

## 8

# Import Tariffs and Quotas under Perfect Competition

## Notes to Instructor

### Chapter Summary

This chapter examines the impact of import tariffs on the welfare of the importing country, exporting country, and world. The welfare implications are different depending on whether the importing country is small or large. Reasons for the popularity of tariffs are discussed as well as the role of the General Agreement on Tariffs and Trade (GATT)/World Trade Organization (WTO). In addition to tariffs, there is also a discussion of the use of an import quota as a barrier to trade.

### Comments

To help students understand the impact of import tariffs on Home welfare under the small- and large-importing country cases, it would be useful to briefly review how consumer and producer surplus changes when a tax is imposed with a perfectly elastic supply curve and an upward-sloping supply curve.

## Lecture Notes

### Introduction

As part of his campaign for re-election, President George W. Bush made promises to use a **trade policy** to protect the steel industry. Upon his victory,

with a “safeguard” rationale, President Bush placed **import tariffs** on steel. Although the tariffs were scheduled to be imposed for 3 years, President Bush suspended the import tax after 19 months.

As a member of the WTO, the United States is governed by policies to promote free trade between nations by lowering tariffs and other barriers to trade. In this chapter, we examine why countries apply import tariffs or **import quotas** (limits on imports), and the welfare implications of these tariffs on the importing country, exporting country, and the world under the assumption of perfect competition. In addition, we compare the effect of an import quota with that of a tariff.

## 1 A Brief History of the World Trade Organization

The GATT was formed in 1947 to promote free trade among nations by reducing trade barriers. The goal was to foster cooperation, integration, and mutual gains from trade. Through periodic negotiations called rounds, member countries would agree to lower trade restrictions. On January 1, 1995, the GATT was christened the World Trade Organization and became a formal global institution. The WTO gained authority to govern international trade through binding agreements.

1. One of the main agreements governing trade states that a nation must apply the same tariffs to all members of the WTO. Article I of the GATT, also known as the “most favored nation” clause, helps to eliminate discrimination by requiring that all WTO countries be treated equally.
2. Although the rules of the WTO require members to maintain low tariffs, under certain provisions, a member country may temporarily charge a higher tariff. One such case is the exception under Article VI of the GATT, which allows an importing country to respond with a tariff when an exporting country is found dumping, namely selling products below fair-market value.
3. Under Article XI, countries agree to promote free trade by not maintaining quotas or limits on imports.
4. By Article XVI, the members will refrain from distorting trade through the use of export subsidies. If export subsidies are provided, the extent of the subsidies should be declared to all affected parties (i.e., particular firms, sectors, or industries).
5. Another exemption from the rules is given in Article XIX, also referred to as the “safeguard” provision or the “escape clause.” Under Article XIX, a country experiencing or in threat of serious injury from foreign competition may temporarily raise its import tariffs against the exporting country.
6. In addition, provided that tariffs on outside members remain unchanged, two or more WTO countries may form **regional trade agreements**, such as **free-trade areas** and **customs unions**, under Article XXIV of the GATT.

**NETWORK**

There are 149 members as of December 11, 2005.

<b>Date of Membership: 1995</b>		
Antigua and Barbuda	Guatemala	Nicaragua
Argentina	Guinea	Nigeria
Australia	Guinea Bissau	Norway
Austria	Guyana	Pakistan
Bahrain	Honduras	Paraguay
Bangladesh	Hong Kong	Peru
Barbados	Hungary	Philippines
Belgium	Iceland	Poland
Belize	India	Portugal
Bolivia	Indonesia	Romania
Botswana	Ireland	St. Lucia
Brazil	Israel	St. Vincent and Grenadines
Brunei	Italy	Senegal
Burkina Faso	Jamaica	Sierra Leone
Burundi	Japan	Singapore
Cameroon	Kenya	Slovak Republic
Canada	South Korea	Slovenia
Central African Republic	Kuwait	South Africa
Chile	Lesotho	Spain
Colombia	Liechtenstein	Sri Lanka
Costa Rica	Luxembourg	Suriname
Côte d'Ivoire	Macao	Swaziland
Cuba	Madagascar	Sweden
Cyprus	Malawi	Switzerland
Czech Republic	Malaysia	Tanzania
Denmark	Maldives	Thailand
Djibouti	Mali	Togo
Dominica	Malta	Trinidad and Tobago
Dominican Republic	Mauritania	Tunisia
Egypt	Mauritius	Turkey
El Salvador	Mexico	Uganda
Finland	Morocco	United Kingdom
France	Mozambique	United States of America
Gabon	Myanmar	Uruguay
Germany	Namibia	Venezuela
Ghana	Netherlands	Zambia
Greece	New Zealand	Zimbabwe
<b>Date of Membership: 1996–1999</b>		
Angola	Gambia	Panama
Benin	Grenada	Papua New Guinea
Bulgaria	Haiti	Qatar
Chad	Kyrgyz	Rwanda
Congo	Latvia	Solomon Islands
Ecuador	Mongolia	St. Kitts and Nevis
Estonia	Niger	United Arab Emirates
Fiji		
<b>Date of Membership: 2000–2005</b>		
Albania	Georgia	Nepal
Armenia	Jordan	Oman
Cambodia	Lithuania	Saudi Arabia
China	Macedonia	Taiwan
Croatia	Moldova	

**S I D E B A R****Key Provisions of the GATT**

The article presented in this section states the goal of the GATT and the corresponding main articles. Namely, the objective of the GATT is for member countries to achieve mutual benefits through the reduction of tariffs and other barriers to trade.

**ARTICLE I: General Most-Favoured-Nation Treatment**

Under Article I, a member country may not engage in discriminatory practices such as extending privileges to its most-favored nation without offering these favors to all other contracting parties.

**ARTICLE VI: Anti-dumping and Countervailing Duties**

Article VI allows an injured country to retaliate against an exporter illegally dumping the product in the importing market. Dumping is defined as the act of selling the product to the importing country at a price less than what the exporter offers to its domestic market or lower than to a third country or below the cost of production.

**ARTICLE XI: General Elimination of Quantitative Restrictions**

Article XI requires the members to eliminate or convert other trade barriers such as quotas and import or export licenses to tariffs that are more measurable.

**ARTICLE XVI: Subsidies**

A member must notify contracting parties of its intention to assist its importing or exporting industries through a subsidy under Article XVI.

**ARTICLE XIX: Emergency Action on Imports of Particular Products**

As mentioned previously, Article XIX gives permission to a contracting party to prevent or remedy any conditions as to cause or threaten serious injury to the importing country by removing its obligation to lower tariff on the exporting country.

**ARTICLE XXIV: Territorial Application—Frontier Traffic—Customs Unions and Free-trade Areas**

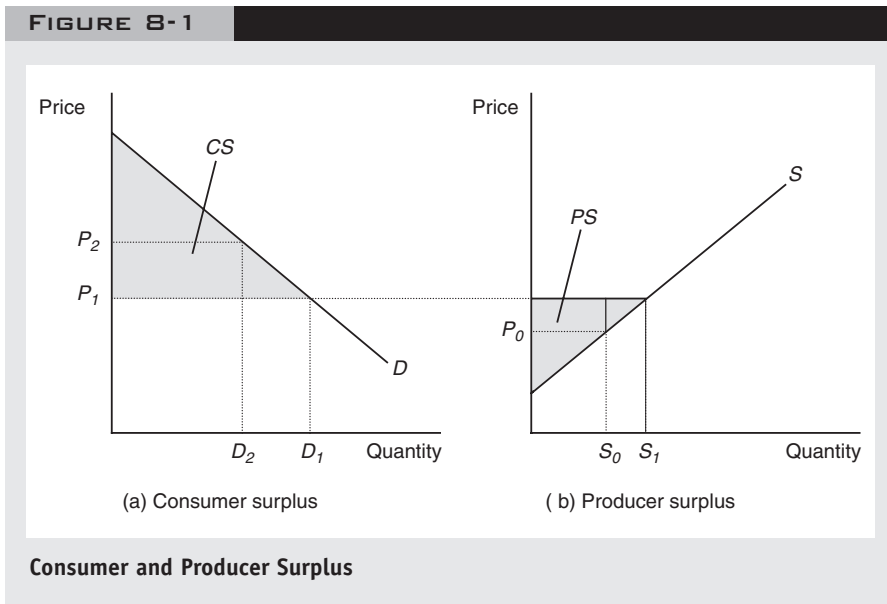
Countries may form customs unions under Article XXIV, provided that the tariffs applied to noncustoms members not exceed those prior to the formation.

**2 The Gains from Trade**

In what follows, we use the concept of consumer surplus and producer surplus to examine the gains a country receives from engaging in international trade, beginning with a review using supply and demand curves.

