it equals the *return to fixed factors of production in the industry*. That is, producer surplus is the difference between the sales revenue $P_1 \cdot S_1$ and the total variable costs of production (i.e., wages paid to labor and the costs of intermediate inputs). If there are fixed factors such as capital or land in the industry, as in the specific-factors model we studied in Chapter 3, then producer surplus equals the returns to these fixed factors of production. We might still loosely refer to this return as the "profit" earned in the industry, but it is important to understand that producer surplus is not *monopoly profit*, because we are assuming perfect competition (i.e., zero monopoly profits) throughout this chapter.[3]

Home Welfare

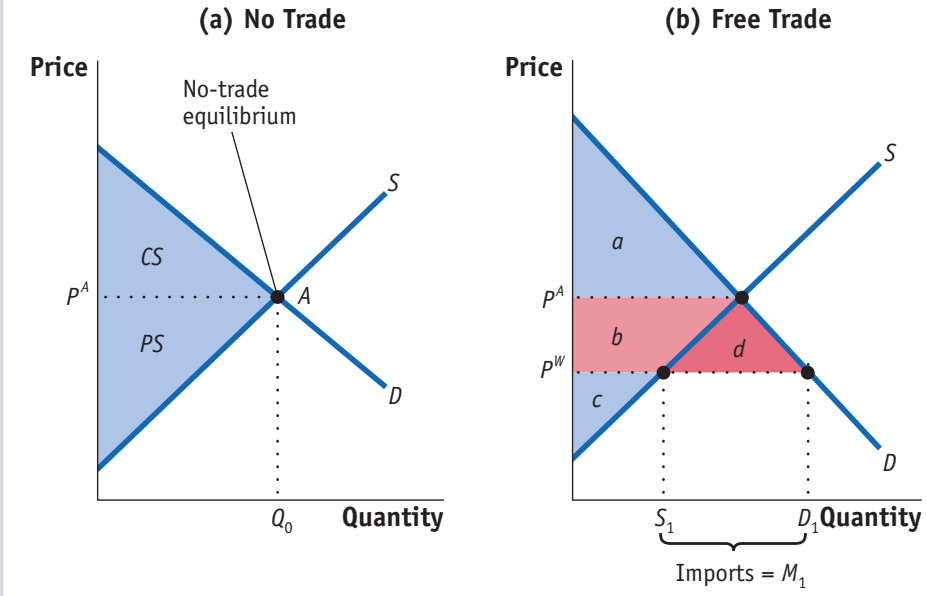
To examine the effects of trade on a country's welfare, we consider once again a world composed of two countries, Home and Foreign, with each country consisting of producers and consumers. Total Home welfare can be measured by adding up consumer and producer surplus. As you would expect, the greater the total amount of Home welfare, the better off are the consumers and producers overall in the economy. To measure the gains from trade, we will compare Home welfare in no-trade and free-trade situations.

No Trade In panel (a) of Figure 8-2, we combine the Home demand and supply curves in a single diagram. The no-trade equilibrium occurs at the autarky price of P^A, where the quantity demanded equals the quantity supplied, of Q_0. Consumer surplus is the region above the price of P^A and below the demand curve, which is labeled as *CS* in panel (a) and also shown as area *a* in panel (b). Producer surplus is the area below the price of P^A and above the supply curve, which is labeled as *PS* in panel (a) and also shown as area $(b + c)$ in panel (b). So the sum of consumer surplus and producer surplus is the area between the demand and supply curves, or $CS + PS =$ area $(a + b + c)$. That area equals Home welfare in the market for this good in the absence of international trade.

Free Trade for a Small Country Now suppose that Home can engage in international trade for this good. As we have discussed in earlier chapters, the world price P^W is determined by the intersection of supply and demand in the world market. Generally, there will be many countries buying and selling on the world market. We will suppose that the Home country is a **small country,** by which we mean that it is small in comparison with all the other countries buying and selling this product. For that reason, Home will be a *price taker* in the world market: it faces the fixed world price of P^W, and its own level of demand and supply for this product has no influence on the world price. In panel (b) of Figure 8-2, we assume that the world price P^W is *below* the Home no-trade price of P^A. At the lower price, Home demand will increase

[3] Recall from Chapter 6 that under imperfect competition, firms can influence the price of their goods and hence earn positive monopoly profits.

FIGURE 8-2



The Gains from Free Trade at Home With Home demand of D and supply of S, the no-trade equilibrium is at point A, at the price P^A producing Q_0. With free trade, the world price is P^W, so quantity demanded increases to D_1 and quantity supplied falls to S_1. Since quantity demanded exceeds quantity supplied, Home imports $D_1 - S_1$. Consumer surplus increases by the area $(b + d)$, and producer surplus falls by area b. The gains from trade are measured by area d.

from Q_0 under no trade to D_1, and Home supply will decrease from Q_0 under no trade to S_1. The difference between D_1 and S_1 is *imports* of the good, or $M_1 = D_1 - S_1$. Because the world price P^W is below the no-trade price of P^A, the Home country is an importer of the product at the world price. If, instead, P^W were above P^A, then Home would be an exporter of the product at the world price.

Gains from Trade Now that we have established the free-trade equilibrium at price P^W, it is easy to measure Home welfare as the sum of consumer and producer surplus with trade, and compare it with the no-trade situation. In panel (b) of Figure 8-2, Home consumer surplus at the price P^W equals the area $(a + b + d)$, which is the area below the demand curve and above the price P^W. In the absence of trade, consumer surplus was the area a, so the drop in price from P^A to P^W has increased consumer surplus by the amount $(b + d)$. Home consumers clearly gain from the drop in price.

Home firms, on the other hand, suffer a decrease in producer surplus from the drop in price. In panel (b), Home producer surplus at the price P^W equals the area c, which is the area above the supply curve and below the price P^W. In the absence of trade, producer surplus was the area $(b + c)$, so the drop in price from P^A to P^W has decreased producer surplus by the amount b. Home firms clearly lose from the drop in price.

Comparing the gains of consumers, $(b + d)$, with the losses of producers, area b, we see that consumers gain more than the producers lose, which indicates that total

Home welfare (the sum of consumer surplus and producer surplus) has gone up. We can calculate the total change in Home welfare due to the opening of trade by adding the *changes* in consumer surplus and producer surplus:

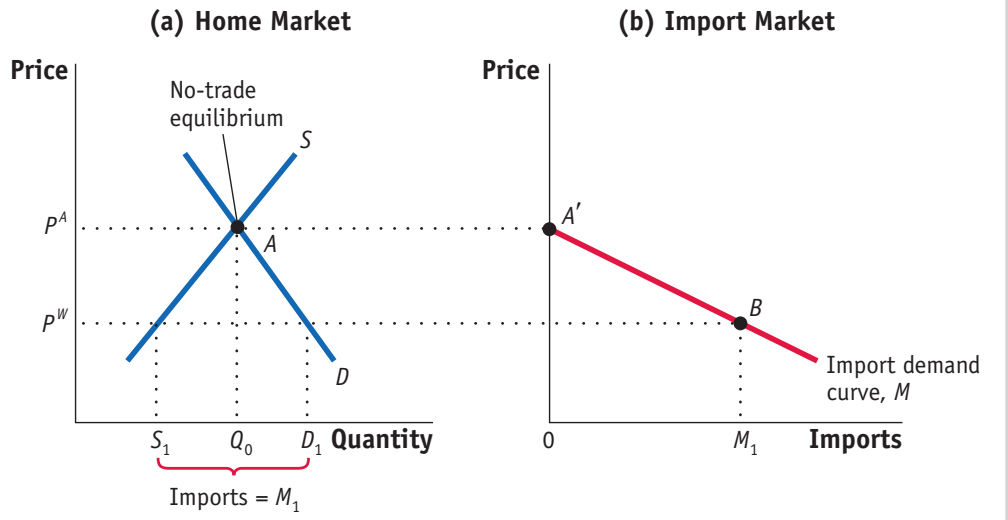
Rise in consumer surplus:	$+ (b + d)$
Fall in producer surplus:	$- b$
Net effect on Home welfare:	$+d$

The area d is a measure of the *gains from trade* for the importing country due to free trade in this good. It is similar to the gains from trade that we have identified in earlier chapters using the production possibilities frontier and indifference curves, but it is easier to measure: the triangle d has a base equal to free-trade imports $M_1 = D_1 - S_1$, and a height that is the drop in price, $P^A - P^W$, so the gains from trade equal the area of the triangle, $\frac{1}{2} \cdot (P^A - P^W) \cdot M_1$. Of course, with many goods being imported, we would need to add up the areas of the triangles for each good and take into account the net gains on the export side to determine the overall gains from trade for a country. Because gains are positive for each individual good, after summing all imported and exported goods, the gains from trade are still positive.

Home Import Demand Curve

Before introducing a tariff, we use Figure 8-3 to derive the **import demand curve,** which shows the relationship between the world price of a good and the quantity of imports demanded by Home consumers. We first derived this curve in Chapter 2,

FIGURE 8-3



Home Import Demand With Home demand of D and supply of S, the no-trade equilibrium is at point A, with the price P^A and import quantity Q_0. Import demand at this price is zero, as shown by the point A' in panel (b). At a lower world price of P^W, import demand is $M_1 = D_1 - S_1$, as shown by point B. Joining up all points between A' and B, we obtain the import demand curve, M.

for the Ricardian model. We now briefly review the derivation of the import demand curve before analyzing the effect of an import tariff on prices and welfare.

In panel (a) of Figure 8-3, we again show the downward-sloping Home demand curve (D) and the upward-sloping Home supply curve (S). The no-trade equilibrium is at point A, which determines Home's no-trade equilibrium price P^A, and its no-trade equilibrium quantity of Q_0. Because quantity demanded equals quantity supplied, there are zero imports of this product. Zero imports is shown as point A' in panel (b).

Now suppose the world price is at P^W, below the no-trade price of P^A. At the price of P^W, the quantity demanded in Home is D_1, but the quantity supplied by Home suppliers is only S_1. Therefore, the quantity imported is $M_1 = D_1 - S_1$, as shown by the point B in panel (b). Joining points A' and B, we obtain the downward-sloping import demand curve M.

Notice that the import demand curve applies for all prices *below* the no-trade price of P^A in Figure 8-3. Having lower prices leads to greater Home demand and less Home supply and, therefore, positive imports. What happens if the world price is *above* the no-trade price? In that case, the higher price would lead to greater Home supply and less Home demand, so Home would become an exporter of the product.

3 Import Tariffs for a Small Country

We can now use this supply and demand framework to show what happens when a small country imposes a tariff. As we have already explained, an importing country is "small" if its tariff does not have any effect on the world price of the good on which the tariff is applied. As we will see, the Home price of the good will increase due to the tariff. Because the tariff (which is a tax) is applied at the border, the price charged to Home consumers will increase by the amount of the tariff.

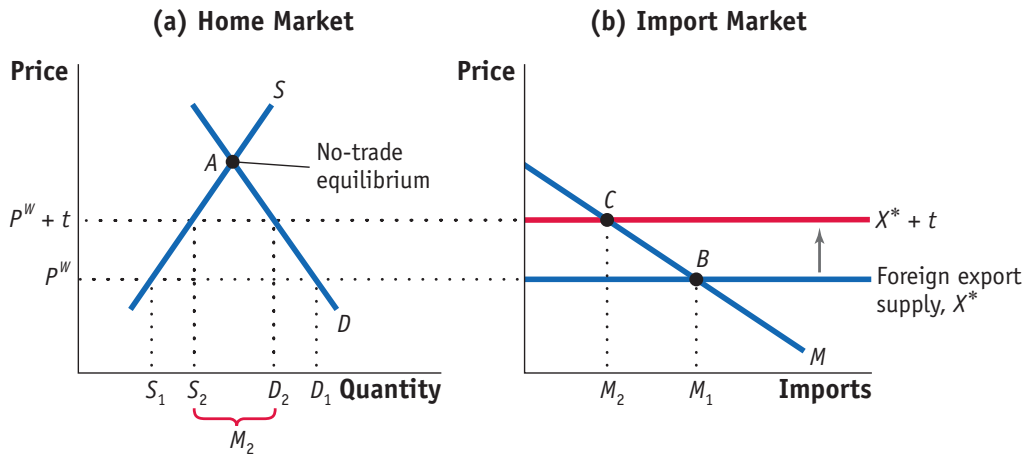
Free Trade for a Small Country

In Figure 8-4, we again show the free-trade equilibrium for the Home country. In panel (b), the Foreign export supply curve X^* is horizontal at the world price P^W. The horizontal export supply curve means that Home can import any amount at the price P^W without having an impact on that price. The free-trade equilibrium is determined by the intersection of the Foreign export supply and the Home import demand curves, which is point B in panel (b), at the world price P^W. At that price, Home demand is D_1 and Home supply is S_1, shown in panel (a). Imports at the world price P^W are then just the difference between demand and supply, or $M_1 = D_1 - S_1$.

Effect of the Tariff

With the import tariff of t dollars, the export supply curve facing the Home country shifts up by exactly that amount, reflecting the higher price that must be paid to import the good. The shift in the Foreign export supply curve is analogous to the shift in domestic supply caused by a sales tax, as you may have seen in earlier economics courses; it reflects an effective increase in the costs of the firm. In

FIGURE 8-4



Tariff for a Small Country Applying a tariff of t dollars will increase the import price from P^W to $P^W + t$. The domestic price of that good also rises to $P^W + t$. This price rise leads to an increase in Home supply from S_1 to S_2, and a decrease in Home demand from D_1 to D_2, in panel (a). Imports fall due to the tariff, from M_1 to M_2 in panel (b). As a result, the equilibrium shifts from point B to C.

panel (b) of Figure 8-4, the export supply curve shifts up to $X^* + t$. The intersection of the post-tariff export supply curve and the import demand curve now occurs at the price of $P^W + t$ and the import quantity of M_2. The import tariff has reduced the amount imported, from M_1 under free trade to M_2 under the tariff, because of its higher price.

We assume that the imported product is identical to the domestic alternative that is available. For example, if the imported product is a women's cruiser bicycle, then the Home demand curve D in panel (a) is the demand for women's cruisers, and the Home supply curve is the supply of women's cruisers. When the import price rises to $P^W + t$, then we expect that the Home price for locally produced bicycles will rise by the same amount. This is because at the higher import price of $P^W + t$, the quantity of cruisers demanded at Home falls from its free-trade quantity of D_1 to D_2. At the same time, the higher price will encourage Home firms to increase the quantity of cruisers they supply from the free-trade quantity of S_1 to S_2. As firms increase the quantity they produce, however, the marginal costs of production rise. The Home supply curve (S) reflects these marginal costs, so the Home price will rise along the supply curve until Home firms are supplying the quantity S_2, at a marginal cost just equal to the import price of $P^W + t$. Since marginal costs equal $P^W + t$, the price charged by Home firms will also equal $P^W + t$, and the domestic price will equal the import price.