**Consumer and Producer Surplus**

Recall that the height of the demand curve reflects the consumer's willingness to pay for a product. With the demand curve,  $D$ , illustrated in panel (a) of Figure 8-1, the consumer is willing to buy  $D_i$  units of the good at the price of  $P_i$ . For the last unit purchased, the demand curve intersects the price paid. This means that the consumer is paying the amount exactly equal to the individual's value of the product. However, for every unit prior to the last one, the demand curve is above the price paid. Namely, the consumer is willing to pay a price higher than  $P_i$  for the product. The vertical difference between the demand curve and the price,  $P_i$ , is the additional surplus the consumer receives from purchasing the product. Consumer surplus (CS) is obtained by summing the additional benefit from each unit purchased at price  $P_i$  up to demand,  $D_i$ .



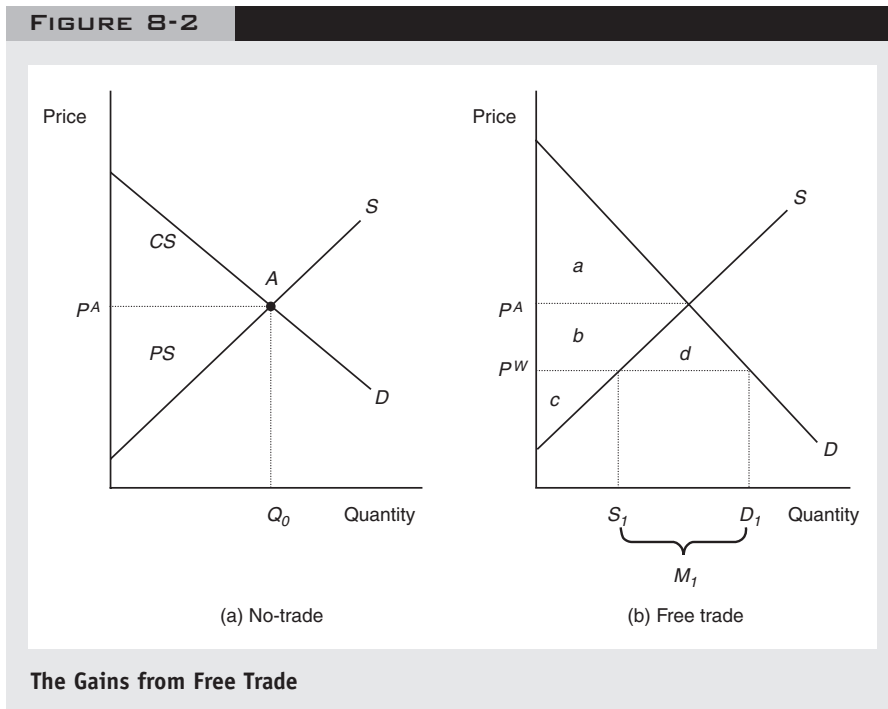
To determine producer surplus refer to the supply curve,  $S$ , shown in panel (b) of Figure 8-1. The supply curve indicates the marginal cost of producing each additional unit of output. Given a price of  $P_1$ , a firm will supply  $S_1$  quantity of the product. In supplying the last unit, the marginal cost incurred by the firm from production is precisely offset by the price received. For each quantity produced by the firm prior to  $S_1$ , the marginal cost of that unit is lower than the price paid by consumers. For example, in providing the  $S_0$  unit, the marginal cost to the firm is  $P_0$ . However, since the firm is able to receive the price of  $P_1$  for that unit it obtains an additional surplus equal to the vertical distance between the price received and the supply curve. Adding up the surplus for units up to  $S_1$  gives the producer surplus (PS) at the price of  $P_1$ .

### Home Welfare

Using the concept of consumer and producer surplus, we will return to our simple world of two countries to examine how trade affects the total welfare at Home.

**No-Trade** Panel (a) of Figure 8-2 shows that in the absence of trade, the intersection of supply and demand gives the equilibrium quantity,  $Q_0$ , and equilibrium price,  $P^A$ . CS is the region beneath the demand curve and above  $P^A$  in panel (a) or area  $a$  in panel (b). PS is represented by the section above the supply curve and below  $P^A$  in panel (a) or area  $(b + c)$  in panel (b). The Home welfare is the sum of consumer and producer surplus, which equals  $CS + PS$  in panel (a) or area  $(a + b + c)$  in panel (b). Home is better off the greater the amount of consumer and producer surplus.

**Free Trade for a Small Country** We will now allow Home to engage in international trade. Suppose that Home is an importer much too small to impact the world price by the amount it purchases. Given the fixed world price,  $P^W$ , which is lower than its autarky price of  $P^A$ , consumers at Home will increase the quantity demanded to  $D_1$ , whereas producers will decrease the quantity



supplied to  $S_1$ . The excess demand, given by the difference between  $D_1$  and  $S_1$ , is satisfied via imports,  $M_1$ .

**Gains from Trade** Let's turn to panel (b) to determine the gains from trade. Under free trade, consumers are better off because they pay a lower price,  $P^W$ , relative to autarky,  $P^A$ . Due to the decrease in price and increase in quantity demanded, consumer surplus enlarges by the amount  $(b + d)$ . By contrast, producers at Home are worse off because the price they received decreased from  $P^A$  in the absence of trade to  $P^W$  under free trade. Due to the reduction in price received, the quantity supplied decreases.

The drop in price results in a loss of area  $b$  for producers. By summing up the gains of the consumers,  $(b + d)$ , with the losses of producers, area  $b$ , we can calculate the net effect of trade on Home welfare as follows:

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

Because the rise in consumer surplus is greater than the fall in producer surplus (i.e.,  $(b + d) > b$ ) the overall impact of trade on Home welfare is positive.

The triangle  $d$  denotes the *gains from trade* Home receives by importing under free trade.

### Home Import Demand Curve

We will briefly review the concept of **import demand curves** and export supply curves first introduced in Chapter 2 before we begin our analysis of import tariffs. Panel (a) of Figure 8-3 shows the familiar supply and demand

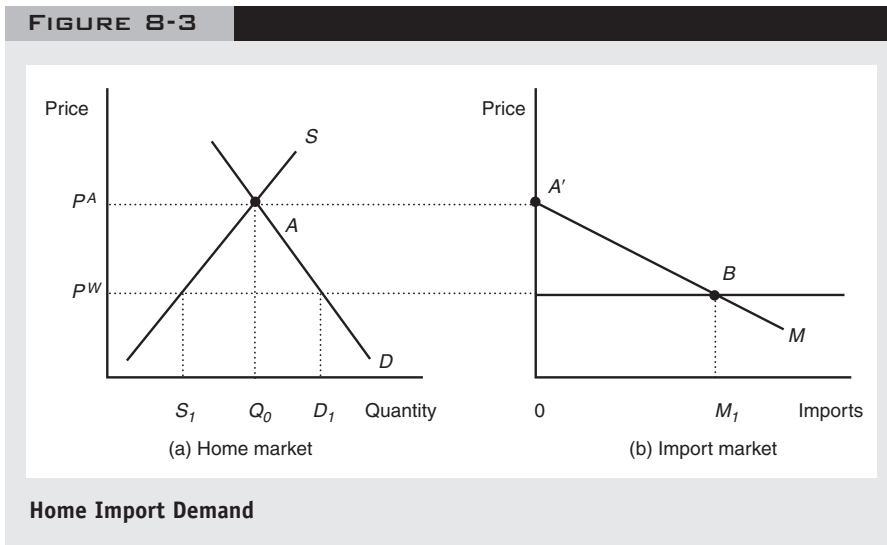


diagram for Home. The domestic market equilibrium, absence of trade, is given by point  $A$  with equilibrium quantity and price denoted by  $Q_0$  and  $P^A$ , respectively. Because the quantity supplied equals the quantity demanded at point  $A$ , Home import is zero as shown by point  $A'$  in panel (b). Suppose when Home opens to trade, it faces a lower world price, given by  $P^W$ . From panel (a), we see that at  $P^W$ , the quantity demanded,  $D_1$ , exceeds the quantity supplied,  $S_1$ . The difference between what consumers at Home are willing to purchase at  $P^W$  and what producers are willing to supply is the amount imported,  $M_1 = D_1 - S_1$ , or point  $B$  in panel (b). The line labeled  $M$  in panel (b) connecting points  $A'$  and  $B$  represents the import demand curve for Home.

### 3 Import Tariffs for a Small Country

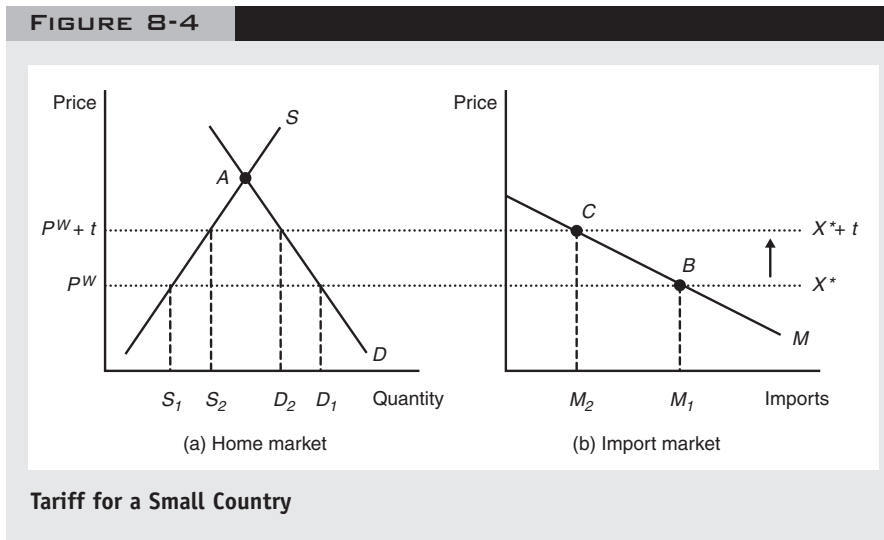
We are now ready to examine the effect of an import tariff on Home's welfare. We begin by assuming that Home is a small country taking the world price as fixed.

#### Free Trade for a Small Country

Figure 8-4 shows the Home market in panel (a) and the import market in panel (b). Given that the world price,  $P^W$ , is below the no-trade equilibrium price, Home will import  $M_1$  to meet the excess demand ( $D_1 - S_1$ ). Because Home is a small country, its demand in the world market does not influence price as represented by the horizontal export supply curve, labeled  $X^*$  in panel (b).

#### Effect of the Tariff

In what follows, we will impose an import tariff, also known as a *duty*, in the amount of  $t$  on each good that enters Home. Similar to other forms of taxes, the import tariff will have an effect on the price paid by the consumer as well as the prices received by the local and foreign producers. We assume that the



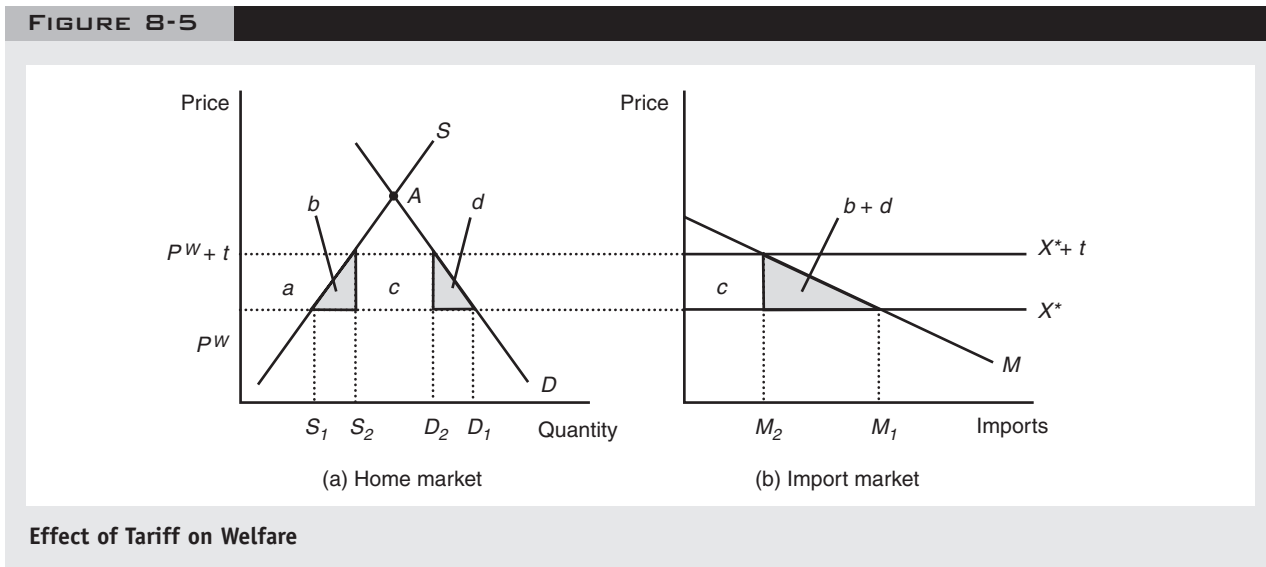
product is homogenous, whether produced at Home or exported from Foreign.

Due to the import tariff in the amount of  $t$  per unit, the price of the import increases from  $P^W$  to  $P^W + t$  in panel (a), which corresponds to an upward shift of the export supply curve by size of the tariff to  $X^* + t$  in panel (b). At the higher price, quantity demanded falls from  $D_1$  to  $D_2$  as shown in panel (a). By contrast, the quantity supplied increases from  $S_1$  to  $S_2$  because additional producers now find it profitable to supply in the market. Namely, at  $P^W$ , producers with marginal costs greater than the free-trade price would not be able to compete. However, with the higher price induced by the tariff, producers whose marginal costs exceed  $P^W$  but are less than or equal to  $P^W + t$  can now domestically supply their product. With the decrease in the quantity demanded and the increase in the quantity supplied, it follows that the amount imported,  $M_2$ , has fallen, as shown in panel (b).

**Effect of the Tariff on Consumer Surplus** Recalling that consumer surplus is the difference between what the consumers are willing to pay, represented by the demand curve, minus what they actually pay, we will determine the effect of the import tariff on the welfare of the consumers at Home. Because the tariff raised the price paid by consumers from  $P^W$  to  $P^W + t$ , consumer surplus is no longer the area under the demand curve and above  $P^W$  but instead is the smaller area under the demand curve and above  $P^W + t$ . The resulting loss in consumer surplus is denoted by area  $(a + b + c + d)$  in Figure 8-5.

**Effect of the Tariff on Producer Surplus** Contrary to the situation for consumers, producer surplus increases as a result of the import tariff. To see this, recall that producer surplus is the area between the price received and the marginal cost of production, given by the supply curve. In particular, the tariff raises the price the sellers receive from  $P^W$  to  $P^W + t$  so they gain the additional area labeled  $a$  in Figure 8-5.

**Effect of the Tariff on Government Revenue** To accurately determine the impact of the import tariff on Home welfare, we also need to consider the tar-



iff revenue received by the government. With the amount of the tariff per unit given by  $t$  and the quantity imported equal to  $M_2$  or  $D_2 - S_2$ , the revenue collected by the government is the area  $c$  from multiplying  $t$  with  $M_2$ .

**Overall Effect of the Tariff on Welfare** To analyze the effects of the import tariff on Home welfare, we sum up the loss of the consumers with the gains of the producers and government as follows:

$$\text{Fall in consumer surplus:} \quad -(a + b + c + d)$$

$$\text{Rise in producer surplus:} \quad +a$$

$$\text{Rise in government revenue:} \quad +c$$

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$$\text{Net effect on Home welfare} \quad -(b + d)$$

The net effect on Home welfare is negative, as denoted by the areas  $b$  and  $d$  in panel (a) of Figure 8-5. More specifically, the areas  $a$  and  $c$  once belonging to consumers before the tariff are transferred to producers and the government, respectively. However there are additional losses to consumers that are not claimed by any group in the economy after the imposition of the tariff. This net loss—also referred to as a deadweight loss—is represented by area  $(b + d)$  in panel (b).

**Production Loss** The deadweight loss can be further identified. The triangle  $b$  is called the production loss or efficiency loss because, although the product can be imported more cheaply at the world price, production is shifted to local producers with higher marginal costs when the price received by producers at Home raises from  $P^W$  to  $P^W + t$  due to the tariff.

**Consumption Loss** With the tariff, the price faced by consumers ( $P^W + t$ ) is now higher than some individual's willingness to pay for units  $D_1$  to  $D_2$ . The resulting consumption loss is given by the triangle labeled  $d$  in panel (a).

### Why are Tariffs Used?

This section shows that a small importing country loses when it imposes a tariff on foreign export. Yet tariffs are widely used despite the potential net loss for the importing country. One explanation is that tariffs provide necessary government revenues for a developing country. Another reason is that the benefits of the tariff to producers and workers in the protected industry are more concentrated relative to the costs borne by consumers. With a more defined constituent, the promise of or imposition of tariffs could potentially lead to political gains. Examples include President Bush's promise to impose an import tariff to protect the steel industry during his re-election campaign.

## S I D E B A R

### Globalization and Developing Countries—A Shrinking Tax Base?

Despite their higher deadweight loss, tariffs are frequently used as sources of revenue, particularly in developing countries, because custom duties are easier to collect compared with other taxes such as income or value-added. Unlike the “hard-to-collect” taxes, which rely on the earnings report filed by individuals and firms, import tariffs are imposed as foreign goods cross the border. How-

ever, with globalization, countries are likely to shift away from tariffs toward “hard-to-collect” taxes to decrease the deadweight loss. Results from one study show that from the early 1980s to the late 1990s, the ratio of “easy-to-collect” tax revenue to gross domestic product (GDP) decreased by 20% whereas ratio of “hard-to-collect” tax revenue increased 9%.

### APPLICATION

#### U.S. Tariffs on Steel

Section 201 of the U.S. Trade Act has a “safeguard” provision similar to the “escape clause” in Article XIX of the GATT for importers facing “serious injury, or threat thereof” from foreign competition.