Summing up, Home demand at the new price is D_2, Home supply is S_2, and the difference between these are Home imports of $M_2 = D_2 - S_2$. Foreign exporters still receive the "net-of-tariff" price (i.e., the Home price minus the tariff) of P^W, but Home consumers pay the higher price $P^W + t$. We now investigate how the rise in the Home price from P^W to $P^W + t$ affects consumer surplus, producer surplus, and overall Home welfare.

Effect of the Tariff on Consumer Surplus In Figure 8-5, we again show the effect of the tariff of t dollars, which is to increase the price of the imported and domestic good from P^W to $P^W + t$. Under free trade, consumer surplus in panel (a) was the area under the demand curve and above P^W. With the tariff, consumers now pay the higher price, $P^W + t$, and their surplus is the area under the demand curve and above the price $P^W + t$. The fall in consumer surplus due to the tariff is the area between the two prices and to the left of Home demand, which is $(a + b + c + d)$ in panel (a) of Figure 8-5. This area is the amount that consumers lose due to the higher price caused by the tariff.

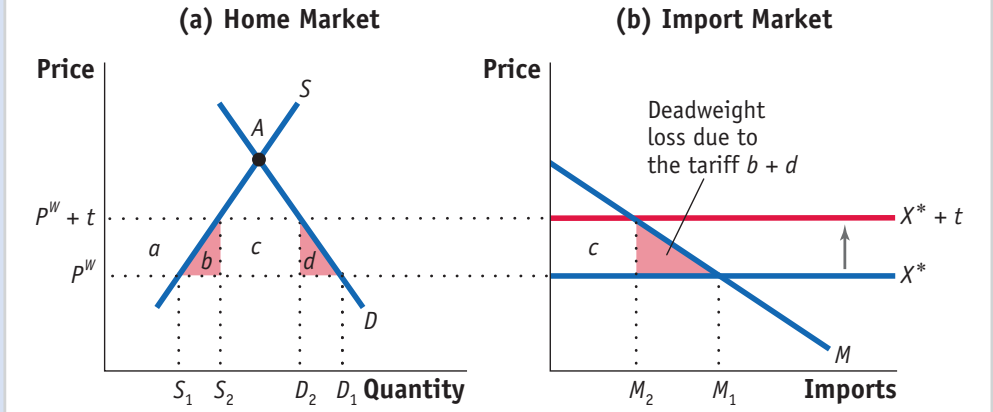
Effect of the Tariff on Producer Surplus We can also trace the impact of the tariff on producer surplus. Under free trade, producer surplus was the area above the supply curve in panel (a) and below the price of P^W. With the tariff, producer surplus is the area above the supply curve and below the price $P^W + t$: since the tariff increases the Home price, firms are able to sell more goods at a higher price, thus increasing their surplus. We can illustrate this rise in producer surplus as the amount between the two prices and to the left of Home supply, which is labeled as a in panel (a). This area is the amount that Home firms gain because of the higher price caused by the tariff. As we have just explained, the rise in producer surplus should be thought of as an increase in the return to fixed factors (capital or land) in the industry. Sometimes we even think of labor as a partially fixed factor because the skills learned in one industry cannot necessarily be transferred to other industries. In that case, it is reasonable to think that the increase in Home producer surplus can also benefit Home workers in the import-competing industry, along with capital and land, but this benefit comes at the expense of consumer surplus.

Effect of the Tariff on Government Revenue In addition to affecting consumers and producers, the tariff also affects government revenue. The amount of revenue collected is the tariff t times the quantity of imports $(D_2 - S_2)$. In Figure 8-5, panel (a), this revenue is shown by the area c. The collection of revenue is a gain for the government in the importing country.

Overall Effect of the Tariff on Welfare We are now in a position to summarize the impact of the tariff on the welfare of the Home importing country, which is the sum of producer surplus, consumer surplus, and government revenues. Thus, our approach is to *add up* these impacts to obtain a net effect. In adding up the loss of consumers and the gains of producers, one dollar of consumer surplus is the same as one dollar of producer surplus or government revenue. In other words, we do not care whether the consumers facing higher prices are poor or rich, and do not care whether the specific factors in the industry (capital, land, and possibly labor) earn a lot or a little. Under this approach, transferring one dollar from consumer to producer surplus will have no impact on overall welfare: the decrease in consumer surplus will cancel out the increase in producer surplus.

You may object to this method of evaluating overall welfare, and feel that a dollar taken away from a poor consumer and given to a rich producer represents a net loss of overall welfare, rather than zero effect, as in our approach. We should be careful in evaluating the impact of tariffs on different income groups in the society, especially for poor countries or countries with a high degree of inequality among income groups. But for now we ignore this concern and simply add up consumer surplus, producer surplus, and government revenue. Keep in mind that under this approach we are just evaluating the *efficiency* of tariffs and not their effect on equity (i.e., how fair the tariff is to one group versus another).

FIGURE 8-5



Effect of Tariff on Welfare The tariff increases the price from P^W to $P^W + t$. As a result, consumer surplus falls by $(a + b + c + d)$. Producer surplus rises by area a, and government revenue increases by the area c. Therefore, the net loss in welfare, the deadweight loss to Home, is $(b + d)$, which is measured by the two triangles b and d in panel (a) or the single (combined) triangle $b + d$ in panel (b).

The overall impact of the tariff in the small country can be summarized as follows:

Fall in consumer surplus:	$-(a + b + c + d)$
Rise in producer surplus:	$+ a$
Rise in government revenue:	$+ c$
Net effect on Home welfare:	$\mathbf{-(b + d)}$

In Figure 8-5(b), the triangle $(b + d)$ is the *net welfare loss* in a small importing country due to the tariff. We sometimes refer to this area as a **deadweight loss,** meaning that it is not offset by a gain elsewhere in the economy. Notice that in panel (a) the area a, which is a gain for producers, just cancels out that portion of the consumer surplus loss; the area a is effectively a transfer from consumers to producers via the higher domestic prices induced by the tariff. Likewise, area c, the gain in government revenue, also cancels out that portion of the consumer surplus loss; this is a transfer from consumers to the government. Thus, the area $(b + d)$ is the remaining loss for consumers that is not offset by a gain elsewhere. This deadweight loss is measured by the two triangles, b and d, in panel (a), or by the combined triangle $(b + d)$ in panel (b). The two triangles b and d of deadweight loss can each be given a precise interpretation, as follows.

Production Loss Notice that the base of triangle b is the net increase in Home supply due to the tariff, from S_1 to S_2. The height of this triangle is the increase in marginal costs due to the increase in supply. The unit S_1 was produced at a marginal cost equal to P^W, which is the free-trade price, but every unit above that amount is produced with higher marginal costs. The fact that marginal costs exceed the world price means that this country is producing the good inefficiently: it would be cheaper to import it rather than produce the extra quantity at home. The area of triangle b equals the increase in marginal costs for the extra units produced and can be interpreted as the **production loss** (or the *efficiency loss*) for the economy due to producing

at marginal costs above the world price. Notice that the production loss is only a portion of the overall deadweight loss, which is ($b + d$) in Figure 8-5.

Consumption Loss The triangle d in panel (a) (the other part of the deadweight loss) can also be given a precise interpretation. Because of the tariff and the price increase from P^W to $P^W + t$, the quantity consumed at Home is reduced from D_1 to D_2. The area of the triangle d can be interpreted as the drop in consumer surplus for those individuals who are no longer able to consume the units between D_1 and D_2 because of the higher price. We refer to this drop in consumer surplus as the **consumption loss** for the economy.

Why and How Are Tariffs Applied?

Our finding that a tariff always leads to deadweight losses for a small importing country explains why most economists oppose the use of tariffs. If a small country suffers a loss when it imposes a tariff, why do so many have tariffs as part of their trade policies? One answer is that a developing country does not have any other source of government revenue. Import tariffs are "easy to collect" because every country has customs agents at major ports checking the goods that cross the border. It is easy to tax imports, even though the deadweight loss from using a tariff is typically higher than the deadweight loss from using "hard-to-collect" taxes, such as income taxes or value-added taxes. These taxes are hard to collect because they require individuals and firms to honestly report earnings, and the government cannot check every report (as they can check imports at the border). Still, to the extent that developing countries recognize that tariffs have a higher deadweight loss, we would expect that over time they would shift away from such easy-to-collect taxes. That is exactly what has occurred, according to one research study.[4] The fraction of total tax revenue collected from "easy to collect" taxes such as tariffs fell during the 1980s and 1990s, especially in developing countries, whereas the fraction of revenue raised from "hard to collect" taxes rose over this same period.

A second reason why tariffs are used even though they have a deadweight loss is politics. The tariff benefits the Home producers, as we have seen, so if the government cares more about producer surplus than consumer surplus, it might decide to use the tariff despite the deadweight loss it incurs. Indeed, the benefits to producers (and their workers) are typically more concentrated on specific firms and states than the costs to consumers, which are spread nationwide. This is our interpretation of the tariff that President George W. Bush granted to the steel industry from 2002 to 2004: its benefits were concentrated in the steel-producing states of Pennsylvania, West Virginia, and Ohio, and its costs to consumers—in this case, steel-using industries—were spread more widely. [5] For the tariff on tires imported from China granted by President Barack Obama from 2009 to 2012, the argument is a bit different. This tariff was

[4] Joshua Aizenman and Yothin Jinjarak, January 2006, "Globalization and Developing Countries—A Shrinking Tax Base?" National Bureau of Economic Research (NBER) Working Paper No. 11933.

[5] Although the steel tariff was used to obtain votes from the steel-producing states, it also served another political purpose. In 2002 President George W. Bush faced a vote on whether the president should be granted "fast-track authority" to negotiate trade agreements with other countries. Fast-track authority allows the president to present a new trade agreement to the Congress for an up-or-down vote within 90 days, without having the terms of the trade agreement revised by the Congress. This authority expires every five years. In 2002 the steel tariff prompted some members of Congress to vote in favor of fast-track authority, which passed in Congress by only two votes. More recently, fast-track authority, also called "trade promotion authority," was not renewed by Congress and was allowed to lapse on July 1, 2007.

requested by the United Steelworkers, the union who represents workers in the U.S. tire industry, and it was expected to benefit those workers. But U.S. tire producers did not support the tariff because many of them were already manufacturing tires in other countries—especially China—and this tariff made it more costly for them to do so.

In both the steel and tire cases, the president was not free to impose just any tariff, but had to follow the rules of the GATT discussed earlier in this chapter. Recall that Article XIX of the GATT, known as the "safeguard" or "escape clause," allows a temporary tariff to be used under certain circumstances. GATT Article XIX is mirrored in U.S. trade law. In **Side Bar: Safeguard Tariffs,** we list the key passages for two sections of the Trade Act of 1974, as amended, both of which deal with safeguard tariffs.

First, Section 201 states that a tariff can be requested by the president, by the House of Representatives, by the Senate, or by any other party such as a firm or union that files a petition with the U.S. International Trade Commission (ITC). That commission determines whether rising imports have been "a substantial cause of serious injury, or threat thereof, to the U.S. industry. . . ." The commission then makes a recommendation to the president who has the final authority to approve or veto the tariff. Section 201 goes further in defining a "substantial cause" as a "cause that is important and not less than any other cause." Although this kind of legal language sounds obscure, it basically means that rising imports have to be *the most important* cause of injury to justify import protection. The steel tariff used by President Bush met this criterion, but as we see in later chapters, many other requests for tariffs do not meet this criterion and are not approved.

SIDE BAR

Safeguard Tariffs

The U.S. Trade Act of 1974, as amended, describes conditions under which tariffs can be applied in the United States, and it mirrors the provisions of the GATT and WTO. Two sections of the Trade Act of 1974 deal with the use of "safeguard" tariffs:

Section 201

Upon the filing of a petition. . . , the request of the President or the Trade Representative, the resolution of either the Committee on Ways and Means of the House of Representatives or the Committee on Finance of the Senate, or on its own motion, the [International Trade] Commission shall promptly make an investigation to determine whether an article is being imported into the United States in such increased quantities as to be a *substantial cause of serious injury, or the threat thereof, to the domestic industry* producing an article like or directly competitive with the imported article.

. . . For purposes of this section, the term "substantial cause" means a cause which is *important and not less than any other cause*.

Section 421

Upon the filing of a petition . . . the United States International Trade Commission . . . shall promptly make an investigation to determine whether products of the People's Republic of China are being imported into the United States in such increased quantities or under such conditions as to *cause or threaten to cause market disruption to the domestic producers* of like or directly competitive products.

. . . (1) For purposes of this section, *market disruption* exists whenever imports of an article like or directly competitive with an article produced by a domestic industry are increasing rapidly, either absolutely or relatively, so as to be a *significant cause of material injury, or threat of material injury, to the domestic industry*.

(2) For purposes of paragraph (1), the term "significant cause" refers to a cause which contributes significantly to the material injury of the domestic industry, *but need not be equal to or greater than any other cause*.

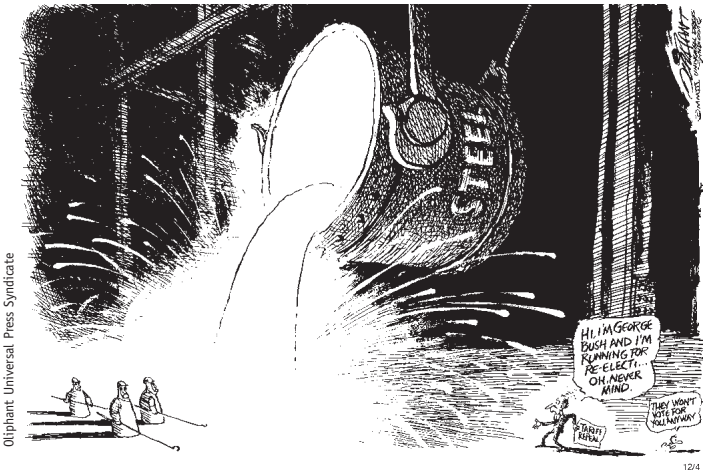
Source: http://www.law.cornell.edu/uscode/text/19/2252 and http://www.law.cornell.edu/uscode/text/19/2451

A second, more recent amendment to the Trade Act of 1974 is Section 421 that applies only to China. This provision was added by the United States as a condition to China's joining the WTO in 2001.[6] Because the United States was worried about exceptional surges in imports from China, it drafted this legislation so that tariffs could be applied in such a case. Under Section 421, various groups can file a petition with the U.S. International Trade Commission, which makes a recommendation to the president. The commission must determine whether rising imports from China cause "market disruption" in a U.S. industry, which means "a significant cause of material injury, or threat of material injury, to the domestic industry." Furthermore, the term "significant cause" refers to "a cause which contributes significantly to the material injury of the domestic industry, but need not be equal to or greater than any other cause." Again, the legal language can be hard to follow, but it indicates that tariffs can be applied even when rising imports from China *are not the most important* cause of injury to the domestic industry. Section 421 can therefore be applied under weaker conditions than Section 201, and it was used by President Obama to justify the tariff on tires imported from China.