As part of his re-election campaign to the steel-producing states of Pennsylvania, West Virginia, and Ohio, President George W. Bush made promises to protect the steel industry. Upon his victory, President Bush requested the U.S. International Trade Commission (ITC) to initiate a Section 201 investigation for the steel industry. The ITC in turn recommended to the President that the tariffs be imposed. In March 2002, the President placed tariffs on steel, ranging from 8% to 30%, but exempted countries that have free-trade agreements with the United States (i.e., Canada, Mexico, Jordan, and Israel) as well as 100 small developing countries that export lesser amounts of steel to the United States. The tariffs were to be imposed for 3 years, declining with each subsequent year. ■

### NETWORK

According to the guidelines of Section 201 of the U.S. Trade Act of 1974, the ITC has 120 days from the time a complaint is filed to make its injury finding. For more complicated cases, the ITC is allowed 150 days. Any recommendations, along with the report, must be submitted to the president within 180 days after receipt of the petition.

Recent Cases				
Docket No.	Received	Country	Commodity	Firm
2493	06/23/2006	China	Certain polyester staple fiber	Dak Americas LLC, Nan Ya Plastics Corporation America, and Wellman, Inc.
2473	03/08/2006	China	Activated carbon	Calgon Carbon Corporation and Norit Americas Inc.
2455	11/10/2005	China, Germany, and Turkey	Carbon and alloy steel wire rod	Connecticut Steel Corp.; Gerdau Ameristeel U.S., Inc.; Keystone Consolidated Industries, Inc.; Mittal Steel U.S.A. Georgetown; and Rocky Mountain Steel Mills

*Source: U.S. International Trade Commission, 2006.*

**Deadweight Loss due to the Steel Tariff** To calculate the deadweight loss due to the tariff on steel, we will define the corresponding triangle  $b + d$  in panel (b) of Figure 8-5 as

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

where  $\Delta M$  is the change in import (base of triangle) and  $DP$  is the increase in the domestic price (height of the triangle) following the import tax (i.e.,  $DP = t$ ). To measure the deadweight loss relative to the value of imports  $P^W \cdot M$ , we multiply the right-hand side by the percentage tariff,  $t / P^W$ . Re-arranging gives:

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

Next we substitute in the percentage increase in price with the average tariffs of 30% (i.e.,  $t / P^W = 0.3$ ) and the 30% decrease in the quantity of steel imported during the first year of the tariff (i.e.,  $\% \Delta M = 0.3$ ) and get,

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

Averaging the value of steel imports before (\$4.7 billion) and after (\$3.5 billion) tariff placement gives a 2-year average of \$4.1 billion. Multiplying the calculated deadweight loss of 4.5% to the average import value of \$4.1 billion, we get that the net annual loss to the United States due to the tariffs on steel was \$185 million.

**Response of the European Countries** As expected, those in the steel-producing industry gained from the tariff, whereas consumers of steel opposed the higher price. However, it was the threat of tariff retaliation by exporting countries, which included 25 members of the European Union along with Japan, South Korea, China, Norway, Switzerland, New Zealand, and Brazil, that led President Bush to suspend the steel tariff on December 5, 2003. The potential **tariff war** ended the steel tariff 19 months after it was imposed rather than 3 years originally planned. Through the **dispute settlement procedure**, the exporting countries received permission from the WTO to impose tariffs against U.S. exports. The WTO ruled that because the United States failed to

prove serious injury to its steel industry due to a sudden increase in import competition, it was ineligible for Article XIX protection.

## HEADLINES

### Europe's Little List: Apples, Tractors, and Toilet Paper

With the finding by an appellate board of the WTO that the United States violated international trade law with the imposition of the steel tariff, the European Union sought to retaliate with \$2.2 billion in tariffs on various American products. These U.S. exports included steel as well as politically sensitive goods such as Florida oranges, Michigan and Wisconsin apples, California fruits, agricultural equipment from Illinois, Midwest toilet paper, and many others.

## 4 Import Tariffs for a Large Country

Aside from potential government revenues and political gains, some countries use tariffs to increase their gains from trade. In particular, unlike the small-country case we studied in the previous section, a large importing country may be able to improve its welfare by imposing a tariff. Namely, a large country has the power to affect the exporter's price with a tariff due to its purchasing capacity.

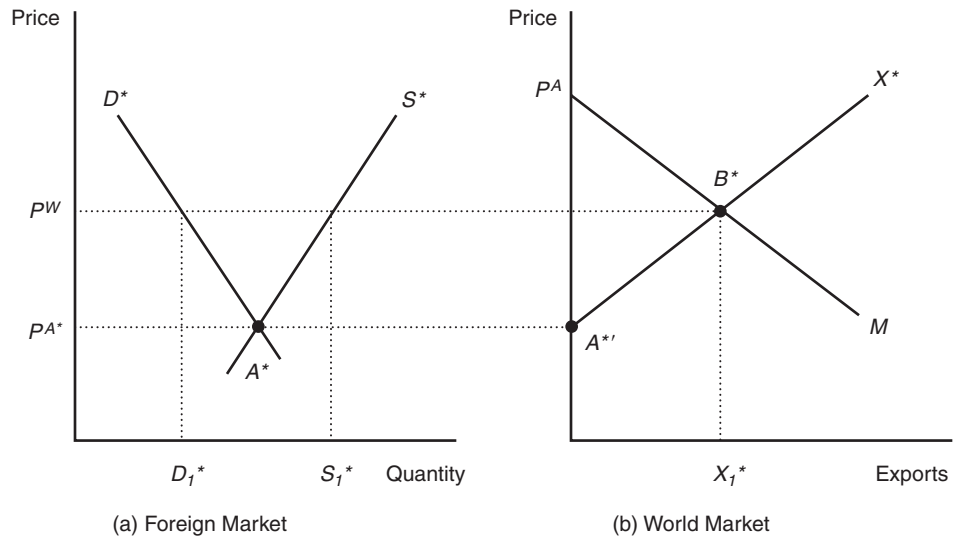
### Foreign Export Supply

Contrary to the situation for the small country, the Foreign export supply will no longer be horizontal when we examine a large Home country because the importer can influence free-trade price by the amount it imports in the world market. To derive the Foreign export supply curve, we will refer to panel (a) of Figure 8-6, which shows the Foreign demand and supply curves, denoted by  $D^*$  and  $S^*$ , respectively. Without trade, the Foreign equilibrium price,  $P^{A^*}$  is at point  $A^*$  in panel (a) or correspondingly represented by point  $A^{*'}$  in panel (b) where exports are zero. As Foreign opens up to trade, it will export the amount  $X^*_1 = S^*_1 - D^*_1$  because the world price,  $P^W$ , is higher than its autarky price of  $P^{A^*}$ . The upward-sloping Foreign export-supply curve is obtained by connecting points  $A^{*'}$  and  $B^*$ , where the latter is given by the amount exported at the world price of  $P^W$ . Combining the Foreign export supply curve,  $X^*$ , and Home import demand curve,  $M$ , we get the free-trade price,  $P^W$ , as shown in panel (b).

### Effect of the Tariff

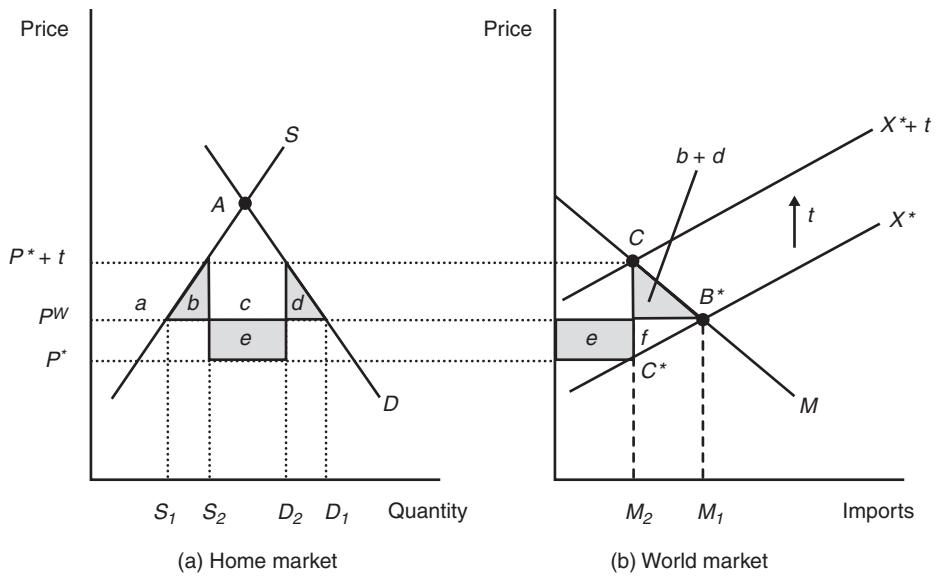
We assume that Home imposes a tariff in the amount of  $t$  dollars on Foreign imports. Due to the tariff, the export supply curve shifts up by the amount  $t$  as illustrated in panel (b) of Figure 8-7. The intersection of the new export-supply curve,  $X^* + t$ , with the import-demand curve,  $M$ , at point  $C$  gives the new equilibrium price,  $P^* + t$ , faced by Home consumers. At the higher price, the quantity demanded at Home falls to  $D_2$ , whereas the quantity supplied increases to  $S_2$  so that the amount imported decreases to  $M_2$ .