APPLICATION

U.S. Tariffs on Steel and Tires

The U.S. steel and tire tariffs highlight the political motivation for applying tariffs despite the deadweight losses associated with them. We can use our small-country model introduced previously to calculate a rough estimate of how costly these tariffs were in terms of welfare. Although the United States may not be a small country when it comes to its influence on import and export prices, it is a good starting point for our analysis, and we will examine the large-country case in the next section. For now, we stay with our small-country model and illustrate the deadweight loss due to a tariff with the U.S. steel tariff in place from March 2002 to December 2003. After that calculation, we compare the steel tariff with the more recent tariff on tires.



Oliphant Universal Press Syndicate

To fulfill his campaign promise to protect the steel industry, President George W. Bush requested that the ITC initiate a Section 201 investigation into the steel industry. This was one of the few times that a president had initiated a Section 201 action; usually, firms or unions in an industry apply to the ITC for import protection. After investigating, the ITC determined that the conditions of Section 201 and Article XIX were met and recommended that tariffs be put in place to protect the U.S. steel industry. The tariffs recommended by the ITC varied across products, ranging from 10% to 20% for the first year, as shown in Table 8-1, and then falling over time so as to be eliminated after three years.

[6] Section 421 was added to U.S. trade law for 12 years, and was due to expire on December 11, 2013.

TABLE 8-1

U.S. ITC Recommended and Actual Tariffs for Steel Shown here are the tariffs recommended by the U.S. International Trade Commission for steel imports, and the actual tariffs that were applied in the first year.

Product Category	U.S. ITC Recommendation (First Year, %)	Actual U.S. Tariff (First Year, %)
Carbon and Alloy Flat Products		
Slab	20	30
Flat products	20	30
Tin mill products	U*	30
Carbon and Alloy Long Products		
Hot-rolled bar	20	30
Cold-finished bar	20	30
Rebar	10	15
Carbon and Alloy Tubular Products		
Tubular products	?**	15
Alloy fittings and flanges	13	13
Stainless and Tool Steel Products		
Stainless steel bar	15	15
Stainless steel rod	?**	15
Stainless steel wire	U*	8

* Uncertain—the ITC was divided on whether a tariff should be used.

** A specific recommendation was not made by the U.S. ITC.

Source: Robert Read, 2005, "The Political Economy of Trade Protection: The Determinants and Welfare Impact of the 2002 U.S. Emergency Steel Safeguard Measures," The World Economy, *1119–1137.*

The ITC decision was based on several factors.[7] First, imports had been rising and prices were falling in the steel industry from 1998 to early 2001, leading to substantial losses for U.S. firms. Those losses, along with falling investment and employment, met the condition of "serious injury." An explanation given by the ITC for the falling import prices was that the U.S. dollar appreciated substantially prior to 2001: as the dollar rises in value, foreign currencies become cheaper and so do imported products such as steel, as occurred during this period. To meet the criterion of Section 201 and Article XIX, rising imports need to be a "substantial cause" of serious injury, which is defined as "a cause which is important and not less than any other cause." Sometimes another cause of injury to U.S. firms can be a domestic recession, but that was not the case in the years preceding 2001, when demand for steel products was rising.[8]

President Bush accepted the recommendation of the ITC but applied even higher tariffs, ranging from 8% to 30%, as shown in Table 8-1, with 30% tariffs applied to

[7] We focus here on the ITC conclusions for flat-rolled carbon steel, from U.S. International Trade Commission, 2001, Steel: Investigation No. TA-201-73, Volume I, Publication 3479, Washington, D.C.
[8] A short recession began in the United States in March 2001 and ended eight months later, in November 2001.

the most commonly used steel products (such as flat-rolled steel sheets and steel slab). Initially, the tariffs were meant to be in place for three years and to decline over time. Knowing that U.S. trading partners would be upset by this action, President Bush exempted some countries from the tariffs on steel. The countries exempted included Canada, Mexico, Jordan, and Israel, all of which have free-trade agreements with the United States, and 100 small developing countries that were exporting only a very small amount of steel to the United States.

Deadweight Loss Due to the Steel Tariff To measure the deadweight loss due to the tariffs levied on steel, we need to estimate the area of the triangle $b + d$ in Figure 8-5(b). The base of this triangle is the change in imports due to the tariffs, or $\Delta M = M_1 - M_2$. The height of the triangle is the increase in the domestic price due to the tariff, or $\Delta P = t$. So the deadweight loss equals

$$DWL = \frac{1}{2} \cdot t \cdot \Delta M$$

It is convenient to measure the deadweight loss relative to the value of imports, which is $P^W \cdot M$. We will also use the percentage tariff, which is t/P^W, and the percentage change in the quantity of imports, which is $\%\Delta M = \Delta M/M$. The deadweight loss relative to the value of imports can then be rewritten as

$$\frac{DWL}{P^W \cdot M} = \frac{1}{2} \cdot \frac{t \cdot \Delta M}{P^W \cdot M} = \frac{1}{2} \cdot \left(\frac{t}{P^W} \right) \cdot \%\Delta M$$

For the tariffs on steel, the most commonly used products had a tariff of 30%, so that is the percentage increase in the price: $t/P^W = 0.3$. It turns out that the quantity of steel imports also fell by 30% the first year after the tariff was imposed, so that $\%\Delta M = 0.3$. Therefore, the deadweight loss is

$$\frac{DWL}{P^W \cdot M} = \frac{1}{2}(0.3 \cdot 0.3) = 0.045, \text{ or } 4.5\% \text{ of the import value}$$

The value of steel imports that were affected by the tariff was about $4.7 billion in the year prior to March 2002 and $3.5 billion in the year after March 2002, so average imports over the two years were $\frac{1}{2}(4.7 + 3.5) = \$4.1$ billion (these values do not include the tariffs).[9]

If we apply the deadweight loss of 4.5% to the average import value of $4.1 billion, then the dollar magnitude of deadweight loss is 0.045 • 4.1 billion = $185 million. As we discussed earlier, this deadweight loss reflects the net annual loss to the United States from applying the tariff. If you are a steelworker, then you might think that the price of $185 million is money well spent to protect your job, at least temporarily. On the other hand, if you are a consumer of steel, then you will probably object to the higher prices and deadweight loss. In fact, many of the U.S. firms that purchase steel—such as firms producing automobiles—objected to the tariffs and encouraged President Bush to end them early. But the biggest objections to the tariffs came from exporting countries whose firms were affected by the tariffs, especially the European countries. ■

[9] The drop in imports of 30% corresponds to a fall in import value of $1.2 billion (since 1.2/4.1 ≈ 0.30, or 30%).

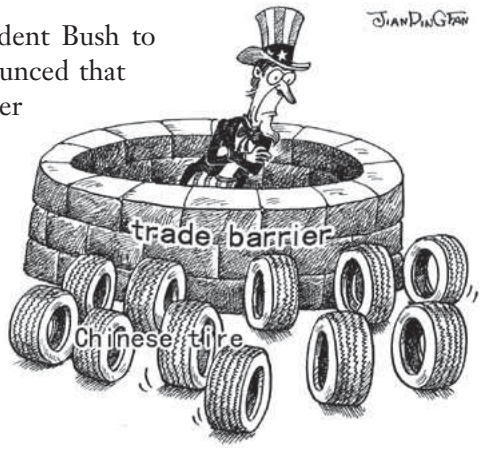
Response of the European Countries The tariffs on steel most heavily affected Europe, Japan, and South Korea, along with some developing countries (Brazil, India, Turkey, Moldova, Romania, Thailand, and Venezuela) that were exporting a significant amount of steel to the United States. These countries objected to the restriction on their ability to sell steel to the United States.

The countries in the European Union (EU) therefore took action by bringing the case to the WTO. They were joined by Brazil, China, Japan, South Korea, New Zealand, Norway, and Switzerland. The WTO has a formal **dispute settlement procedure** under which countries that believe that the WTO rules have not been followed can bring their complaint and have it evaluated. The WTO evaluated this case and, in early November 2003, ruled that the United States had failed to sufficiently prove that its steel industry had been harmed by a sudden increase in imports and therefore did not have the right to impose "safeguard" tariffs.

The WTO ruling was made on legal grounds: that the United States had essentially failed to prove its case (i.e., its eligibility for Article XIX protection).[10] But there are also economic grounds for doubting the wisdom of the safeguard tariffs in the first place. Even if we accept that there might be an argument on equity or fairness grounds for temporarily protecting an industry facing import competition, it is hard to argue that such protection should occur because of a change in exchange rates. The U.S. dollar appreciated for much of the 1990s, including the period before 2001 on which the ITC focused, leading to much lower prices for imported steel. But the appreciation of the dollar also lowered the prices for *all other* import products, so many other industries in the United States faced import competition, too. On fairness grounds, there is no special reason to single out the steel industry for protection.

The WTO ruling entitled the European Union and other countries to retaliate against the United States by imposing tariffs of their own against U.S. exports. The European countries quickly began to draw up a list of products—totaling some $2.2 billion in U.S. exports—against which they would apply tariffs. The European countries naturally picked products that would have the greatest negative impact on the United States, such as oranges from Florida, where Jeb Bush, the president's brother, was governor.

The threat of tariffs being imposed on these products led President Bush to reconsider the U.S. tariffs on steel. On December 5, 2003, he announced that they would be suspended after being in place for only 19 months rather than the three years as initially planned. This chain of events illustrates how the use of tariffs by an importer can easily lead to a response by exporters and a **tariff war.** The elimination of the steel tariffs by President Bush avoided such a retaliatory tariff war.



Tariff on Tires The tariff on tires imported from China, announced by President Obama on September 11, 2009, was requested by the United Steel, Paper and Forestry, Rubber, Manufacturing, Energy, Allied Industrial, and Service Workers International Union (or the United Steelworkers, for short), the union that represents American

[10] One of the legal reasons for the WTO ruling was that imports of flat-rolled steel into the United States had fallen from 1998 to 2001, so this product did not meet the requirement that imports had to be increasing to receive Article XIX protection. Even though imports of other steel products were rising, flat-rolled steel was considered one of the most important imported products.

tire workers. On April 20, 2009, they filed a petition with the U.S. ITC for import relief under Section 421 of U.S. trade law. As discussed in **Side Bar: Safeguard Tariffs,** this section of U.S. trade law enables tariffs to be applied against products imported from China if the imports are "a significant cause of material injury" to the U.S. industry. A majority of the ITC commissioners felt that rising imports from China of tires for cars and light trucks fit this description and recommended that tariffs be applied for a three-year period. Their recommendation was for tariffs of 55% in the first year, 45% in the second year, and 35% in the third year (these tariffs would be in addition to a 4% tariff already applied to U.S. tire imports).

President Obama decided to accept this recommendation from the ITC, which was the first time that a U.S. President accepted a tariff recommendation under Section 421. From 2000 to 2009, there had been six other ITC investigations under Section 421, and in four of these cases a majority of commissioners voted in favor of tariffs. But President George W. Bush declined to apply tariffs in all these cases. In accepting the recommendation to apply tariffs on tires, however, President Obama reduced the amount of the tariff to 35% in the first year starting September 26, 2009, 30% in the second year, and 25% in the third year, with the tariff expiring on September 27, 2012.

We've already noted one key difference between the tariff on tires and the earlier tariff on steel: the tire tariff was applied to imports from a single country—China—under Section 421 of U.S. trade law, whereas the steel tariff was applied against many countries under Section 201. For this reason we will refer to the tariff on tires applied against China as a **discriminatory tariff,** meaning a tariff that is applied to the imports from a specific country. Notice that a discriminatory tariff violates the "most favored nation" principle of the WTO and GATT (see **Sidebar: Key Provisions of the GATT**), which states that all members of the WTO should be treated equally. It was possible for the United States to apply this discriminatory tariff against China because Section 421 was negotiated as a condition for China entering the WTO.

A second difference between these cases is that steel producers in the United States supported that tariff, but no U.S. tire producers joined in the request for the tariff on tires. There are 10 producers of tires in the United States, and seven of them—including well-known firms like Goodyear, Michelin, Cooper, and Bridgestone—also produce tires in China and other countries. These firms naturally did not want the tariff put in place because it would harm rather than help them.

There are also a number of similarities in the two cases. As occurred in steel, the tariff on tires led to retaliation. China responded with actual or potential tariffs on products such as chicken feet (a local delicacy), auto parts, certain nylon products, and even passenger cars. For its part, the United States went on to apply new tariffs on steel pipe imported from China, and also investigated several other products. Another similarity with the steel case is that China made an official complaint to the WTO under its dispute settlement procedure, just as the European countries did in the steel case. China claimed that the "significant cause of material injury" conditions of Section 421 had not been met. China also questioned whether it was legal under the WTO for the United States to apply a discriminatory tariff. Unlike the steel case, the WTO concluded that the United States was justified in applying the tariff on tires.

The final comparison we make between the steel and tire tariffs focuses on the calculation of the deadweight losses. Because the tariff on tires was applied against only one country—China—you might think that it would have a lower deadweight loss that the steel tariff, which was applied against many countries selling to the United

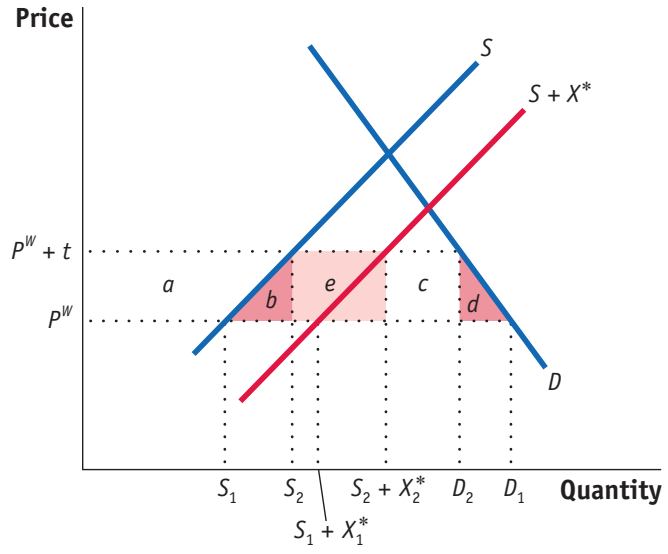
States. It turns out that the opposite is true: the tariff on tires had a *higher* deadweight loss than that tariff on steel, precisely because it was a discriminatory tariff that was applied against only one country. To explain this surprising outcome, we will make use of Figure 8-6.

A Discriminatory Tariff We suppose that China can sell any amount of tires to the United States at the price of P^W in Figure 8-6. What is new in this figure is the treatment of the *other* countries exporting to the United States. We represent these countries by the upward-sloping supply curve X^*, which is added onto U.S. supply of S to obtain total supply from all countries other than China of $S + X^*$.

Under free trade, the price for tires is P^W and the supply from the United States is S_1. Supply from the United States and exporting countries other than China is $S_1 + X_1^*$, while China exports the difference between $S_1 + X_1^*$ and demand of D_1. When the tariff of t is applied against China, the price of tires rises to $P^W + t$, supply from the United States rises to S_2. Supply from the United States and exporting countries other than China rises to $S_2 + X_2^*$. China exports the difference between $S_2 + X_2^*$ and demand of D_2. Because the price has risen to $P^W + t$, both U.S. producers and exporting countries other than China are selling more (moving along their supply curves) while China must be selling less (because the other countries are selling more and total demand has gone down).

So far the diagram looks only a bit different from our treatment of the tariff in Figure 8-5. But when we calculate the effect of the tariff on welfare in the United States, we find a new result. We will not go through each of the steps in calculating the change in consumer and producer surplus, but will focus on tariff revenue and the difference with our earlier treatment in Figure 8-5. The key idea to keep in mind is that the tariff applies only to China, and not to other exporting countries. So with

FIGURE 8-6



Effect of the Tariff on Tires The tariff on tires increases the price of tires from China from P^W to $P^W + t$. The supply from the United States is shown by S, and the supply from other exporting countries by X^*. As a result of the tariff, these two sources of supply increase from $S_1 + X_1^*$ to $S_2 + X_2^*$; China supplies the rest of the market up to demand D_1. Because the other exporting countries do not face the tariff, they collect area e from the higher prices charged in the U.S. market. Therefore, the deadweight loss from the tariff is $(b + d + e)$.

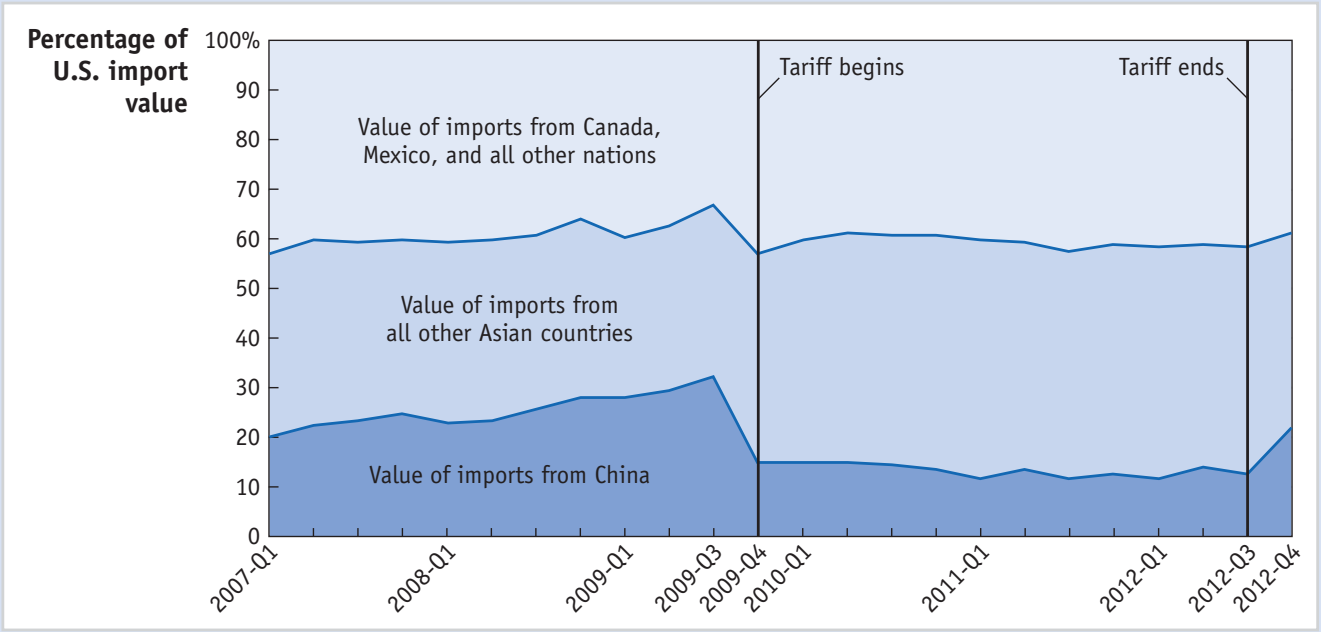
the increase in the price of tires from P^W to $P^W + t$, the other exporting countries get to keep that higher price: it is not collected from these countries as tariff revenue. Under these circumstances, the amount of tariff revenue is only the quantity that China exports (the difference between $S_2 + X_2^*$ and demand of D_2) times the tariff t, which is the area shown by c. In comparison, the area shown by e is the increase in the price charged by *other* exporters times their exports of X_2^*. Area e is not collected by the U.S. government as tariff revenue, and becomes part of the deadweight loss for the United States. The total deadweight loss for the U.S. is then $(b + d + e)$, which exceeds the deadweight loss of $(b + d)$ that we found in Figure 8-5. The reason that the deadweight loss has gone up is that other exporters are selling for a higher price in the United States, and the government does not collect any tariff revenue from them.

Deadweight Loss Due to the Tire Tariff Figure 8-6 shows that a discriminatory tariff applied against just one country has a higher deadweight loss, of $(b + d + e)$, than an equal tariff applied against all exporting countries, in which case the deadweight loss is just $(b + d)$ as we found in Figure 8-5. To see whether this theoretical result holds in practice, we can compare the tariff on tires with the tariff on steel. In the end, we will find that the tariff on tires was costlier to the United States because other countries—especially Mexico and other countries from Asia—were able to sell more tires to the United States at higher prices.

The effect of the tariff on the percentage of U.S. import value coming from China and other countries is shown in Figure 8-7. Just before the tariff was imposed in September 2009, imports into the United States were evenly divided with one-third coming from China, one-third from other Asian countries, and one-third from Canada, Mexico, and all other countries. The lowest area in the graph represents the value of imports from China. We can see that Chinese imports dropped in the fourth quarter (Q4) of 2009, after the tariff began in September, and rose again in the fourth quarter (Q4) of 2012, after the tariff ended in September of that year. The value of imports from China fell from about 33% of overall imports to 15% when the tariff began, and rose from about 12% of overall imports to 22% after the tariff ended. But this 18 percentage point decline in imports from China when the tariff began was substantially made up by increased imports from other Asian countries. We can see this result by looking at the next area shown in the graph, above China, which represents imports from all other Asian countries. When adding up the Chinese and other Asian imports, we obtain about 60% of the total imports, and while this percentage varies to some extent when the tariff begins and ends, it varies much less than does the percentage imported from China itself. In other words, other Asian countries made up for the reduction in China exports by increasing their own exports; similarly, Mexico (included within the top area in the graph) also increased its exports to the United States during the time the tariff was applied.

This increase in sales from other Asian countries and Mexico is consistent with Figure 8-6, which shows that sales from other exporters increase from X_1^* to X_2^* due to the tariff on China. The evidence also indicates that these other exporters were able to charge higher prices for the tires they sold to the United States. For car tires, the average price charged by countries other than China increased from $54 to $64 during the times of the tariff, while for light truck tires, the average prices increased from $76 to $90. Both these increases are higher than we would expect from inflation during 2009–12. As shown in Figure 8-6, these price increases for other exporters occur because they are competing with Chinese exporters who must pay the tariff.

FIGURE 8-7



U.S. Imports of Tires The tariff applied to U.S. imports of tires began in the fourth quarter of 2009 (2009Q4) and ended in the third quarter of 2012 (2012Q3). The value of imports from China fell from about 33% of overall imports to 15% when the tariff began, and rose from about 12% of overall imports to 22% when the tariff ended. This decline in imports from China was substantially made up by increased imports from other Asian countries and Mexico, which exported more to the United States.

An estimate of the area *e*—which is the total increase in the amount paid to tire exporters other than China—is $716 million per year for imports of car tires and another $101 million per year for imports of light truck tires, totaling $817 million per year.[11] This is in addition to the deadweight loss ($b + d$). This area *e* for the tire tariff substantially exceeds the deadweight loss for the steel tariff of $185 million per year that we calculated above. So we see that a discriminatory tariff, applied against just one exporting country, can be more costly then an equal tariff applied against all exporters.

At the beginning of the chapter we included a quote from President Obama in his State of the Union address in 2012, in which he said that "over a thousand Americans are working today because we stopped a surge in Chinese tires." Although 1,000 jobs in the tire industry is roughly the estimate of how many jobs were saved, we have shown that these jobs came at a very high cost because the tariff was discriminatory.[12]

[11] See Gary Clyde Hufbauer and Sean Lowry, 2012, "U.S. Tire Tariffs: Saving Few Jobs at High Cost," Peterson Institute for International Economics, Policy Brief no. PB12-9.

[12] According to Gary Clyde Hufbauer and Sean Lowry, 2012, cited in the previous footnote, there were 1,200 jobs saved in the tire industry. But taking the area *e* cost of $817 million and dividing it by 1,200 jobs gives an annual cost per job of $681,000, which is many times more than the annual earnings of a tire worker. So the discriminatory tariff was an expensive way to save these jobs.

In a later chapter we will discuss another example like this which shows that opening up free trade with just one country can have a surprising negative effect on welfare as compared with opening up free trade with all countries. ■

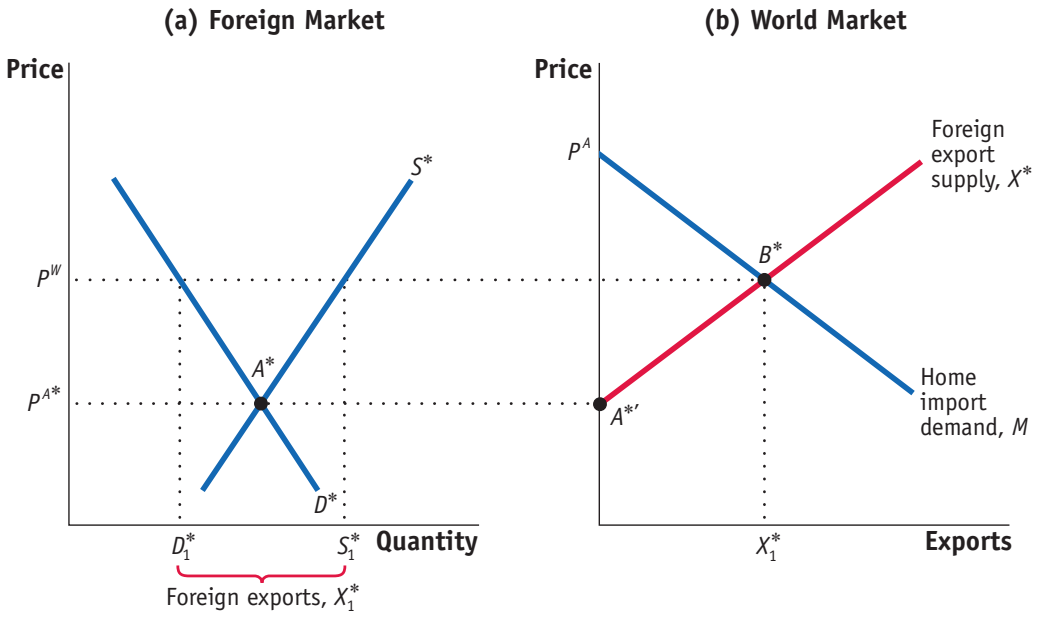
4 Import Tariffs for a Large Country

Under the small-country assumption that we have used so far, we know for sure that the deadweight loss is positive; that is, the importing country is always harmed by the tariff. The small-country assumption means that the world price P^W is unchanged by the tariff applied by the importing country. If we consider a large enough importing country or a **large country,** however, then we might expect that its tariff will change the world price. In that case, the welfare for a large importing country can be improved by a tariff, as we now show.

Foreign Export Supply

If the Home country is large, then we can no longer assume that it faces a Foreign export supply curve X^* that is horizontal at the given world price P^W. Instead, we need to derive the Foreign export supply curve using the Foreign market demand and

FIGURE 8-8



Foreign Export Supply In panel (a), with Foreign demand of D^* and Foreign supply of S^*, the no-trade equilibrium in Foreign is at point A^*, with the price of P^{A*}. At this price, the Foreign market is in equilibrium and Foreign exports are zero—point A^* in panel (a) and point $A^{*\prime}$ in panel (b), respectively. When the world price P^W is higher than Foreign's no-trade price, the quantity supplied by Foreign, S_1^*, exceeds the quantity demanded by Foreign, D_1^*, and Foreign exports $X_1^* = S_1^* - D_1^*$. In panel (b), joining up points $A^{*\prime}$ and B^*, we obtain the upward-sloping export supply curve X^*. With the Home import demand of M, the world equilibrium is at point B^*, with the price P^W.

supply curves. In panel (a) of Figure 8-8, we show the Foreign demand curve D^* and supply curve S^*. These intersect at the point A^*, with a no-trade equilibrium price of P^{A*}. Because Foreign demand equals supply at that price, Foreign exports are zero, which we show by point $A^{*\prime}$ in panel (b), where we graph Foreign exports against their price.

Now suppose the world price P^W is above the Foreign no-trade price of P^{A*}. At the price of P^W, the Foreign quantity demanded is lower, at D_1^* in panel (a), but the quantity supplied by Foreign firms is larger, at S_1^*. Because Foreign supply exceeds demand, Foreign will export the amount $X_1^* = S_1^* - D_1^*$ at the price of P^W, as shown by the point B^* in panel (b). Drawing a line through points $A^{*\prime}$ and B^*, we obtain the upward-sloping Foreign export supply curve X^*.

We can then combine the Foreign export supply curve X^* and Home import demand curve M, which is also shown in panel (b). They intersect at the price P^W, the world equilibrium price. Notice that the Home import demand curve starts at the no-trade price P^A on the price axis, whereas the Foreign export supply curve starts at the price P^{A*}. As we have drawn them, the Foreign no-trade price is lower, $P^{A*} < P^A$. In Chapters 2 to 5 of this book, a country with comparative advantage in a good would have a lower no-trade relative price and would become an exporter when trade was opened. Likewise, in panel (b), Foreign exports the good since its no-trade price P^{A*} is lower than the world price, and Home imports the good since its no-trade price P^A is higher than the world price. So the world equilibrium illustrated in panel (b) is similar to that in some of the trade models presented in earlier chapters.