FIGURE 8-6



Foreign Export Supply

FIGURE 8-7



Tariff for a Large Country

Note that in panel (a) the increase in the price due to the tariff (vertical distance between  $P^* + t$  and  $P^W$ ) is less than the amount of the tariff. This implies that the burden of the tariff is incurred not only by consumers at Home but also by Foreign exporters. The price received by the Foreign exporters,  $P^*$ , is ob-

tained by subtracting the tariff from the new Home price. Because  $P^*$  is less than  $P^W$ , the price Foreign exporters receive has fallen due to the tariff.

**Terms of Trade** Recall that a country's terms of trade is defined as the ratio of its export price to its import price. With the fall in the import price relative to the initial world price,  $P^W$ , Home experiences a gain in its terms of trade.

**Home Welfare** To examine whether the gain in the terms of trade leads to an increase in welfare at Home, we will analyze the impact of the tariff on the consumers, the producers, and the government. From panel (a) of Figure 8-7, we see that the loss in consumer surplus due to the higher Home price is given by the areas  $(a + b + c + d)$ . The benefit to producers arising from the price increase is the gain in producer surplus denoted by area  $a$ . Lastly, the benefit to the government is equal to the amount of the tariff  $t$  multiplied by the amount of Home imports,  $M_2$ . The tariff revenue,  $t \cdot M_2$ , is represented by the areas  $(c + e)$ . Summing up the loss of the consumers with the gains of the producers and government gives the overall impact of the tariff as follows:

$$\text{Fall in consumer surplus:} \quad -(a + b + c + d)$$

$$\text{Rise in producer surplus:} \quad +a$$

$$\text{Rise in government revenue:} \quad +(c + e)$$

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$$\text{Net effect on Home welfare} \quad e - (b + d)$$

As in the small-country case, the triangle  $(b + d)$  indicates the deadweight loss due to the tariff. However, contrary to the small country, the large country gains area  $e$  because it is able to shift part of the burden of the tariff to the Foreign exporters. Area  $e$  gives a measure of the terms-of-trade gain due to the tariff. It follows that Home would be better off with the tariff if  $e$  is greater than  $(b + d)$  and worse off if  $e$  is smaller than  $(b + d)$ .

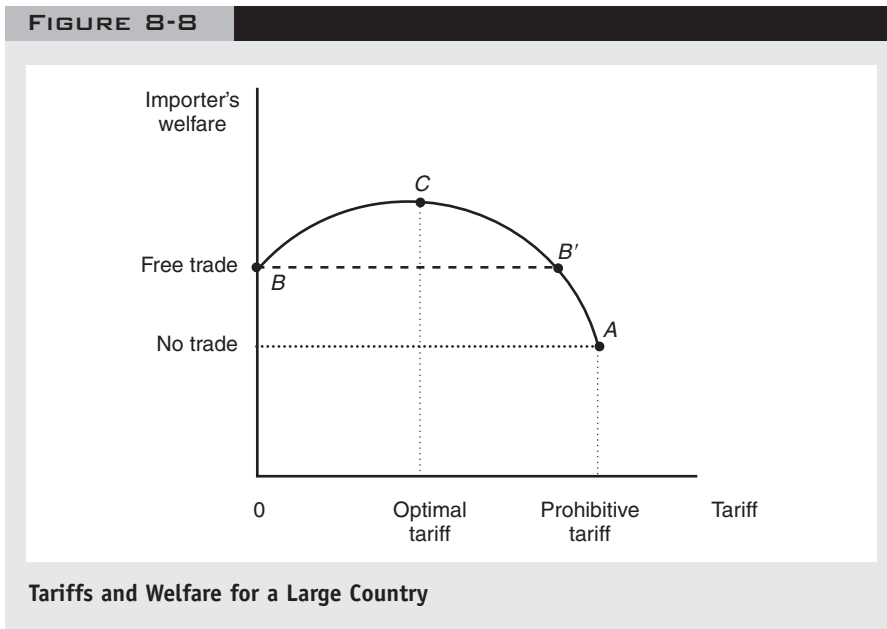
**Foreign and World Welfare** By contrast to Home, exporters in Foreign suffer a loss given by  $(e + f)$  in panel (b). Although the terms-of-trade gain for Home is offset by the terms-of-trade loss by Foreign (i.e., area  $e$ ), areas  $(b + d + f)$  remain undistributed. Therefore, areas  $(b + d + f)$  represent the net loss in world welfare or world deadweight loss. Moreover, because the gain of Home due to the tariff is at the expense of Foreign, the imposition of the tariff is also referred to as a “beggar thy neighbor” policy.

#### APPLICATION

### U.S. Tariffs on Steel Once Again

We will re-examine the effect of the steel tariff on U.S. welfare assuming that it is a large country. Namely, the United States has an impact on the Foreign export price because it is a large importer of steel.

**Optimal Tariff** To clearly calculate the effect of the tariff on U.S. welfare, we will need to incorporate the concept of the optimal tariff, the duty which maximizes the increase in welfare for the importing country. To begin with, our theory tells us that a large importing country can increase its welfare by imposing a tariff. Starting from the left of Figure 8-8, relative to free trade denoted by point  $B$ , we see that Home can increase its welfare by applying a tariff on foreign exports. The welfare continues to increase until it reaches the



highest point corresponding to the optimal tariff. After point *C*, any additional increases in the amount of the tariff results in a decline in Home welfare. A tariff is called a “prohibitive tariff” if it is so large that trade is prevented (see point *A*).

**Optimal Tariff Formula** The formula for the optimal tariff is:

$$\text{Optimal tariff} = \frac{1}{E_x^*}$$

where  $E_x^*$  is the elasticity of export supply, which measures the percentage change in the quantity exported due to a percentage change in the world price of export. Thus, according to the formula, a country will obtain a greater terms-of-trade gain through a large tariff if the elasticity of export supply is small (i.e., a more inelastic or steeper Foreign export supply curve). This is because the Foreign exporter will absorb a larger fraction of the tariff when the export-supply elasticity is low. If the elasticity of export supply is high the situation is reversed. Namely, for a small country facing a horizontal Foreign export supply, Home welfare will be highest if the optimal tariff is zero.

**Optimal Tariffs for Steel** With the established formula, we can now determine the impact of the tariffs on the steel industry using the export supply elasticities presented in Table 8-2.

For the steel products classified under iron and nonalloy steel flat-rolled products and iron and steel tubes, pipes, and fittings, the export supply elasticities are large. Taking the inverse of the export supply elasticity for each of these product categories, we can calculate the optimal tariffs and compare them with the actual tariffs. For iron and nonalloy steel flat-rolled products, the optimal tariff is  $1 / 750 \approx 0\%$ , which is the nearly the same as the actual tariff. The optimal tariff for iron and steel tubes, pipes, and fittings is  $1 / 90 = 1\%$ . Because the actual tariff was between 13% and 15%, the deadweight loss

from the tariff was greater than the terms-of-trade gain so that the United States experienced an overall loss in welfare from the duty imposed on this product. In other words, the high elasticity of export supply suggests that the United States is a small country when it comes to the imports of iron and steel tubes, pipes, and fittings. As such, welfare in the United States would have been highest under free trade.

The first three items have small elasticities of export supply. Therefore, the United States is a large country relative to other countries in importing these products such that the optimal tariffs, given by the third column, are very high. As an example, U.S. welfare would be maximized if the government levied a tariff of  $1 / 0.27 = 370\%$  on alloy steel flat-rolled products. For these three products, the improvement in terms of trade exceeded the deadweight loss from applying the tariff. As a result, the United States increased its welfare relative to free trade by imposing the import duty. However, the gains would have been greater had the actual tariff been much higher. ■

## 5 Import Quotas

After more than three decades from its inception in 1974, the system of import quotas known as the **Multifibre Arrangement (MFA)** came to an end on January 1, 2005. In an effort to protect their domestic industries, the arrangement allowed Canada, the United States, and Europe to restrict the amount of textiles and apparel products that were imported from garment-producing countries. However, the threat of import competition from China with the abolishment of the MFA has led to the establishment of new import quotas by the United States and Europe. Other examples of import quotas include those imposed on sugar by the United States and ones previously placed on bananas by Europe to protect exporters in its former colonies in Africa from producers in Latin America.

## HEADLINES

### Europe Reaches Deal on Banana Imports

To comply with WTO guidelines, governments in the European Union replaced pre-existing import quotas on bananas with a tariff of 176 euros per ton. However, this agreement not only raised issues of concern by exporting Latin American countries but also within the European countries.