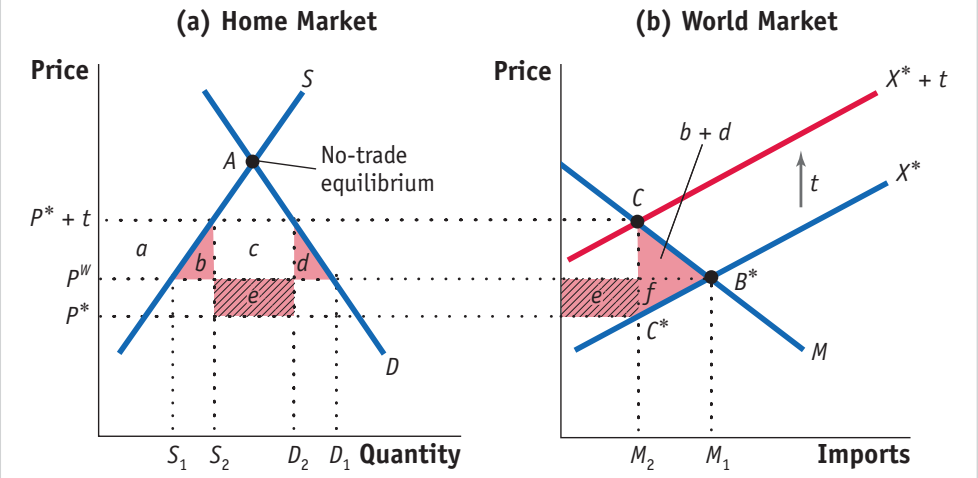
Effect of the Tariff

In panel (b) of Figure 8-9, we repeat the Home import demand curve M and Foreign export supply curve X^*, with the world equilibrium at B^*. When Home applies a tariff of t dollars, the cost to Foreign producers of supplying the Home market is t more than it was before. Because of this increase in costs, the Foreign export supply curve shifts up by exactly the amount of the tariff, as shown in panel (b) with the shift from X^* to $X^* + t$. The $X^* + t$ curve intersects import demand M at point C, which establishes the Home price (including the tariff) paid by consumers. On the other hand, the Foreign exporters receive the net-of-tariff price, which is directly below the point C by exactly the amount t, at point C^*. Let us call the price received by Foreign exporters P^*, at point C^*, which is the new world price.

The important feature of the new equilibrium is that the price Home pays for its imports, $P^* + t$, rises by *less than* the amount of the tariff t as compared with the initial world price P^W. The reason that the Home price rises by less than the full amount of the tariff is that the price received by Foreign exporters, P^*, has fallen as compared with the initial world price P^W. So, Foreign producers are essentially "absorbing" a part of the tariff, by lowering their price from P^W (in the initial free-trade equilibrium) to P^* (after the tariff).

In sum, we can interpret the tariff as driving a wedge between what Home consumers pay and what Foreign producers receive, with the difference (of t) going to the Home government. As is the case with many taxes, the amount of the tariff (t) is shared by both consumers and producers.

FIGURE 8-9



Tariff for a Large Country The tariff shifts up the export supply curve from X^* to $X^* + t$. As a result, the Home price increases from P^W to $P^* + t$, and the Foreign price falls from P^W to P^*. The deadweight loss at Home is the area of the triangle $(b + d)$, and Home also has a terms-of-trade gain of area e. Foreign loses the area $(e + f)$, so the net loss in world welfare is the triangle $(b + d + f)$.

Terms of Trade In Chapter 2, we defined the **terms of trade** for a country as the ratio of export prices to import prices. Generally, an improvement in the terms of trade indicates a gain for a country because it is either receiving more for its exports or paying less for its imports. To measure the Home terms of trade, we want to use the net-of-tariff import price P^* (received by Foreign firms) since that is the total amount transferred from Home to Foreign for each import. Because this price has fallen (from its initial world price of P^W), it follows that the Home terms of trade have increased. We might expect, therefore, that the Home country gains from the tariff in terms of Home welfare. To determine whether that is the case, we need to analyze the impact on the welfare of Home consumers, producers, and government revenue, which we do in Figure 8-9.

Home Welfare In panel (a), the Home consumer price increases from P^W to $P^* + t$, which makes consumers worse off. The drop in consumer surplus is represented by the area between these two prices and to the left of the demand curve D, which is shown by $(a + b + c + d)$. At the same time, the price received by Home firms rises from P^W to $P^* + t$, making Home firms better off. The increase in producer surplus equals the area between these two prices, and to the left of the supply curve S, which is the amount a. Finally, we also need to keep track of the changes in government revenue. Revenue collected from the tariff equals the amount of the tariff (t) times the new amount of imports, which is $M_2 = D_2 - S_2$. Therefore, government revenue equals the area $(c + e)$ in panel (a).

By summing the change in consumer surplus, producer surplus, and government revenue, we obtain the overall impact of the tariff in the large country, as follows:

Fall in consumer surplus:	$-(a+b+c+d)$
Rise in producer surplus:	$+a$
Rise in government revenue:	$+(c+e)$
Net effect on Home welfare:	$\boldsymbol{+e-(b+d)}$

The triangle $(b + d)$ is the deadweight loss due to the tariff (just as it is for a small country). But for the large country, there is also a source of gain—the area e—that offsets this deadweight loss. If e exceeds $(b + d)$, then Home is better off due to the tariff; if e is less than $(b + d)$, then Home is worse off.

Notice that the area e is a rectangle whose height is the fall in the price that Foreign exporters receive, the difference between P^W and P^*. The base of this rectangle equals the quantity of imports, M_2. Multiplying the drop in the import price by the quantity of imports to obtain the area e, we obtain a precise measure of the **terms-of-trade gain** for the importer. If this terms-of-trade gain exceeds the deadweight loss of the tariff, which is $(b + d)$, then Home gains from the tariff.

Thus, we see that a large importer might gain by the application of a tariff. We can add this to our list of reasons why countries use tariffs, in addition to their being a source of government revenue or a tool for political purposes. However, for the large country, any net gain from the tariff comes at the expense of the Foreign exporters, as we show next.

Foreign and World Welfare While Home might gain from the tariff, Foreign, the exporting country, definitely loses. In panel (b) of Figure 8-9, the Foreign loss is measured by the area $(e + f)$. We should think of $(e + f)$ as the loss in Foreign producer surplus from selling fewer goods to Home at a lower price. Notice that the area e is the terms-of-trade gain for Home but an equivalent terms-of-trade *loss* for Foreign; Home's gain comes at the expense of Foreign. In addition, the large-country tariff incurs an extra deadweight loss of f in Foreign, so the combined total outweighs the benefits to Home. For this reason, we sometimes call a tariff imposed by a large country a "beggar thy neighbor" tariff.

Adding together the change in Home welfare and Foreign welfare, the area e cancels out and we are left with a *net loss* in world welfare of $(b + d + f)$, the triangle in panel (b). This area is a deadweight loss for the world. The terms-of-trade gain that Home has extracted from the Foreign country by using a tariff comes at the expense of the Foreign exporters, and in addition, there is an added world deadweight loss. The fact that the large-country tariff leads to a world deadweight loss is another reason that most economists oppose the use of tariffs.

Optimal Tariff for a Large Importing Country We have found that a large importer might gain by the application of tariffs, but have yet to determine what *level* of tariff a country should apply in order to maximize welfare. It turns out there is a shortcut method we can use to evaluate the effect of the tariff on the welfare of a large importing country. The shortcut method uses the concept of the **optimal tariff.**

The optimal tariff is defined as the tariff that leads to the maximum increase in welfare for the importing country. For a large importing country, a small tariff initially increases welfare because the terms-of-trade gain exceeds the deadweight loss. That is, the area of the rectangle e in panel (a) of Figure 8-9 exceeds the area of the triangle $(b + d)$ in panel (b) when the tariff is small enough. The reason for this is that both the height and base of the triangle $(b + d)$ shrink to zero when the tariff is very small, so the

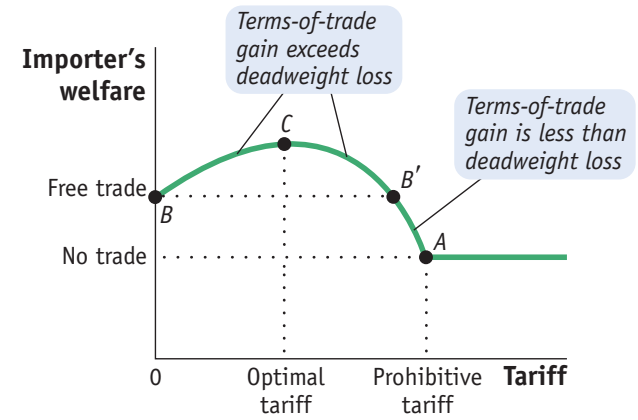
area of the triangle is very small indeed; but for the rectangle e, only the height shrinks to zero when the tariff is small, so the area of the rectangle exceeds that of the triangle. By this mathematical reasoning, the Home gains are positive—$e > (b + d)$—when the Home tariff is sufficiently small.

In Figure 8-10, we graph Home welfare against the level of the tariff. Free trade is at point B, where the tariff is zero. A small increase in the tariff, as we have just noted, leads to an *increase* in Home welfare (because the terms-of-trade gain exceeds the deadweight loss). Therefore, starting at point B, the graph of Home welfare must be upward-sloping. But what if the tariff is very large? If the tariff is too large, then welfare will fall *below* the free-trade level of welfare. For example, with a prohibitive tariff so high that no imports are purchased at all, then the importer's welfare will be at the no-trade level, shown by point A. So while the graph of welfare must be increasing for a small tariff from point B, as the tariff increases, welfare eventually falls past the free-trade level at point B' to the no-trade welfare at point A.

Given that points B and A are both on the graph of the importer's welfare (for free trade and no trade, respectively) and that welfare must be rising after point B, it follows that there must be a highest point of welfare, shown by point C. At this point, the importer's welfare is highest because the difference between the terms-of-trade gain and deadweight loss is maximized. We will call the tariff at that point the "optimal tariff." For increases in the tariff beyond its optimal level (i.e., between points C and A), the importer's welfare falls because the deadweight loss due to the tariff overwhelms the terms-of-trade gain. But whenever the tariff is below its optimal level, between points B and C, then welfare is higher than its free-trade level because the terms-of-trade gain exceeds the deadweight loss.

Optimal Tariff Formula It turns out that there is a simple formula for the optimal tariff. The formula depends on the elasticity of Foreign export supply, which we call E_X^*. Recall that the elasticity of any supply curve is the percentage increase in supply caused by a percentage increase in price. Likewise, the elasticity of the Foreign export supply curve is the percentage change in the quantity exported in response to a percent change in the world price of the export. If the export supply curve is very steep, then there is

FIGURE 8-10



Tariffs and Welfare for a Large Country For a large importing country, a tariff initially increases the importer's welfare because the terms-of-trade gain exceeds the deadweight loss. So the importer's welfare rises from point B. Welfare continues to rise until the tariff is at its optimal level (point C). After that, welfare falls. If the tariff is too large (greater than at B'), then welfare will fall below the free-trade level. For a prohibitive tariff, with no imports at all, the importer's welfare will be at the no-trade level, at point A.

little response of the quantity supplied, and so the elasticity E_X^* is low. Conversely, if the export supply curve is very flat, there is a large response of the quantity supplied due to a change in the world price, and so E_X^* is high. Recall also that a small importing country faces a perfectly horizontal, or perfectly elastic, Foreign export supply curve, which means that the elasticity of Foreign export supply is infinite.

Using the elasticity of Foreign export supply, the optimal tariff equals

$$\text{optimal tariff} = \frac{1}{E_X^*}$$

That is, the optimal tariff (measured as a percentage) equals the inverse of the elasticity of Foreign export supply. For a small importing country, the elasticity of Foreign export supply is infinite, and so the optimal tariff is zero. That result makes sense, since any tariff higher than zero leads to a deadweight loss for the importer (and no terms-of-trade gain), so the best tariff to choose is zero, or free trade.

For a large importing country however, the Foreign export supply is less than infinite, and we can use this formula to compute the optimal tariff. As the elasticity of Foreign export supply decreases (which means that the Foreign export supply curve is steeper), the optimal tariff is higher. The reason for this result is that with a steep Foreign export supply curve, Foreign exporters will lower their price more in response to the tariff.[13] For instance, if E_X^* decreases from 3 to 2, then the optimal tariff increases from $\frac{1}{3} = 33\%$ to $\frac{1}{2} = 50\%$, reflecting the fact that Foreign producers are willing to lower their prices more, taking on a larger share of the tariff burden. In that case, the Home country obtains a larger terms-of-trade increase and hence the optimal level of the tariff is higher.

APPLICATION

U.S. Tariffs on Steel Once Again

Let us return to the U.S. tariff on steel, and reevaluate the effect on U.S. welfare in the large-country case. The calculation of the deadweight loss that we did earlier in the application assumed that the United States was a small country, facing fixed world prices for steel. In that case, the 30% tariff on steel was fully reflected in U.S. prices, which rose by 30%. But what if the import prices for steel in the United States did not rise by the full amount of the tariff? If the United States is a large enough importer of steel, then the Foreign export price will fall and the U.S. import price will rise by less than the tariff. It is then possible that the United States gained from the tariff.

To determine whether the United States gained from the tariff on steel products, we can compute the deadweight loss (area $b + d$) and the terms-of-trade gain (area e) for each imported steel product using the optimum tariff formula.

Optimal Tariffs for Steel Let us apply this formula to the U.S. steel tariffs to see how the tariffs applied compare with the theoretical optimal tariff. In Table 8-2, we show various steel products along with their respective elasticities of export supply to the United States. By taking the inverse of each export supply elasticity, we obtain the optimal tariff. For example, alloy steel flat-rolled products (the first item) have a low

[13] See Problem 3 at the end of the chapter, where you will show that steeper export supply leads Foreign to absorb more of the tariff.

TABLE 8-2

Optimal Tariffs for Steel Products This table shows optimal tariffs for steel products, calculated with the elasticity formula.

Product Category	Elasticity of Export Supply	Optimal Tariff (%)	Actual Tariff (%)
Alloy steel flat-rolled products	0.27	370	30
Iron and steel rails and railway track	0.80	125	0
Iron and steel bars, rods, angles, shapes	0.80	125	15–30
Ferrous waste and scrap	17	6	0
Iron and steel tubes, pipes, and fittings	90	1	13–15
Iron and nonalloy steel flat-rolled products	750	0	0

Source: Elasticities of export supply provided by Christian Broda and David Weinstein, May 2006, "Globalization and the Gains from Variety," Quarterly Journal of Economics, *121(2), 541–585.*

export supply elasticity, 0.27, so they have a very high optimal tariff of 1/0.27 = 3.7 = 370%. In contrast, iron and nonalloy steel flat-rolled products (the last item) have a very high export supply elasticity of 750, so the optimal tariff is 1/750 ≈ 0%. Products between these have optimal tariffs ranging from 1% to 125%.

In the final column of Table 8-2, we show the actual tariffs that were applied to these products. For alloy steel flat-rolled products (the first item), the actual tariff was 30%, which is far below the optimal tariff. That means the terms-of-trade gain for that product was higher than the deadweight loss: the tariff is on the portion of the welfare graph between *B* and *C* in Figure 8-10, and U.S. welfare is above its free-trade level. The same holds for iron and steel bars, rods, angles, and shapes, for which the tariffs of 15% to 30% are again less than their optimal level, so the United States obtains a terms-of-trade gain that exceeds the deadweight loss. However, for iron and steel tubes, pipes, and fittings, the U.S. tariffs were 13% to 15%, but the optimal tariff for that product was only 1%. Because of the very high elasticity of export supply, the United States has practically no effect on the world price, so the deadweight loss for that product exceeds the terms-of-trade gain.

To summarize, for the three product categories in Table 8-2 to which the United States applied tariffs, in two products the terms-of-trade gain exceeded the deadweight loss, so U.S. welfare rose due to the tariff, but in a third case the deadweight loss was larger, so U.S. welfare fell due to the tariff. The first two products illustrate the large-country case for tariffs, in which the welfare of the importer can rise because of a tariff, whereas the third product illustrates the small-country case, in which the importer loses from the tariff.

From the information given in Table 8-2, we do not know whether the United States gained or lost overall from the steel tariffs: that calculation would require adding up the gains and losses due to the tariff over all imported steel products, which we have not done. But in the end, we should keep in mind that any rise in U.S. welfare comes at the expense of exporting countries. Even if there were an overall terms-of-trade gain for the United States when adding up across all steel products, that gain would be at the expense of the European countries and other steel exporters. As we

have already discussed, the steel exporters objected to the U.S. tariffs at the WTO and were entitled to apply *retaliatory* tariffs of their own against U.S. products. If these tariffs had been applied, they would have eliminated and reversed any U.S. gain. By removing the tariffs in less than two years, the United States avoided a costly tariff war. Indeed, that is one of the main goals of the WTO: by allowing exporting countries to retaliate with tariffs, the WTO prevents importers from using optimal tariffs to their own advantage. In a later chapter, we show more carefully how such a tariff war will end up being costly to all countries involved. ■

5 Import Quotas

On January 1, 2005, China was poised to become the world's largest exporter of textiles and apparel. On that date, a system of worldwide import quotas known as the **Multifibre Arrangement (MFA)** was abolished. Import quotas are a restriction on the amount of a particular good that one country can purchase from another country. Under the Multifibre Arrangement, begun in 1974, import quotas restricted the amount of nearly every textile and apparel product that was imported to Canada, the European countries, and the United States. These countries limited their textile imports to protect their own domestic firms producing those products. With the end of the MFA, China was ready to enjoy greatly increased exports—but this did not occur. The threat of import competition from China led the United States and Europe to negotiate *new* temporary import quotas with China, as we discuss in this section.

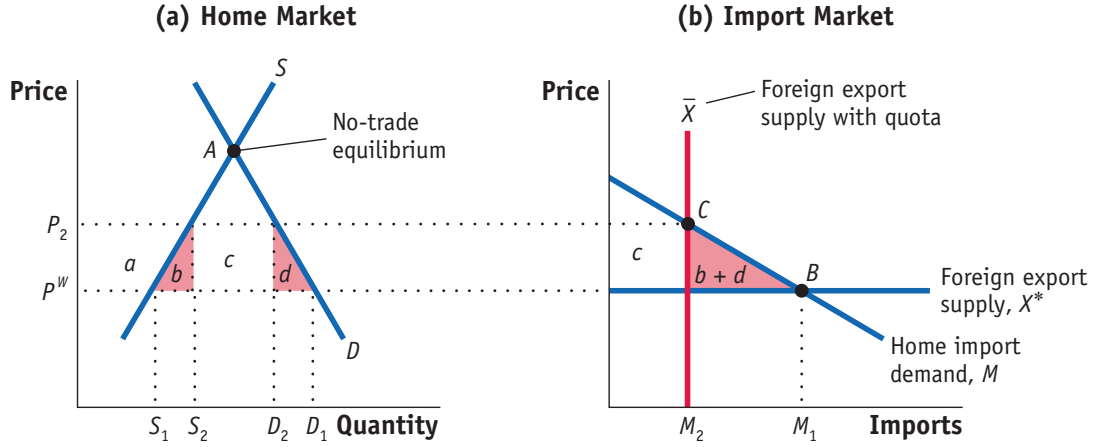
Besides the MFA, there are many other examples of import quotas. For example, since 1993 Europe had a quota on the imports of bananas that allowed for a greater number of bananas to enter from its former colonies in Africa than from Latin America. In 2005 that quota was simplified and converted into a tariff, even though that tariff still discriminated among countries based on their colonial past. Then, in 2009, Europe agreed to reduce the tariff on Latin American bananas, effectively bringing to an end this "banana war," which had lasted for more than 15 years (see **Headlines: Banana Wars**). Another example is the quota on U.S. imports of sugar, which is still in place despite calls for its removal (see **Headlines: Sugar Could Sweeten U.S. Australia Trans-Pacific Trade Talks**). In this section, we explain how quotas affect the importing and exporting countries and examine the differences between quotas and tariffs. Like a tariff, an import quota often imposes a welfare cost on the importing country. But we will find that quotas can often lead to higher welfare losses for the importer than tariffs do.

Import Quota in a Small Country

Applying an import quota for a small country is similar to applying a tariff, so we can use the graphs developed earlier in the chapter to analyze quotas, too.

Free-Trade Equilibrium In panel (a) of Figure 8-11, we show the Home demand curve D and the Home supply curve S. At the free-trade world price of P^W, Home quantity demanded is D_1 and quantity supplied is S_1, so imports are $M_1 = D_1 - S_1$. The import demand curve $M = D - S$ is shown in panel (b). The assumption that the Home country is small means that the fixed world price P^W is not affected by the import quota, so under free trade, the Foreign export supply curve X^* is

FIGURE 8-11



Quota for a Small Country Under free trade, the Foreign export supply curve is horizontal at the world price, P^W, and the free-trade equilibrium is at point B with imports of M_1. Applying an import quota of $M_2 < M_1$ leads to the vertical export supply curve $\bar{X}$—with the equilibrium at point C. The quota increases the import price from P^W to P_2. There would be the same impact on price and quantities if instead of the quota, a tariff of $t = P_2 - P^W$ had been used.

a horizontal line at the world price P^W. The Home import demand curve M and Foreign export supply curve X^* intersect at point B, resulting in the free-trade level of imports, M_1.

Effect of the Quota Now suppose that an import quota of $M_2 < M_1$ is imposed, meaning that the quantity imported cannot exceed this amount. This quota effectively establishes a vertical export supply curve labeled as $\bar{X}$ in panel (b), which fixes the import quantity at M_2. The vertical export supply curve now intersects import demand at point C, which establishes the Home price of P_2. In panel (a), the price of P_2 leads firms to increase the quantity supplied to S_2 and consumers to decrease their quantity demanded to D_2.

The import quota therefore leads to an increase in the Home price and a reduction in Home imports, just like a tariff. Furthermore, notice that there would be an equivalent effect on the import price and quantity if instead of the quota, the government had imposed an import tariff of $t = P_2 - P^W$. That is, the tariff of $t = P_2 - P^W$ would raise the Home price to P_2 and reduce imports to the level M_2. We conclude that for every level of the import quota, there is an **equivalent import tariff** that would lead to the same Home price and quantity of imports.[14]

Effect on Welfare As we have shown, the quota leads to an increase in the Home price. The rise in the price for consumers leads to a fall in consumer surplus. That fall is measured by the area between the prices P_2 and P^W and to the left of the demand curve, which is the area $(a + b + c + d)$ in panel (a) of Figure 8-11. On the other hand, the increase in the price facing Home producers leads to a gain in producer surplus.

[14] As we show in the next chapter, this conclusion depends on our assumption of perfect competition and does not hold without that assumption.

HEADLINES

Banana Wars

This article discusses a well-known example of a quota that applied to European imports of bananas. The quota and discriminatory tariff on bananas from Latin America finally ended in late 2009.

I can hardly believe the banana wars are over. The dispute started back in 1993 when the European Union set quotas favoring banana imports from Ivory Coast, the Windward Islands and other former colonies at the expense of imports from Latin America. American banana companies and the Latin American countries where they grow their bananas sued the E.U., accusing it of rigging an unfair trade deal, first under the GATT and then under the W.T.O.

The suit dragged on for years, and at several points threatened to spark an all-out trade war between Washington and Europe. In 1999, after a meeting on Kosovo was hijacked by the banana crisis, the secretary of state then, Madeleine Albright, declared in exasperation: "I never in my life thought I would spend so much time on bananas."

It finally ended this month when the E.U. said it would continue to grant tariff-free access to its former colonies but would reduce tariffs on Latin American bananas by 35 percent over seven years. The United States and Latin American producers agreed to drop their case. After all the roiling, what strikes me now is how little people seem to care. That says a lot about how attitudes toward trade have changed.

When this started, trade was trumpeted as the single most important tool for development. Europe insisted that its special treatment of its former colonies was central to its post-imperial responsibilities. The United States and Latin American countries vowed to hold the line for free trade—over bananas at least—to make it a tool of development for all.

Today nobody talks about bananas. Stalled global trade talks (remember Doha?) barely get mentioned. There are a lot of problems out there, including the collapse of world trade in the wake of the global recession and the looming threat of protectionism. Yet there has also been a rethinking about trade's supposed silver bullet role in economic development.

China's growth stands as a beacon for the power of trade. But others that have hitched their economic strategy to trade, like Mexico, have found prosperity elusive. Despite growing banana exports, both the Latin American banana exporters and Europe's impoverished former colonies remain poor.

One thing we have learned over the past 15 years is that trade is necessary but not sufficient for development. Countries also need investment in infrastructure, technology and human capital. They need credit. They need legitimate institutions—like clean courts to battle monopolies—and help building them. Putting up a few barriers against banana imports, or tearing a few of them down, can't do it all.

That gain is measured by the area between the prices P_2 and P^W and to the left of the supply curve, which is the area *a* in Figure 8-11(a). These two welfare effects are the same as would occur under a tariff.

The quota and tariff differ, however, in terms of area *c*, which would be collected as government revenue under a tariff. Under the quota, this area equals the difference between the domestic price P_2 and the world price P^W, times the quantity of imports M_2. Therefore, whoever is actually importing the good will be able to earn the difference between the world price P^W and the higher Home price P_2 by selling the imports in the Home market. We call the difference between these two prices the *rent* associated with the quota, and hence the area *c* represents the total **quota rents.** There are four possible ways that these quota rents can be allocated:

1. Giving the Quota to Home Firms First, **quota licenses** (i.e., permits to import the quantity allowed under the quota system) can be given to Home firms, which are then able to import at the world price P^W and sell locally at P_2, earning the difference

HEADLINES

Sugar Could Sweeten U.S. Australia Trans-Pacific Trade Talks

This article discusses the reasons for a sugar quota in the United States, which has been in place since before World War II. Under current negotiations for the Trans-Pacific Partnership, Australia has asked the United States to reconsider this quota and allow more exports from Australia.

Australia's sugar growers and investors could end up with a sweeter deal under the upcoming Trans-Pacific Partnership negotiations as the U.S. faces growing calls to put its long-standing sugar import restrictions on the table. The U.S. has been leading the wide-ranging regional talks, which aim to eliminate barriers to trade between the world's largest economy and some of the fastest-growing markets. In all, the 11 countries in the talks—which include Australia—account for one-third of U.S. trade. . . . [The] U.S. may finally be forced to reconsider the limits on sugar imports it has had in place since before the start of the Second World War.

To be sure, sugar is a sticky subject in the U.S. That's not only because it's already the world's largest importer of sugar, buying from more than 40 countries, the largest market for sweeteners or because, with annual production in excess of 8 million short tons, it's also one of the world's largest producers. It's because the sugar industry—which employs around 142,000 people and generates nearly $20 billion a year, according to lobby group the American Sugar Alliance—is extremely politically vocal and represents important votes in key swing states. For this reason the industry has been able to keep trade barriers intact that, for decades, kept domestic prices at roughly double the world price until about 5 years ago.

. . . [A]s the world's third-largest sugar exporter, Australia stands to reap significant benefits if the U.S. relaxes its regulations. Tom Earley, vice president for Agralytica Consulting, estimates there's an annual shortfall of more than 1 million metric tons in the U.S. that isn't met by fixed quotas and so would be up for grabs under any changes. "Australian negotiators are saying everything should be on the table and that makes sense to me," he said. "At the end of the day everything is on the table." . . . A spokesman for Australia's Department of Agriculture, Fisheries and Forestry said the U.S. remains a "valued market for the Australian sugar industry, despite volumes being constrained." The government "continues to press for increased sugar access to the U.S., although this remains a difficult issue for both countries," he added.

between these as rents. An example of this is the dairy industry in the United States, in which U.S. producers of cheese receive licenses to import from abroad. With home firms earning the rents c, the net effect of the quota on Home welfare is

Fall in consumer surplus:	$-(a+b+c+d)$
Rise in producer surplus:	$+a$
Quota rents earned at Home	+ c
Net effect on Home welfare:	$\mathbf{-(b+d)}$

We see from this calculation that the net effect on Home welfare is a loss of amount $(b + d)$. That loss is the same as what we found in Section 3 of this chapter for the loss of a tariff in a small country. As in that section, we still refer to $(b + d)$ as a deadweight loss.

2. Rent Seeking One complication of simply giving valuable quota licenses to Home firms is that these firms may engage in some kind of inefficient activities to

obtain them. For example, suppose that Home firms are producing batteries and import the chemical needed as an input. If licenses for the imported chemicals are allocated in proportion to each firm's production of batteries in the previous years, then the Home firms will likely produce more batteries than they can sell (and at lower quality) *just to obtain the import licenses for the following year*. Alternatively, firms might engage in bribery or other lobbying activities to obtain the licenses. These kinds of inefficient activities done to obtain quota licenses are called **rent seeking.** It has been suggested that the waste of resources devoted to rent-seeking activities could be as large as the value of rents themselves so that the area c would be wasted rather than accrue to Home firms. If rent seeking occurs, the welfare loss due to the quota would be

Fall in consumer surplus:	$-(a+b+c+d)$
Rise in producer surplus:	$+a$
Net effect on Home welfare:	$\mathbf{-(b+c+d)}$

The waste of resources due to rent seeking leads to a fall in Home welfare of $(b+c+d)$, which is larger than that for a tariff. It is often thought that rent seeking is more severe in some developing countries where rules are not well enforced and officials are willing to take bribes in exchange for the licenses.

3. Auctioning the Quota A third possibility for allocating the rents that come from the quota is for the government of the importing country to auction off the quota licenses. This occurred in Australia and New Zealand during the 1980s. In Australia, the auctions covered imports of textiles, apparel, footwear, and motor vehicles. The quota auctions used for imports of textiles and apparel in Australia were an alternative to the Multifibre Arrangement (MFA). Auctions of import quotas have also been proposed in the United States but have never actually occurred.[15] In a well-organized, competitive auction, the revenue collected should exactly equal the value of the rents, so that area c would be earned by the Home government. Using the auction method to allocate quota rents, the net loss in domestic welfare due to the quota becomes

Fall in consumer surplus:	$-(a+b+c+d)$
Rise in producer surplus:	$+a$
Auction revenue earned at Home	$+c$
Net effect on Home welfare:	$\mathbf{-(b+d)}$

The net effect on Home welfare in this case is the deadweight loss of $(b+d)$, which is once again the same loss as incurred from a tariff.