The former contends that the tariff is too high, particularly because ex-European colonies are exempted from the duty, whereas members of the latter are split between protecting their banana growers in the Caribbean versus lowering prices for consumers.

## HEADLINES

### Sweet Opportunity

In an effort to protect American farmers from import competition, the United States imposes import quotas on foreign sugar. As a result of the restriction, the domestic sugar price has been two to three times higher than the world price for the past 25 years. Moreover, the gov-

ernment guarantees the farmers a break-even price by allowing them to sell their excess to the U.S. Department of Agriculture (USDA). However, the sugar program may need to change given that the world price of sugar has now risen to the U.S. level and a shortage exists in the United States. Under the current condition, the U.S. government could potentially remove the import quota, which would improve domestic welfare without inflicting huge costs to the USDA. Not surprisingly, the U.S. sugar producers have a strong incentive to maintain the status quo by lobbying for limits on trade expansion.

### Import Quota in a Small Country

The effect of an import quota on a small country is similar to that of a tariff, as we will now examine.

**Free-Trade Equilibrium** We begin the analysis of an import quota in a small country with the Home demand and supply curves shown in panel (a) of Figure 8-9. The quantity demanded at Home given the free trade world price of  $P^W$  is  $D_1$  and the quantity supplied is  $S_1$ . Thus, the amount imported is  $M_1 = D_1 - S_1$ . The equilibrium of the import demand curve,  $M$ , and the horizontal export supply curve,  $X^*$ , is given by point  $B$  in panel (b).

**Effect of the Quota** If Home imposes an import quota of  $M_2 < M_1$ , then the exports may not exceed this amount. We can represent the limitation with a vertical export supply curve,  $\bar{X}$ , as shown in panel (b). Given the Home import demand curve and the new restricted export supply curve, the new equilibrium price is higher at  $P_2$ . Due to the higher price, domestic producers increase the quantity supplied to  $S_2$  and consumers reduce the quantity demanded to  $D_2$ . Note that the change in quantity and price would be identical if the government replaced the quota with an import tariff of  $t = P_2 - P^W$ . Namely, import quotas have **equivalent import tariffs**, which would lead to the same higher price and lower quantity of imports.

**Effect on Welfare** The welfare effect of an import quota on producers and consumers is similar to that of a tariff. More specifically, in Figure 8-9 the loss in consumer surplus due to the quota is area  $(a + b + c + d)$ , whereas the gain in producer surplus is the area  $a$ . However, the similarity ends with the consideration of area  $c$ . Although it is the revenue collected by the government under a tariff, area  $c$  represents “rents” under a quota. Depending on the allocation of the **quota rents**, the net loss due to an import quota may be greater than that of a tariff.

**1. Giving the Quota to Home Firms** The first possibility is for the quota licenses to be given directly to the Home firms. Namely, the Home firms are given the right to import the amount  $M_2$  at the world price of  $P^W$  and to sell it in the domestic market at the price of  $P_2$ . Therefore, the rents earned by the Home firms are  $M_2 \cdot (P_2 - P^W)$ . Summing up the losses and gains due to the quota gives:

Fall in consumer surplus:	$-(a + b + c + d)$
Rise in producer surplus:	$+a$
Quota rents earned at Home:	$+c$
<b>Net effect on Home welfare:</b>	<b><math>-(b + d)</math></b>

With the Home firms holding the quota licenses, the net effect of the quota on welfare is the same deadweight loss as a tariff. The only difference is that area  $c$  is collected by the Home firms instead of the government.

**2. Rent Seeking** The second possibility also involves the quota licenses to be given to the Home firms but not directly. As a result, firms engage in rent-seeking behaviors. Namely, they employ inefficient activities to obtain the rights to the import the product at the world price of  $P^W$ . For example, a firm may overproduce if the license distribution is based on production in the previous year. If the resources dedicated to rent seeking equal the value of the rents, then area  $c$  is essentially wasted. As such, the welfare effect of the quota is the sum of the loss in consumer surplus and the gain in producer surplus:

Fall in consumer surplus:	$a + b + c + d$
Rise in producer surplus:	$a$
<b>Net effect on welfare:</b>	<b><math>-(b + c + d)</math></b>

Due to the rent-seeking activities, the net welfare loss is greater with the quota than a tariff.

**3. Auctioning the Quota** The third possibility is for the Home government to auction off the quota licenses. Assuming that the value the government accrued from the auction is equal to area  $c$ , then the net effect of the quota is the same as that of a tariff as given by the following:

Fall in consumer surplus:	$a + b + c + d$
Rise in producer surplus:	$a$
Auction revenue earned at Home:	$c$
<b>Net effect on welfare:</b>	<b><math>-(b + d)</math></b>

#### APPLICATION

### Auctioning Import Quotas in Australia and New Zealand

To control the imports of a number of goods, Australia and New Zealand auctioned quota licenses during the 1980s. The value of imports subject to quotas between 1981 and 1987 for New Zealand is presented in Table 8-3. At \$56 million, the value of imports covered by the quotas equates to 28% of all goods entering the country in 1982. The value dropped to 16.5% in 1987. By 1992, the quota licenses were eliminated.

Area  $c$ , or the quota rent, can be estimated by the value of the bids for the quota licenses. Namely, the rent associated with the quotas between 1981 and 1983 is \$10.5 million. The tariff equivalent can also be calculated by dividing the value of the bids with the value of the imports with the quotas. The first row shows that the tariff equivalent is 18.7% for 1981 to 1983. In reality, the revenue collected by the New Zealand government would have been more under the tariff equivalent than the quota auction because some firms withdrew their rights to purchase the import licenses upon winning the bids and others resold the licenses at higher prices. ■

**4. “Voluntary” Export Restraint** The fourth possibility is the case in which the Foreign country initiates the quota. Namely, Foreign voluntarily puts limits on the amount it exports to Home. These self-imposed restrictions are referred to as “voluntary” export restraint (VER) or “voluntary” restraint agreement (VRA). Because the quota rents are collected by foreign producers, the loss in Home welfare is greater than a tariff as the summation of the losses and gains below shows:

$$\text{Fall in consumer surplus: } -(a + b + c + d)$$

$$\text{Rise in producer surplus: } +a$$

---


$$\text{Net effect on Home welfare: } -(b + c + d)$$

Although a VER clearly results in a greater negative net effect on Home welfare relative to an import tax, by transferring the quota rents to the Foreign exporter, a tariff or quota war may be prevented by imposing the “voluntary” trade restriction.

**Costs of Import Quotas in the United States** Estimates of U.S. deadweight loss and quota rents due to import quotas on five industries are presented in Table 8-4 for 1985. The sum of the deadweight loss for these industries ranged from \$8 to \$12 billion annually, with textiles and apparel contributing about \$5 to \$6 billion of the total. The net welfare loss is even larger since the rents were transferred to Foreign exporters in all the industries, except for dairy. Foreign earned about \$7 to \$17 billion in quota rents each year during the mid 1980s. Because some of the quotas expired or ceased to be binding (MFA and automobiles, respectively), whereas others were replaced by tariffs (steel and agricultural products), most of the costs associated with the import quotas no longer exist today.

#### APPLICATION

### China and the Multifibre Arrangement

The long standing MFA came to an end on January 1, 2005. The system of import quotas protected the apparel industry in the industrialized countries by specifying the amount of each product the developing countries could export. The end of the MFA meant that exporters no longer needed to hold back their production capabilities. This represented a huge potential for China, the largest supplier, which became a cause for concern not only among other developing countries but also industrialized countries. The common worries were that rising exports from China would compete with their textiles and apparel industry, causing job losses.

**Growth in Exports from China** Figure 8-10 compares the changes in clothing and textiles exports with the United States following the elimination of the MFA. Panel (a) shows that in 2005, China’s textile and apparel exports to the United States increased by more than 40% relative to the previous year, whereas those from higher-cost exporters like South Korea, Hong Kong, and Taiwan declined by 10% to 20%. Furthermore, Chinese exports of tights and pantyhose to Europe increased by as much as 2000% during the first 2 months of 2005 as compared with the year before.

According to the theory, the removal of the MFA should lead to a reduction in the price that was raised by the import quotas. Panel (b) shows that

prices of “constrained goods” indeed decreased for many countries exporting to the United States, with the largest drop from China by 38% between 2004 and 2005.

**Welfare Cost of MFA** The drop in prices in 2005 with the removal of the MFA translates to a return of the quota rents from the foreign exporters to U.S. consumers. More specifically, with an estimated price reduction ranging between \$6.5 and \$16.2 billion from 2004 to 2005, the cost of the MFA equates to about \$100 per household when we divide the loss of \$11.4 billion by 111 million U.S. households.

**Import Quality** The removal of the MFA resulted in a “quality downgrading” of Chinese exports. The reduction in prices was larger in percentage terms for lower-priced products such as t-shirts (\$1) relative to more expensive items such as a blouse (\$10). The reason is that without the import quota, the incentive to sell a limited quantity at higher values becomes moot.