4. "Voluntary" Export Restraint The final possibility for allocating quota rents is for the government of the importing country to give authority for implementing the quota to the government of the *exporting* country. Because the exporting

[15] The proposals to auction import quotas in the United States were made during the 1980s; see C. Fred Bergsten, 1987, *Auction Quotas and United States Trade Policy* (Washington, D.C.: Peterson Institute for International Economics). Government auctions have occurred in the United States for bandwidth in radio frequencies and also for off-shore oil drilling.

country allocates the quota among its own producers, this is sometimes called a **"voluntary" export restraint (VER),** or a **"voluntary" restraint agreement (VRA).** In the 1980s the United States used this type of arrangement to restrict Japanese automobile imports. In that case, Japan's Ministry of International Trade and Industry (MITI), a government agency that implements Japan's trade policies, told each Japanese auto manufacturer how much it could export to the United States. In this case, the quota rents are earned by foreign producers, so the loss in Home welfare equals

Fall in consumer surplus:	$-(a+b+c+d)$
Rise in producer surplus:	$+a$
Net effect on Home welfare:	$\mathbf{-(b+c+d)}$

The VER gives a higher net loss $(b + c + d)$ for the importer than does a tariff because the quota rents are earned by foreign exporters. This result raises the question of why VERs are used at all. One answer is that by giving the quota rents to firms in the exporting country that country is much less likely to retaliate by adopting import tariffs or quotas of its own. In other words, the transfer of quota rents to the exporter becomes a way to avoid a tariff or quota war.

Costs of Import Quotas in the United States Table 8-3 presents some estimates of the home deadweight losses, along with the quota rents, for major U.S. quotas in the years around 1985. In all cases except dairy, the rents were earned by foreign exporters. We discuss the case of automobiles in the next chapter, for which the quota rents earned by foreigners range from $2 billion to $8 billion. Textiles and apparel also had very large quota rents and U.S. deadweight losses (about $5 billion each) under the MFA. In addition, the MFA imposed large losses on the Foreign exporting countries, due to rent-seeking activities by exporters to obtain the quota permits. Adding up the costs shown in Table 8-3, the total U.S. deadweight loss from these quotas was in the range of $8 billion to $12 billion annually in the mid-1980s, whereas the quota rents transferred to foreigners were another $7 billion to $17 billion annually.

Some, but not all, of these costs for the United States are no longer relevant today. The quota in automobiles ceased being applied after 1987 because Japanese producers built plants in the United States and therefore reduced their imports. The quotas in the steel industry were replaced by the "safeguard" tariffs that President Bush temporarily imposed from 2002 to 2003. But the quotas used in sugar remain, and while the MFA expired on January 1, 2005, it has been replaced by a new set of quotas with China. There is the prospect of continuing losses for the United States due to quotas in these industries, as we discuss in the next application to textiles and apparel.

TABLE 8-3

Annual Cost of U.S. Import Protection ($ billions)
Shown here are estimates of the deadweight losses and quota rents due to U.S. import quotas in the 1980s, for the years around 1985. Many of these quotas are no longer in place today.

	U.S. Deadweight Loss (area $b + d$)	Quota Rents (area c)
Automobiles	0.2–1.2	2.2–7.9
Dairy	1.4	0.25*
Steel	0.1–0.3	0.7–2.0
Sugar	0.1	0.4–1.3
Textiles and apparel	4.9–5.9	4.0–6.1
Import tariffs	1.2–3.4	0
Total	7.9–12.3	7.3–17.3

* In dairy the quota rents are earned by U.S. importers and so are not included in the total.

Source: Robert Feenstra, Summer 1992, "How Costly Is Protectionism?" Journal of Economic Perspectives, *159–178.*

APPLICATION

China and the Multifibre Arrangement

One of the founding principles of GATT was that countries should not use quotas to restrict imports (see Article XI of **Side Bar: Key Provisions of the GATT**). The Multifibre Arrangement (MFA), organized under the auspices of the GATT in 1974, was a major exception to that principle and allowed the industrial countries to restrict imports of textile and apparel products from the developing countries. Importing countries could join the MFA and arrange quotas bilaterally (i.e., after negotiating with exporters) or unilaterally (on their own). In practice, the import quotas established under the MFA were very detailed and specified the amount of each textile and apparel product that each developing country could sell to countries including Canada, Europe, and the United States.

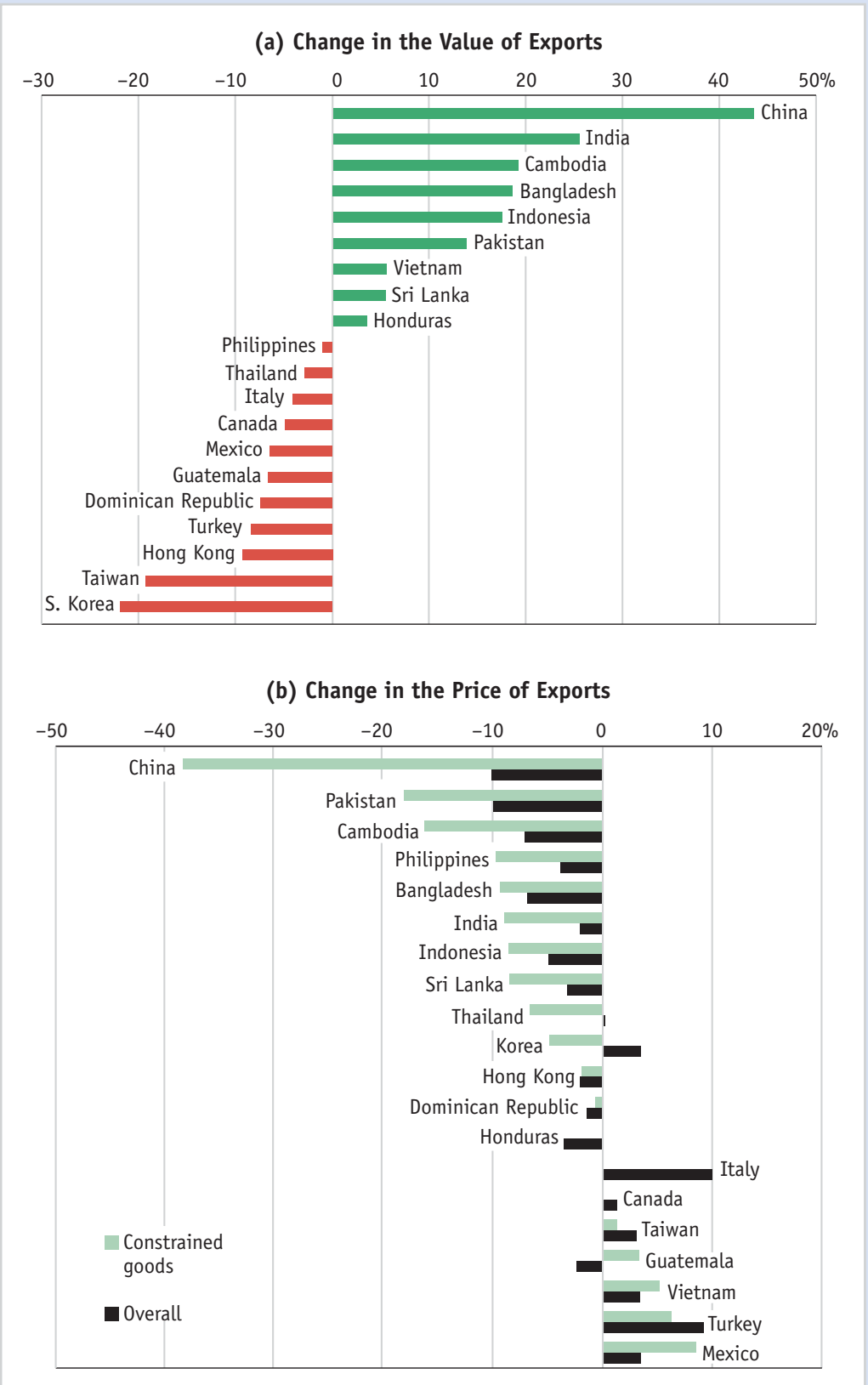
Although the amount of the quotas was occasionally revised upward, it did not keep up with the increasing ability of new supplying countries to sell. Under the Uruguay Round of WTO negotiations held from 1986 to 1994, developing countries were able to negotiate an end to this system of import quotas. The MFA expired on January 1, 2005. The biggest potential supplier of textile and apparel products was China, so the expiration of the MFA meant that China could export as much as it wanted to other countries—or so it thought. The potential for a huge increase in exports from China posed a problem for many other countries. Some developing countries expected that rising exports from China would compete with their own export of apparel items, on which many workers depended for their livelihood. The large producers in importing countries were also concerned with the potential rise in Chinese exports because it could lead to the loss of jobs for their own workers in textiles and apparel.

Growth in Exports from China Immediately after January 1, 2005, exports of textiles and apparel from China grew rapidly. For example, exports of Chinese tights and pantyhose to the European Union increased by 2,000% in January and February, as compared with a year earlier; imports of pullovers and jerseys from China jumped nearly 1,000%; and imports of trousers more than tripled. Overall in 2005, China's textile and apparel imports to the United States rose by more than 40% as compared with the year before, as shown in Figure 8-12, where we include the top 20 exporters to the U.S. market.[16] In panel (a), we show the change in the value of textile and apparel imports from each country. The surge of imports from China came at the expense of some higher-cost exporters, such as South Korea, Hong Kong, and Taiwan, whose exports to the United States declined by 10% to 20%.

In panel (b) of Figure 8-12, we show the percentage change in the prices of textiles and apparel products from each country, depending on whether the products were "constrained goods," subject to the MFA quota before January 1, 2005. China has the largest drop in prices from 2004 to 2005, 38% in the "constrained goods" categories. Many other countries also experienced a substantial fall in their prices due to the end of the MFA quota: 18% for Pakistan; 16% for Cambodia; and 8% to 9% for the Philippines, Bangladesh, India, Indonesia, and Sri Lanka. A drop in price due to the removal of the import quota is exactly what we predict from the theory, as we move

[16] Figure 8-12 and the welfare estimates in the following paragraphs are from James Harrigan and Geoffrey Barrows, 2009, "Testing the Theory of Trade Policy: Evidence from the Abrupt End of the Multifibre Arrangement," *The Review of Economics and Statistics*, vol. 91(2), pp. 282–294.

FIGURE 8-12



Changes in Clothing and Textile Exports to the United States after the MFA, 2004–2005 After the expiration of the Multifibre Arrangement (MFA), the value of clothing and textile exports from China rose dramatically, as shown in panel (a). This reflects the surge in the quantity of exports that were formerly constrained under the MFA as well as a shift to Chinese exports from other, higher-cost producers such as Hong Kong, Taiwan, and South Korea. In panel (b), we see that the prices of goods constrained by the MFA typically fell by more than the average change in export prices after the MFA's expiry. This is exactly what our theory of quotas predicts: The removal of quotas lowers import prices for consumers.

Source: James Harrigan and Geoffrey Barrows, 2009, Testing the Theory of Trade Policy: Evidence from the Abrupt End of the Multifibre Arrangement, The Review of Economics and Statistics, *vol. 91(2), pp. 282–294.*

from the price P_2 in Figure 8-11 to the free-trade price P^W. Surprisingly, a few countries in Figure 8-12 show increases in their prices, such as Mexico. However, less than 1% of Mexico's sales of textiles and apparel to the United States were constrained by the quota, so that price increase does not appear to be due to the removal of the MFA.

Welfare Cost of MFA Given the drop in prices in 2005 from countries selling to the United States, it is possible to estimate the welfare loss due to the MFA. The United States did not auction the quota licenses for textiles and apparel so the quota rents were earned by foreign exporting firms. That means the welfare loss for the United States due to the MFA is the area $(b + c + d)$ in Figure 8-11. Using the price drops from 2004 to 2005, that area is estimated to be in the range of $6.5 billion to $16.2 billion in 2005.[17] The simple average of these estimates is $11.4 billion as the total cost to the United States. To put that welfare loss in perspective, there were 111 million households in the United States in 2005, and the typical household spent about $1,400 on apparel. Dividing the loss of $11.4 billion by the 111 million households, we obtain about $100 per household, or 7% of their annual spending on apparel as the welfare cost of the MFA.[18]

Import Quality Besides the overall decline in prices, there was also an interesting pattern to the price drops: the prices of textile and apparel products dropped the most (in percentage terms) for the lower-priced items. So, an inexpensive T-shirt coming from China and priced at $1 had a price drop of more than 38% (more than 38¢), whereas a more expensive item priced at $10 experienced a price drop of less than 38% (less than $3.80). As a result, U.S. demand shifted toward the lower-priced items imported from China: there was "quality downgrading" in the exports from China.

To understand why this quality downgrading occurred, it is easiest to think about the problem in reverse: when a quota like the MFA is applied, what is the effect on quality? The MFA, like most other quotas, was applied to the *quantity* of the import sent to each country: it was applied to yards of cloth, or number of shirts, or dozens of pairs of socks, and so on. Faced with a quota of that type, the exporting firm would have an incentive to *upgrade* the type of cloth, shirts, or socks that it sells, since selling a higher value for the same quantity will still meet the quota limitation. So when the MFA starts, we expect to see "quality upgrading" in the exports for each country. By the same logic, when the MFA was removed, there was "quality downgrading" in the exports from China to the United States and exports from other countries, too.

Reaction of the United States and Europe The surge in exports from China to the United States and Europe was short-lived, however. The European Union threatened to impose new quotas on Chinese exports, and in response, China agreed on June 11, 2005, to "voluntary" export restraints that would limit its growth of textile exports to about 10% per year through the end of 2008. For the United States, the ability to negotiate a new system of quotas with China had been guaranteed by a special agreement with China when it joined the WTO in 2001. Under this agreement, China was limited to a 7.5% annual growth in its textile exports to the United States, from 2005 to 2008. This temporary

[17] Notice that this range of estimates for 2005 is comparable with (but wider than) the range of estimates for the welfare costs of textiles and apparel in Table 8-3, which is $8.9 billion to $12 billion for 1985, obtained by adding up the deadweight loss and the quota rents.

[18] In comparison, there were 737,000 U.S. workers in the textile and apparel industries in 2004, with an average annual salary of $31,500. If we divide the total loss of $11.4 billion by all these workers, we obtain about $15,500 per job protected in the U.S. industry, or about one-half of the annual salary of each worker.

quota expired at the end of 2008, at which time we might have expected the U.S. textile and apparel industry to renew its call for quota protection once again. But because of the worldwide recession, Chinese exports in this industry were much lower in 2009 than they had been in earlier years. For that reason, China indicated that it would not accept any further limitation on its ability to export textile and apparel products to the United States and to Europe, and both these quotas expired. ■

6 Conclusions

A tariff on imports is the most commonly used trade policy tool. In this chapter, we have studied the effect of tariffs on consumers and producers in both importing and exporting countries. We have looked at several different cases. First, we assumed that the importing country is so small that it does not affect the world price of the imported good. In that case, the price faced by consumers and producers in the importing country will rise by the full amount of the tariff. With a rise in the consumer price, there is a drop in consumer surplus; and with a rise in the producer price, there is a gain in producer surplus. In addition, the government collects revenue from the tariff. When we add together all these effects—the drop in consumer surplus, gain in producer surplus, and government revenue collected—we still get a *net loss* for the importing country. We have referred to that loss as the deadweight loss resulting from the tariff.

The fact that a small importing country always has a net loss from a tariff explains why most economists oppose the use of tariffs. Still, this result leaves open the question of why tariffs are used. One reason that tariffs are used, despite their deadweight loss, is that they are an easy way for governments to raise revenue, especially in developing countries. A second reason is politics: the government might care more about protecting firms than avoiding losses for consumers. A third reason is that the small-country assumption may not hold in practice: countries may be large enough importers of a product so that a tariff will affect its world price. In this large-country case, the decrease in imports demanded due to the tariff causes foreign exporters to lower their prices. Of course, consumer and producer prices in the importing country still go up, since these prices include the tariff, but they rise by less than the full amount of the tariff. We have shown that if we add up the drop in consumer surplus, gain in producer surplus, and government revenue collected, it is possible for a small tariff to generate welfare gains for the importing country.

Still, any gain for the importer in this large-country case comes at the expense of the foreign exporters. For that reason, the use of a tariff in the large-country case is sometimes called a "beggar thy neighbor" policy. We have found that the drop in the exporter's welfare due to the tariff is greater than the gain in the importer's welfare. Therefore, the world loses overall because of the tariff. This is another reason that most economists oppose their use.

In addition to an import tariff, we have also studied import quotas, which restrict the quantity of imports into a country. The WTO has tried to limit the use of import quotas and has been somewhat successful. For example, the Multifibre Arrangement (MFA) was a complex system of quotas intended to restrict the import of textiles and apparel into many industrialized countries. It was supposed to end on January 1, 2005, but both the United States and the European Union then established new quotas against imports of textiles and apparel from China, which expired at the end of 2008. The United States continues to have a quota on imports of sugar, and up until very

recently, the European Union had a quota and then a discriminatory tariff on imports of bananas (that "banana war" has now ended). These are some of the best-known import quotas, and there are other examples, too.

Under perfect competition, the effect of applying an import quota is similar to the effect of applying an import tariff: they both lead to an increase in the domestic price in the importing country, with a loss for consumers and a gain for producers. One difference, however, is that under a tariff the government in the importing country collects revenue, whereas under a quota, whoever is able to bring in the import earns the difference between the domestic and world prices, called "quota rents." For example, if firms in the importing country have the licenses to bring in imports, then they earn the quota rents. Alternatively, if resources are wasted by firms trying to capture these rents, then there is an additional deadweight loss. It is more common, however, for the foreign exporters to earn the quota rents, as occurs under a "voluntary" export restraint, administered by the foreign government. A fourth possibility is that the government in the importing country auctions the quota licenses, in which case it earns the equivalent of the quota rents as auction revenue; this case is identical to the tariff in its welfare outcome.

KEY POINTS

1. The government of a country can use laws and regulations, called "trade policies," to affect international trade flows. An import tariff, which is a tax at the border, is the most commonly used trade policy.
2. The rules governing trade policies in most countries are outlined by the General Agreement on Tariffs and Trade (GATT), an international legal convention adopted after World War II to promote increased international trade. Since 1995 the new name for the GATT is the World Trade Organization (WTO).
3. In a small country, the quantity of imports demanded is assumed to be very small compared with the total world market. For this reason, the importer faces a fixed world price. In that case, the price faced by consumers and producers in the importing country will rise by the full amount of the tariff.
4. The use of a tariff by a small importing country always leads to a net loss in welfare. We call that loss the "deadweight loss."
5. A discriminatory tariff, which is applied against just one exporting country (such as the tariff on tires applied against China), has a higher deadweight loss than an equal tariff applied against all exporters.
6. In a large country, the decrease in imports demanded due to the tariff causes foreign exporters to lower their prices. Consumer and producer prices in the importing country still go up, since these prices include the tariff, but they rise by less than the full amount of the tariff (since the exporter price falls).
7. The use of a tariff for a large country can lead to a net gain in welfare because the price charged by the exporter has fallen; this is a terms-of-trade gain for the importer.
8. The "optimal tariff" is the tariff amount that maximizes welfare for the importer. For a small country, the optimal tariff is zero since any tariff leads to a net loss. For a large country, however, the optimal tariff is positive.
9. The formula for the optimal tariff states that it depends inversely on the foreign export supply elasticity. If the foreign export supply elasticity is high, then the optimal tariff is low, but if the foreign export supply elasticity is low, then the optimal tariff is high.
10. "Import quotas" restrict the quantity of a particular import, thereby increasing the domestic price, increasing domestic production, and creating a benefit for those who are allowed to import the quantity allotted. These benefits are called "quota rents."

11. Assuming perfectly competitive markets for goods, quotas are similar to tariffs since the restriction in the amount imported leads to a higher domestic price. However, the welfare implications of quotas are different from those of tariffs depending on who earns the quota rents. These rents might be earned by firms in the importing country (if they have the licenses to import the good), or by firms in the exporting country (if the foreign government administers the quota), or by the government in the importing country (if it auctions off the quota licenses). The last case is most similar to a tariff, since the importing government earns the revenue.

KEY TERMS

trade policy, p. 234
import tariff, p. 234
import quota, p. 234
export subsidy, p. 234
dumping, p. 235
safeguard provision, p. 236
escape clause, p. 236
regional trade agreements, p. 236
free-trade areas, p. 236
customs unions, p. 236
consumer surplus, p. 236
producer surplus, p. 236
small country, p. 239
import demand curve, p. 241
deadweight loss, p. 245
production loss, p. 245
consumption loss, p. 246
dispute settlement procedure, p. 251
tariff war, p. 251
discriminatory tariff, p. 252
large country, p. 256
terms of trade, p. 258
terms-of-trade gain, p. 259
optimal tariff, p. 259
Multifibre Arrangement (MFA), p. 263
equivalent import tariff, p. 264
quota rents, p. 265
quota licenses, p. 265
rent seeking, p. 267
"voluntary" export restraint (VER), p. 268
"voluntary" restraint agreement (VRA), p. 268

PROBLEMS

1. The following questions refer to **Side Bar: Key Provisions of the GATT.**
   a. If the United States applies a tariff to a particular product (e.g., steel) imported from one country, what is the implication for its steel tariffs applied to all other countries according to the "most favored nation" principle?
   b. Is Article XXIV an exception to most favored nation treatment? Explain why or why not.
   c. Under the GATT articles, instead of a tariff, can a country impose a quota (quantitative restriction) on the number of goods imported? What has been one exception to this rule in practice?
2. Consider a small country applying a tariff t to imports of a good like that represented in Figure 8-5.
   a. Suppose that the country decides to *reduce* its tariff to t'. Redraw the graphs for the Home and import markets and illustrate this change. What happens to the quantity and price of goods produced at Home? What happens to the quantity of imports?
   b. Are there gains or losses to domestic consumer surplus due to the reduction in tariff? Are there gains or losses to domestic producer surplus due to the reduction in tariff? How is government revenue affected by the policy change? Illustrate these on your graphs.
   c. What is the overall gain or loss in welfare due to the policy change?
3. Consider a large country applying a tariff t to imports of a good like that represented in Figure 8-9.
   a. How does the export supply curve in panel (b) compare with that in the small-country case? Explain why these are different.
   b. Explain how the tariff affects the price paid by consumers in the *importing* country and the price received by producers in the *exporting* country. Use graphs to illustrate how the prices are affected if (i) the export supply curve is very elastic (flat) or (ii) the export supply curve is inelastic (steep).

4. Consider a large country applying a tariff t to imports of a good like that represented in Figure 8-9. How does the size of the terms-of-trade gain compare with the size of the deadweight loss when (i) the tariff is very small and (ii) the tariff is very large? Use graphs to illustrate your answer.

5. a. If the foreign export supply is perfectly elastic, what is the optimal tariff Home should apply to increase welfare? Explain.
   b. If the foreign export supply is less than perfectly elastic, what is the formula for the optimal tariff Home should apply to increase welfare?
   c. What happens to Home welfare if it applies a tariff higher than the optimal tariff?

6. Rank the following in ascending order of Home welfare and justify your answers. If two items are equivalent, indicate this accordingly.
   a. Tariff of t in a small country corresponding to the quantity of imports M
   b. Tariff of t in a large country corresponding to the same quantity of imports M
   c. Tariff of t' in a large country corresponding to the quantity of imports $M' > M$

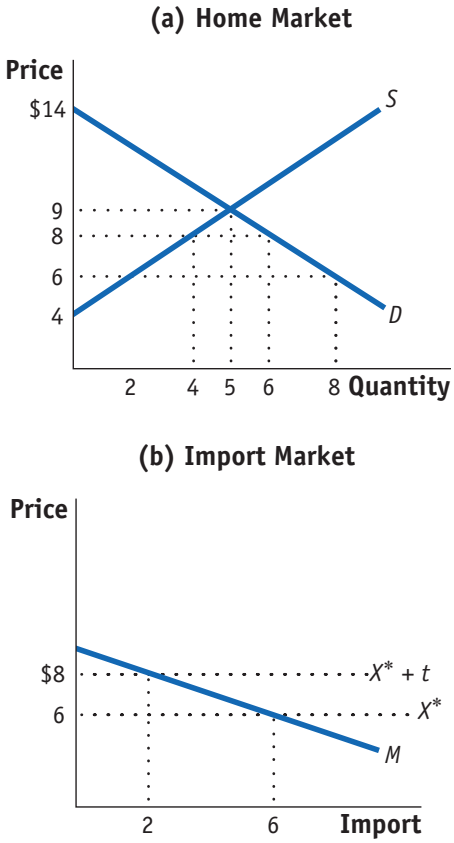
7. Rank the following in ascending order of Home welfare and justify your answers. If two items are equivalent, indicate this accordingly.
   a. Tariff of t in a small country corresponding to the quantity of imports M
   b. Quota with the same imports M in a small country, with quota licenses distributed to Home firms and no rent seeking
   c. Quota of M in a small country with quota licenses auctioned to Home firms
   d. Quota of M in a small country with the quota given to the exporting firms
   e. Quota of M in a small country with quota licenses distributed to rent-seeking Home firms

8. Why did President George W. Bush suspend the U.S. tariffs on steel 17 months ahead of schedule?

9. What provision of U.S. trade law was used by President Barack Obama to apply a tariff on tires imported from China? Does this provision make it easier or harder to apply a tariff than Section 201?

10. No U.S. tire producers joined in the request for the tariff on tires in 2009. Rather, the petition for a tariff on tires imported from China was brought by the United Steelworkers of America, the union who represents workers in the tire industry. Why did major tire manufacturers operating in the United States, such as Goodyear, Michelin, Cooper, and Bridgestone, not support the tariff?

11. Suppose Home is a small country. Use the graphs below to answer the questions.



   a. Calculate Home consumer surplus and producer surplus in the absence of trade.
   b. Now suppose that Home engages in trade and faces the world price, $P^* = \$6$. Determine the consumer and producer surplus under free trade. Does Home benefit from trade? Explain.
   c. Concerned about the welfare of the local producers, the Home government imposes a tariff in the amount of \$2 (i.e., $t = \$2$). Determine the net effect of the tariff on the Home economy.

12. Refer to the graphs in Problem 11. Suppose that instead of a tariff, Home applies an import quota limiting the amount Foreign can sell to 2 units.
    a. Determine the net effect of the import quota on the Home economy if the quota licenses are allocated to local producers.
    b. Calculate the net effect of the import quota on Home welfare if the quota rents are earned by Foreign exporters.
    c. How do your answers to parts (a) and (b) compare with part (c) of Problem 11?

13. Consider a small country applying a tariff t as in Figure 8-5. Instead of a tariff on *all* units imported, however, we will suppose that the tariff applies only to *imports* in excess of some quota amount M' (which is less than the total imports). This is called a "tariff-rate quota" (TRQ) and is commonly used on agricultural goods.
    a. Redraw Figure 8-5, introducing the quota amount M'. Remember that the tariff applies only to imports *in excess* of this amount. With this in mind, what is the rectangle of tariff revenue collected? What is the rectangle of quota rents? Explain briefly what quota rents mean in this scenario.
    b. How does the use of a TRQ rather than a tariff at the same rate affect Home welfare? How does the TRQ, as compared with a tariff at the same rate, affect Foreign welfare? Does it depend on who gets the quota rents?
    c. Based on your answer to (b), why do you think TRQs are used quite often?

14. Consider the following hypothetical information pertaining to a country's imports, consumption, and production of T-shirts following the removal of the MFA quota:

	With MFA	Without MFA (Free Trade)
World price ($/shirt)	2.00	2.00
Domestic price ($/shirt)	2.50	2.00
Domestic consumption (million shirts/year)	100	125
Domestic production (million shirts/year)	75	50
Imports (million shirts/year)	25	75

    a. Graph the effects of the quota removal on domestic consumption and production.
    b. Determine the gain in consumer surplus from the removal of the quota.
    c. Determine the loss in producer surplus from the removal of the quota.
    d. Calculate the quota rents that were earned under the quota.
    e. Determine how much the country has gained from removal of the quota.

15. Suppose that a producer in China is constrained by the MFA to sell a certain number of shirts, regardless of the type of shirt. For a T-shirt selling for $2.00 under free trade, the MFA quota leads to an increase in price to $2.50. For a dress shirt selling for $10.00, the MFA will also lead to an increase in price.

	With MFA	Without MFA (Free Trade)
Domestic price of T-shirt ($/shirt)	2.50	2.00
Domestic price of dress shirt ($/shirt)	?	10.00

    a. Suppose that the MFA leads to an increase in the price of dress shirts from $10 to $11. Will the producer be willing to export both T-shirts and dress shirts? (Remember that only a fixed number of shirts can be exported, but of any type.) Explain why or why not.
    b. For the producer to be willing to sell *both* T-shirts and dress shirts, what must be the price of dress shirts under the MFA?
    c. Based on your answer to part (b), calculate the price of dress shirts *relative* to T-shirts before and after the MFA. What has happened to the relative price due to the MFA?
    d. Based on your answer to part (c), what will happen to the relative demand in the United States for dress shirts versus T-shirts from this producer due to the MFA?
    e. Thinking now of the total export bundle of this producer, does the MFA lead to quality upgrading or downgrading? How about the removal of the MFA?

NETWORK

Go to http://www.wto.org/ and find out how many countries belong to the WTO. Which countries joined most recently?

Go to http://www.usitc.gov/trade_remedy/about_global_safeguard_inv.htm and read about Section 201 and Section 421 of U.S. Trade Act of 1974. What are the differences between these sections? What are some recent cases?