**Reaction of the United States and Europe** To restrict the growth of its exports and subdue the growing concerns, China offered to self-impose a system of export taxes. However, the United States and Europe successfully negotiated a new system of quotas with China, which restricted the amount the developing country can sell in a variety of products. The new system of quotas imposed by the United States is scheduled to end in 2008.

## 6 Conclusion

This chapter examines the effect of trade barriers such as tariffs on the welfare of the importing country, exporting country, and world. Reasons why importing countries impose the barriers to trade include politics, raising government revenue, and increasing welfare for the large-country case. The analysis shows that although a small country always loses with a tariff, a large country may improve its terms of trade by shifting some of the burden of the duty to foreign exporters. Similar to a tariff, an import quota raises the domestic price, which increases producer surplus while making consumers worse off. However, unlike a tariff, in which the importing government collects revenue, “rents” from the quota may go to either the licensed importer, the foreign exporter when the export restraints are “voluntary,” or the government if the rights to quota licenses are auctioned. ■

## IN-CLASS PROBLEMS

1. LobbyInc is a firm that specializes in lobbying the government on behalf of special interest groups. Suppose the sugar producers recently hired LobbyInc to help them obtain the rights to the sugar quota licenses.

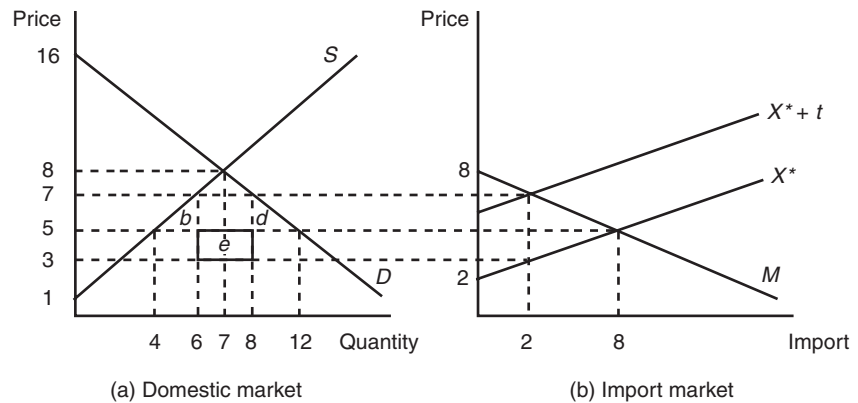
- a. What is the maximum the domestic sugar producers are willing to pay LobbyInc for their services? Explain.

**Answer:** The sugar producers are willing to pay up to the amount of the quota rent, or area  $c$ , in Figure 8-9. Any amount greater would result in a smaller producer surplus than the benefits of the quota licenses.

- b. What is the net effect of their activities on the welfare of the domestic sugar market?

**Answer:** The net effect of their rent-seeking activities would be a fall in domestic welfare by the amount represented by areas  $b + c + d$  in Figure 8-9.

2. Suppose Home is a large country whose supply and demand curves are given by the left of the following figure.



- a. Assume the world price is  $P^w = \$5$ . Determine the consumer and producer surplus under free trade.

**Answer:**

Consumer surplus under free trade:

$$CS = \frac{1}{2} \cdot 12 \cdot (16 - 5)$$

$$CS = 66$$

- b. Suppose the government at Home imposes a tariff in the amount of \$4 (i.e.,  $t = \$4$ ). What is the new Home price? What is the price received by the foreign exporters?

**Answer:** Because Home is a large country, it does not face a horizontal export supply curve. Rather, Home is able to have an impact on the world price. With a tariff of \$4, the new Home price is \$7 whereas the price received by the Foreign exporters is \$2.

- c. Determine the terms of trade for Home with the tariff.

**Answer:** Home's terms-of-trade gain is denoted by area  $e$  in the figure. Namely it is equal to  $4 [= (8 - 6)(5 - 3)]$ .

- d. Does Home welfare increase or decrease due to the tariff? Explain.

**Answer:** To determine whether Home welfare increases or decreases, we need to compare the terms-of-trade gain with the deadweight loss that results from the tariff (i.e., Home is better off if area  $e$  is greater than areas  $b + d$ ).

Areas  $b + d$ :

$$b + d = \frac{1}{2} \cdot (6 - 4) \cdot (7 - 5) + \frac{1}{2} \cdot (12 - 8) \cdot (7 - 5)$$

$$b + d = 2 + 4$$

$$b + d = 6$$

Because area  $e$  equals 4 in part (c), whereas areas  $b + d$  equal 6, then Home is worse off with a tariff of \$4.

3. Refer to problem 2. At what amount would the tariff be considered prohibitive? Explain.

**Answer:** A tariff in the amount of \$6 would be prohibitive because it would raise the price paid by

consumers to the no-trade equilibrium level. As a result, imports would be zero.

4. Aoslia is a small country that takes the world price of corn as given. Its domestic supply and demand for corn is given by the following:

$$D = 45 - 3P$$

$$S = 3P - 9$$

- a. Assume initially that Aoslia does not open to trade. What is the autarky equilibrium price and quantity?

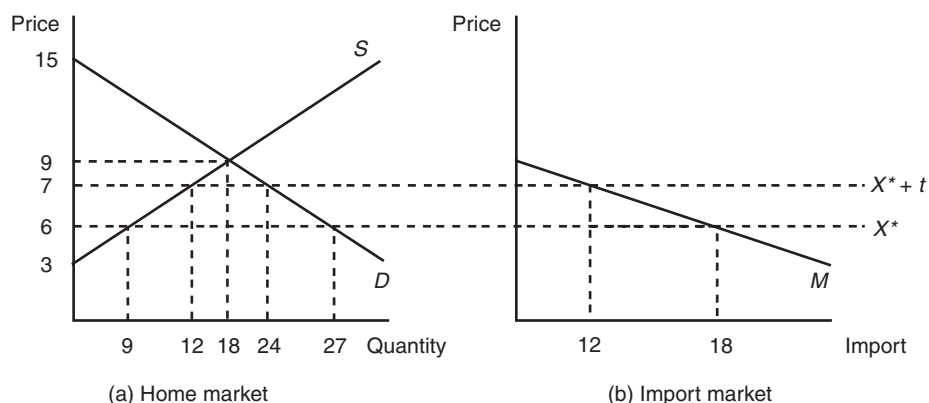
**Answer:** Setting  $S = D$  gives  $P = 9$  and  $Q = 18$ .

- b. Suppose Aoslia decides to engage in trade. Determine the quantity demanded, quantity supplied, and import given the world price of \$6 per bushel of corn.

**Answer:** Given  $P^W = 6$ , we have that  $D_1 = 45 - 3(6) = 27$  and  $S_1 = 3(6) - 9 = 9$ , so  $M_1 = D_1 - S_1 = 27 - 9 = 18$ .

- c. If the Aoslia government imposes a tariff in the amount of \$1 (i.e.,  $t = \$1$ ), what is the new domestic price? What is the amount imported?

**Answer:** The new domestic price is  $P^W + t = 7$  so  $D_2 = 45 - 3(7) = 24$  and  $S_2 = 3(7) - 9 = 12$  so  $M_2 = D_2 - S_2 = 24 - 12 = 12$ .



- d. Determine the effect of the tariff on the Aoslian consumers, producers, and government.

**Answer:**

Consumer surplus  
without tariff:

$$CS = \frac{1}{2} \cdot 27 \cdot (15 - 6)$$

$$CS = 121.5$$

Producer surplus  
without tariff:

$$PS = \frac{1}{2} \cdot 9 \cdot (6 - 3)$$

$$PS = 13.5$$

Government  
without tariff:

$$\text{Government} = 0$$

Consumer surplus  
with tariff:

$$CS = \frac{1}{2} \cdot 24 \cdot (15 - 7)$$

$$CS = 96$$

Producer surplus  
with tariff:

$$PS = \frac{1}{2} \cdot 12 \cdot (7 - 3)$$

$$PS = 24$$

Government  
with tariff:

$$\text{Government} = (24 - 12) \cdot (7 - 6)$$

$$\text{Government} = 12$$

- e. Calculate the terms-of-trade gain. What is the net effect of the tariff on Aoslia's welfare? Explain.

**Answer:** Aoslia does not have a terms-of-trade gain because it faces a perfectly elastic (i.e., horizontal) export supply curve. This means that the entire burden of the tariff falls on its consumers.

Fall in consumer surplus:  $-25.5$

Rise in producer surplus:  $+10.5$

Rise in government revenue:  $+12$

**Net effect on Home welfare:  $-3$**

5. Refer to problem 4. Suppose the Aoslian government applies an import quota that limits imports to 12 bushels.

- a. Determine the quantity demanded, quantity supplied, and new domestic price with the quota.

**Answer:**

$$\begin{aligned}
 45 - 3P - 3P + 9 &= 12 & D &= 45 - 3P & S &= 3P - 9 \\
 54 - 6P &= 12 & &= 45 - 3(7) & &= 3(7) - 9 \\
 6P &= 42 & &= 45 - 21 & &= 21 - 9 \\
 P_2 &= 7 & D_2 &= 24 & S_2 &= 12
 \end{aligned}$$

- b. Calculate the quota rent.

**Answer:**

$$\text{Quota Rent} = M_2 \cdot (P_2 - P_W)$$

$$\text{Quota Rent} = 12 \cdot (7 - 6)$$

$$\text{Quota Rent} = 12$$

- c. Assuming that the quota licenses are allocated to domestic producers, what is the net effect of the quota on Aoslia's welfare?

**Answer:**

Fall in consumer surplus:	-25.5
Rise in producer surplus:	+10.5
Quota rents earned at Home:	+12
<b>Net effect on Home welfare:</b>	<b>-3</b>

- d. Assuming that the quota rents are earned by foreign exporters, what is the net effect of the quota on Aoslia's welfare?

**Answer:**

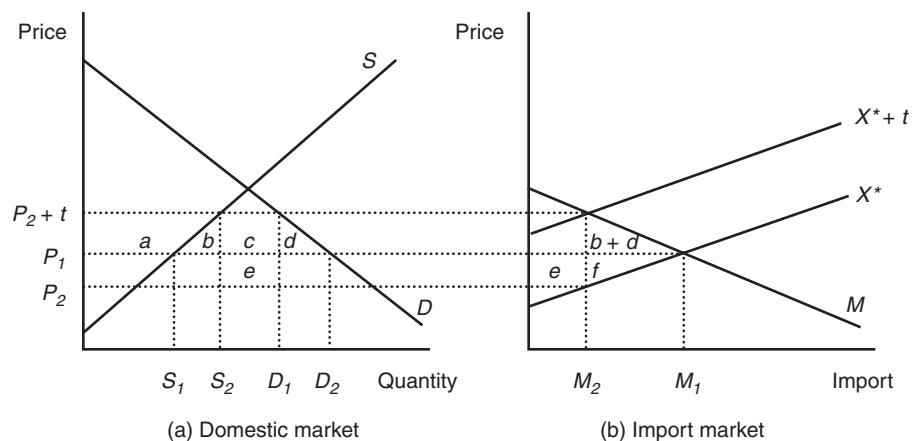
Fall in consumer surplus:	-25.5
Rise in producer surplus:	+10.5

**Net effect on Home welfare: -15**

6. Why do many countries, including the United States, continue to use tariffs to limit imports when the theory shows that such restrictions have a potential to impose net loss on the domestic country?

**Answer:** For small-importing countries, tariff is a source of government revenue that is "easy to collect" compared with income or value-added taxes because the latter requires individuals and firms to honestly report earnings. For large importing countries such as the United States, a tariff has the potential to increase domestic welfare if the terms-of-trade gain is larger than the resulting dead-weight loss created by the import tax. Moreover, an imposition of a tariff could lead to potential political gains by promising to protect the concerned industries or groups from import competition.

7. Suppose the United States is a large importer of Mexican tortilla. Following the implementation of NAFTA, U.S. tariff on tortillas decreased from 25% to 0.



- a. Will the price of tortillas in the United States fall by the exact amount of the tariff? Explain.

**Answer:** Because the United States is a large country, a portion of the tariff was absorbed by Mexico. As such, consumers in the United States did not experience the entire hike in the import price due to the tariff. With the re-

moval of the tariff, the price of tortillas will fall, but by less than 25%.

- b. What is the impact of the NAFTA on U.S. tortilla producers, Mexican tortilla producers, and U.S. tortilla consumers?

**Answer:** U.S. tortilla producers received a higher price under the tariff, so they are worse

off with the removal of the tariff. Mexican tortilla producers receive a higher price under NAFTA whereas U.S. tortilla consumers are able to purchase the good at a lower price, so both of these groups benefit from the elimination of the tariff.

- c. Removal of the tortilla tariff under NAFTA has increased welfare for the United States. Comment.

**Answer:** The statement is true only if the gain in terms-of-trade (area  $e$ ) under the tariff was smaller than the deadweight loss ( $b + d$ ) so that the tariff removal corrects the negative impact of the trade barrier on U.S. welfare.

8. What is the role of the “most-favored nation” clause in helping to eliminate discriminatory treatment in international commerce?

**Answer:** Article I of the key provisions of the GATT states that nations must apply the same tariff to all members of the WTO. This “most-favored nation” clause helps to eliminate discriminatory practices by requiring that all WTO countries be treated equally. Namely, a country must extend the same tariff to all members of the WTO as it would to its most-favored trading partner.

9. The government is more concerned about producer surplus than consumer surplus if it levies an import tariff that raises the domestic price. Comment.

**Answer:** This comment is true if the country is a small importer because the loss in consumer surplus outweighs the gain in producer surplus from the import tax even if the government were to redistribute the tariff revenue to the consumers. Moreover, the comment is also true if the country is a large importer that has the potential to impact the world price. If the terms-of-trade gain is larger than the deadweight loss and the government redistributes the tariff revenue to the consumers, consumers and would still lose relative to free trade because some of the consumer surplus is transferred to the producers as a result of the higher price induced by the tariff.

10. What is an efficiency loss? Does it only occur when small country imposes a tariff?

**Answer:** The efficiency loss or production loss results from the Home producer increasing the

quantity supplied following the raise in the domestic price with the tariff. From Figure 8-5, we see that the additional units,  $S_2 - S_1$ , are supplied by the Home producers with higher marginal costs than foreign exporters producing at the world price. The loss results regardless of the size of the importing country.

11. Why is tariff revenue less important as a source of income for the U.S. governments relative to some developing countries?

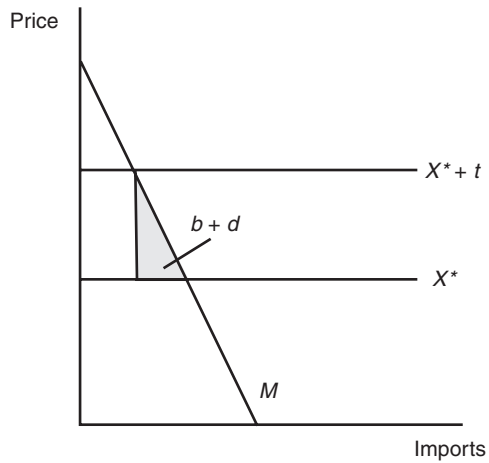
**Answer:** Unlike some developing countries, the high- and middle-income countries are able to obtain a net increase in tax revenue by switching to hard-to-collect taxes such as income and value-added taxes. The reason maybe that the penalty for individuals and firms failing to accurately report their earnings are sufficient to obtain the necessary information in countries such as the United States compared with the developing countries. By contrast, because all imports are subject to customs inspection upon arrival to a country’s port, import tariffs are easy to collect for a developing country.

12. What causes the Foreign-export supply curve to slope upward?

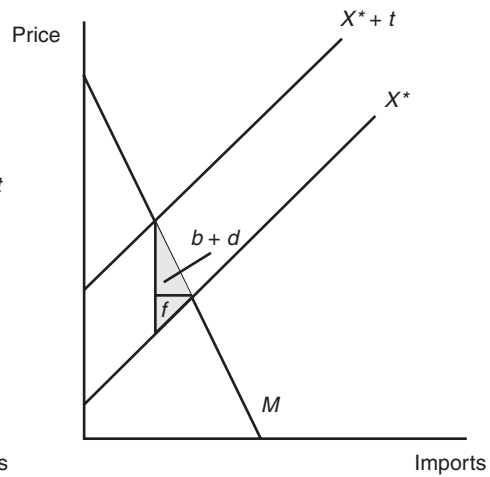
**Answer:** The Foreign-export supply gives the amount exporters in Foreign are willing and able to supply internationally at each world price. When the world price,  $P^W$ , is higher than Foreign’s no-trade price, the quantity supplied by producers in Foreign,  $S_1^*$ , exceeds the quantity demanded by consumers in Foreign,  $D_1^*$ , as illustrated by Figure 8-6. This excess supply or surplus ( $X_1^* = S_1^* - D_1^*$ ) is the amount available for the international market. As the world price rises, the quantity demanded by Foreign consumers decreases even further, whereas the quantity supplied by Foreign producers increases, resulting in a greater quantity of export supply. The direct relationship between the world price and the quantity of export supply gives the curve its upward slope.

13. Graphically show the effect of a United States-imposed tariff on world welfare, assuming that the United States is a small country. How does your result differ if the United States is a large country?

**Answer:** In addition to the deadweight loss equal to area  $b + d$ , there is an additional amount equal to area  $f$  if the United States is a large country.



(a) U.S. as a small country



(b) U.S. as a large country

14. If the Foreign export supply is perfectly elastic, what is the optimal tariff Home should apply to increase welfare? Explain.

**Answer:** A perfectly elastic Foreign export supply curve implies that the importing country is small. Therefore, the optimal tariff for Home is to set the tariff to zero (i.e., not impose an import tax) because it does not have a terms-of-trade gain but suffers a deadweight loss.

